Impact Of School Consolidation On Enrollment and Achievement

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Abstract

I study the impact of school consolidation on enrollment and achievement, using its staggered roll-out in the Indian state of Rajasthan. Across the years 2014, 2016, and 2017, Rajasthan merged many of its grade 1–5 schools with grade 6–10 schools to create grade 1–10 schools at the village level. Anecdotal evidence suggested that consolidation led to declining enrollment levels and teacher lay-offs. Combining the government orders on consolidation and administrative data on schools, I rule-out that consolidation had a negative impact on enrollment or number of teachers. I find that consolidation decreased the number of schools in a village by one, increased the proportion of children studying in a school with a principal by 0.1, and increased the number of teachers in a village by 0.7. I also find that consolidation increased school enrollment in a village by 2 per cent — in particular, girls' enrollment increased by 2 per cent. Consolidation decreased the proportion of high scorers among grade 5 students by 0.08 and did not decrease the proportion of high scorers among grade 8 students by more than 0.02. This indicates that consolidation had a negative effect on achievement among displaced children and no effect on achievement among children in the recipient schools.

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1 Introduction

School consolidation refers to the concept of closing down small community schools and reallocating the students and teachers from these schools to better-resourced schools. School consolidation is thus associated with elimination of small schools and creation of larger schools. Larger schools are preferred by many policy makers across the western world (Beuchert et al. 2018). For instance, Berry and West (2010) refer to school consolidation as an 'organizational revolution that remade American public education'. Until the 1930s, schools in the United States were small and employed a single teacher. In the four decades that followed, nearly two-thirds of US schools were eliminated through school consolidation. There exists proponents and opponents of school consolidation. Supporters of school consolidation argue that larger schools entail lower costs per student, teacher specialization and better resources for a larger number of children. The dissenters of school consolidation asserts that small schools are better for improved learning outcomes and, also that closure of small schools will lead to school dropouts due to increased distance to the new school.

This paper studies both the direct impacts of school consolidation on school availability and resources as well as the broader impact on enrollment and achievement. In order to estimate these effects, I exploit the staggered roll out of consolidation in the Indian state of Rajasthan. The identification strategy is a two-way fixed effects (TWFE) estimation. The identifying assumption of the TWFE model is that in the absence of consolidation, the outcome would have evolved similarly in villages where consolidation happened today relative to villages where consolidation happens in the near future and to villages where consolidation does not happen. I combine the government orders on consolidation with an annual census of schools, called U-DISE (Unified District Information System for Education) to create a school level panel dataset for my analysis. The period of analysis ranges from 2008 to 2017.

It is important to understand Rajasthan school consolidation in the backdrop of prior educational reforms in India, majority of which were access oriented. Until recently, educational policies focused on ensuring school access to every child. Two most noteworthy among them are the Sarva Shiksha Abhiyan (SSA) programme started in 2001 and the Right to Education (RTE) Act passed in 2009. These policies led to the prevalence of a large number of small schools across India. With India's specific focus on universalization of primary education, many of these small schools catered to grades 1–5. Having a large number of schools also meant that many of the schools had low enrollment, limited infrastructure and inadequate teachers (Bhatnagar and Bolia 2019). Large number of these schools thus became a concern across the country. Many Indian states have now resorted to school consolidation to address this concern. School consolidation has also become an important component of the most recent national level educational reforms named New Education Policy (NEP) 2020. Rajasthan is the first Indian state to implement school consolidation at scale.

There are two potential threats to my identification. The first one is imposed by the implementation of the RTE Act in the years leading to the first wave of consolidation. One of the provisions of the RTE Act was to increase the availability of schools across the country. The new schools which were built because of the RTE Act are more likely to get consolidated in the first wave of consolidation. I address this threat by restricting my analysis to villages in which no new schools were built because of the RTE Act. This ensures that my estimates are drawn from villages which had the potential for consolidation, even before the RTE Act was passed. The second threat to my identification stems from the possibility that the school consolidation is not a one-time shock. For instance, if consolidation leads to an increase in school enrollment in the village, private schools can respond by increasing their inputs to attract even more children to school. This can lead to further increase in school enrollment. Sun and Abraham (2021) recently demonstrated that TWFE is appropriate only if the treatment is homogeneous and is a one-time shock. I address this concern by presenting regression estimates using the Callaway

and Sant'Anna (2021) method which accommodates both heterogeneous impacts and the growing effect of consolidation.

In the first paper of the paper, I estimate the direct impacts of consolidation on school availability and resources. I use the government orders on consolidation to identify the consolidated schools. In order to decipher the year in which a school was consolidated, I use the order issue date. If the order issue date is on or before 30 September of a year, I consider that the school is consolidated in that year. U-DISE data for that year reflects post-consolidation information since U-DISE reporting is done on 30 September of every year. For orders issued after 30 September, I consider that the school is consolidated the following year. The consolidation orders also report corresponding villages, blocks and districts in which consolidation takes place. All closed and recipient schools in a consolidation event are located within the same village. School consolidation in Rajasthan was meant to reduce the number of schools in a village and increase the number of children studying in a school with a principal. I look at how school consolidation affects the number of schools in a village. This allows me to be confident about how I have labeled the year of consolidation in a particular village. I also look at how consolidation affects the number of children who study in a school with a principal. Further, I study whether consolidation leads to any adjustment in the number of teachers in the village.

In the latter part of the paper, I estimate the broader impact of consolidation on enrollment and achievement. I look at how consolidation affects school enrollment in a village. One of the arguments by opponents of consolidation is that consolidation leads to children dropping out from school due to increased distance to the new school. Data limitation prevents me from looking at whether consolidation leads to a change in distance to one's school. U-DISE provides data on school enrollment. I look at the impact of consolidation on enrollment in a village. I also look at how consolidation affects achievement among children who move from the closed to the recipient school. Children of grades 1-5 are moved from one school to another as part of consolidation. The disruption can lead to a decline in achievement of these children (Beuchert et al. 2018). U-DISE has data on the number of high scorers in grade 5 exams. I look at the impact of consolidation on achievement among grade 5 children in a village. I also look at how consolidation affects achievement among children who have always been in the recipient school. It is important, from a policy perspective, that children in the recipient schools do not experience a change in their learning because of the consolidation exercise. U-DISE has data on the number of high scorers in grade 8 exams. I look at the impact of consolidation among grade 8 children in a village.

I find that school consolidation decreases the number of schools in a village by one. This provides suggestive evidence that there is a first stage effect. A grade 1-5 school is merged to a grade 6-10 school to create a grade 1-10 school within a village. A grade 1-5 school is thus eliminated in each village. I also find that school consolidation increases the proportion of children studying in a school with a principal by 0.1. The primary objective of Rajasthan school consolidation was to increase the number of children who study in a school with a principal. Grade 1-5 schools do not have a principal unless they have more than 150 children enrolled in them. Children of many of the closed schools thus did not have a principal. With consolidation, these children study in a school with a principal. I also find that school consolidation increases the number of teachers in a village by 0.7. The consolidation orders suggests that the adequacy of teachers in the recipient school will get reevaluated after consolidation. This will lead to any readjustment of the number of teachers in the recipient school. I find that the number of teachers in a village increased by 0.7 because of consolidation.

I find that consolidation increases school enrollment in a village by 2 per cent. At baseline, 473 children on average are enrolled in school in a village. Nine additional children get enrolled in a school, within a village because of consolidation. I also look at the impact of consolidation on school enrollment of children, by gender. I find that consolidation increases school enrollment among girls by 2 percent which is statistically significant. Although not statistically significant, consolidation increases school enroll-

ment among boys by 1 percent. I also find that consolidation decreases the proportion of high scorers among grade 5 children by 0.08. Grade 1-5 children are moved from one school to another because of consolidation and this affects achievement among these children. Achievement among grade 5 children declines because of consolidation. I also find that consolidation does not decrease proportion of high scorers among grade 8 children by more than 0.02. Grade 8 children are those who have previously been studying in the recipient school and continue their studies there after consolidation. I find that consolidation does not affect their achievement.

These findings contribute to multiple strands of literature. The first is to the literature on school consolidation. There is no other paper, to the best of my knowledge, which has looked at the impact of school consolidation on enrollment outcome. Most papers on consolidation are in developed contexts where enrollment in not a margin where change is expected, unlike India. There are prior papers that have studied the impact of consolidation on student achievement, but the results are mixed. Beuchert et al. (2018) find a negative impact, De Haan et al. (2016) find a positive impact, and Izadi (2015) and Liu et al. (2010) find that consolidation has no adverse effect on achievement. There is limited work on school consolidation in developing contexts (Hannum and Wang 2022; Liu et al. 2010), and none of it is based in India. To the best of my knowledge, there is no other paper that has studied the merger of grade 1–5 with grade 6–10 schools. Consolidation in prior work refers to the merger of multiple grade 1–5 schools. The second strand of literature to which I contribute is the literature on the impact of school size on achievement. In this broad area, I contribute to the studies that support small schools for better learning outcomes (Andrews et al. 2002; Leithwood and Jantzi 2009). The third strand of literature to which I contribute is the literature on the impact of school configuration on school achievement (Holmlund and Böhlmark 2019; Jacob and Rockoff 2011).

The remainder of the paper proceeds as follows. Section 2 describes the motivation for implementing school consolidation, the specifics of Rajasthan consolidation policy, and anecdotal evidence on the impact of the same. Section 3 outlines a standard conceptual framework to help explain how school consolidation affects enrollment and achievement. Section 4 describes the data sources and sample used. Section 5 details the empirical strategy that I use to estimate the causal effect of school consolidation on enrollment and achievement. Section 6 discusses the results and their interpretations. Section 7 concludes.

2 Background and details of Rajasthan school consolidation

In this section, I describe the motivation for implementing school consolidation, the specifics of Rajasthan school consolidation policy, and anecdotal evidence on the impact of the same.

India witnessed an increase in the number of schools in response to its access-oriented reforms. Until recently, educational reforms in India focused on ensuring school access to every child. This was expedited by the Sarva Shiksha Abhiyan (SSA) programme, which started in 2001, and the Right to Education (RTE) Act, which was passed in 2009. These resulted in India establishing a large number of schools. As an illustration, India has 1.5 million schools for its 280 million students, in comparison to China which has 266,000 schools for 220 million students (CPI 2018). However, this resulted in the existence of many schools with low enrollment numbers, limited facilities, and inadequate teachers (Bhatnagar and Bolia 2019). In order to address this concern, many Indian states resorted to school consolidation to make better use of limited resources. I present a few news headlines in support of this in Figure 1. The specifics of school consolidation vary by state.

In the state of Rajasthan, government primary or upper primary schools located very close to a government secondary or higher secondary school suffered from low enrollment figures. These schools did not

have separate teachers by grade since the RTE Act requires a minimum enrollment of 121 children to allot five teachers to a primary school. The quality of education in these schools was thus compromised. In order to ensure qualitative improvement in school education, Rajasthan created model schools (also known as *Adarsh* schools) by consolidating primary or upper primary schools with nearby secondary or higher secondary schools within the same village.

Beginning in 2014 and subsequently in 2016 and 2017, school consolidation took place across Rajasthan with the agreement of the Department of Elementary Education and the Department of Secondary Education. Prior to consolidation, it is likely that the primary or upper primary schools did not have a principal since the RTE Act requires a minimum enrollment of 150 children to allot a principal to a primary school. After consolidation, the principal or principal of the recipient secondary or higher secondary school becomes responsible for all administrative and academic duties across the merged primary and upper primary grades as well.

With consolidation, all assets of the upgraded schools, including land and buildings, are transferred to the recipient school. To the extent possible, all classes across grades 1–10 are conducted in the same building or campus as the recipient school. In exceptional cases where all classes cannot be conducted in the same campus due to inadequate space or inconvenience to students, some classes are conducted in buildings of the upgraded schools after receiving approval from the Department of Secondary Education. Every model school has classes from grades 1–10. Even when consolidation merged a grade 1–5 school with a grade 9–12 school, grades 1–12 will be offered in the model school by arranging admission for grades 6–8. The number of teachers required in the model school is re-evaluated after consolidation, and the necessary adjustments follow. Until the adjustments are made, teachers of upgraded schools continue to work in the recipient school.

In Figure 2 I present the number of government schools in Rajasthan across the period of analysis. There is a 9 per cent increase in the number of government schools in the years 2010–13 due to the large-scale school construction following the introduction of the RTE Act. School consolidation in Rajasthan is associated with a 23 per cent decline in the number of government schools between 2013 and 2017. These trends remain when I restrict the sample to villages that appear across all ten years of the analysis, as shown in Appendix Figure A1. In Figure 3 I further present the disaggregated number of government schools categorized by grades to which they cater, across the period of analysis. The increase in number of schools during the RTE years is driven by grade 1–5 and grade 6–10 schools. The consolidation years of 2013–17 correspond to shifting away from all other types of schools to grade 1–10 schools. The number of grade 1–10 schools in 2017 is five times that in 2013. In Figure A2 I show that these trends remain when I restrict the sample to villages that appear across all ten years of the analysis.

I present more details on Rajasthan consolidation in Table 1. There were 12,100 model schools created across the three waves of consolidation. The majority of the model schools (86 per cent) were formed in 2014. Most of the consolidation involved merging a single primary or upper primary school to a nearby high school. However, 22 per cent of model schools in 2014, 8 per cent in 2016, and 11 per cent in 2017 were created by upgrading multiple elementary schools; 4 per cent of model schools in 2014, 29 per cent in 2016, and 24 per cent in 2017 were created by merging all-girls elementary schools to coed high schools. There are 11,194 villages where at least one model school was created through consolidation.

There is no empirical evidence on the impact of Rajasthan school consolidation. There exists anecdotal evidence, but it is not in favour of consolidation. The media reports suggest that consolidation led to declining enrollment levels and teachers lay-offs. I present some news headlines in Figure 4 in support of this.

3 Conceptual framework

In this section, I outline a standard conceptual framework to help explain how school consolidation affects enrollment and achievement.

Rajasthan school consolidation involves the merger of a grade 1–5 school to a nearby grade 6–10 school to create a grade 1–10 model school. Teachers and students from the upgraded grade 1–5 school are reallocated to the model school. The decision about schools involved in a consolidation lies with the state government. The government anticipated three changes to the school system with the establishment of these consolidated model schools. First, the number of schools in a village will decline mechanically after consolidation. Second, the number of children who study in a school with a principal will increase since all model schools have a principal. Third, the number of teachers in a village will increase as model schools have to readjust their numbers of teachers on re-evaluating the post-consolidation increase in enrollment.

When a grade 1–5 school gets consolidated to a nearby grade 6–10 school, there is a decline in the number of schools in the village. In the majority of villages the number of schools declined by one since 80 per cent of the consolidations involved the closing of a single grade 1–5 school. The reduced number of schools could lead to a decline in enrollment if adequate arrangements are not made to accommodate the children of the closed schools into model schools. This is relevant in the context of India, where education is guaranteed but not compulsory. A parent can choose to not send their child to school. The reduced number of schools can lead to a decline in achievement of students of both closed and recipient schools if recipient school resources are inadequate for the increased number of children.

Consolidation leads to an increase in the number of children who study in a school with a principal. Only 38 per cent of the school-going children in a village attended a school with a principal at baseline. With consolidation, the government mandated that all model schools will have a principal. The presence of a principal could ensure increased quality monitoring at the school. This could encourage more parents to send their children to school. The presence of a principal could also signal increased safety in the school, which could lead to increased school enrollment among girls. The government anticipated that the presence of a principal would ensure higher-quality education and thus improve school achievement.

The government indicated that the number of teachers in the model schools would be readjusted after consolidation, if necessary. With consolidation, the teachers of the closed schools have to start working in the recipient schools with immediate effect. After consolidation, the government promised to re-evaluate the teacher requirements in the model schools and to make any necessary adjustments. At baseline, 73 per cent of grade 1–5 schools had only one or two teachers. However, if any positive adjustment is done by hiring more teachers, it would signal increased education quality. This could encourage more parents to send their children to school. If the number of teachers increases and if it translates into higher learning outcomes, it could be reflected in increased school achievement.

Rajasthan school consolidation corresponds to the merger of a grade 1–5 school to a nearby grade 6–10 school to create a grade 1–10 model school. This is expected to reduce the number of schools in a village and increase the number of children studying in a school with a principal. Consolidation may also lead to a change in the number of teachers. School enrollment, and in particular girls' school enrollment, could increase. The impact of consolidation on student achievement is ambiguous.

4 Data and sample construction

In this section I describe the data sources and sample used to study the effects of school consolidation on school enrollment and learning outcomes.

4.1 Data sources

I construct a school-level panel dataset for the Indian state of Rajasthan, combining government orders on school consolidation with education outcomes. I match an annual census of schools, the Unified District Information System for Education (U-DISE, 2008–17) to state government orders on school consolidation (2014, 2016, 2017). I match school names across the two data sources using a custom fuzzy matching script based on the Levenshtein algorithm.

U-DISE is an annual census of primary and middle schools in India. For every primary and middle school in the country, U-DISE provides data on enrollment, exam completion, and infrastructure. U-DISE is administered annually by the National Institute of Educational Planning and Administration.[1] U-DISE has enrollment data by social categories, by gender, and by grade. Adukia et al. (2020) successfully replicated national survey-based enrollment statistics using the U-DISE enrollment data, thus suggesting that U-DISE data are reliable. U-DISE also has information on examinations at the end of primary and middle school grades. This includes the number of students who sat the exam, passed the exam, and scored high marks. U-DISE also has data on the number of teachers in a school, the number of classrooms, and whether the school has separate toilets by gender. Since 2013 U-DISE also reports enrollment in high school grades. One of the limitations of U-DISE is that it does not report the total number of school-aged children in a neighbourhood; because of this I am unable to calculate enrollment rates.

I use consolidation orders issued by the Rajasthan government's Department of Education to identify treatment status of schools by year.[2] The orders have the names of the schools which are to be closed and the names of the schools to which children and teachers of closed schools are to be reallocated. I use the issue date on these orders to identify the year in which a school is consolidated. If the order issue date for a school is on or before 30 September of a year, I consider that the school is consolidated in that year. U-DISE data for that year reflects post-consolidation information since U-DISE reporting is done on 30 September of every year. For orders issued after 30 September, I consider that the school is consolidated the following year. The orders also report corresponding villages, blocks, and districts in which consolidation takes place. It is noteworthy to know that the closed school(s) and recipient school in a consolidation are located within the same village.

4.2 Sample construction

In this section I describe the steps and restrictions that I impose on the data to build the analytical sample. In Figure 5 I present the first step in which I match schools in the state government consolidation orders to the U-DISE data. There are 27,142 schools in the state consolidation orders. I exclude all 478 schools located in the district Dhaulpur, which has missing observations in the U-DISE data. I match the remaining 26,664 schools with the schools in the U-DISE data using a custom fuzzy matching script based on the Levenshtein algorithm. Overall, 64 per cent of the schools are matched across the state consolidation orders and U-DISE data. This translates into 17,048 schools. Out of the 17,048 schools that are matched across consolidation orders and U-DISE, 8,186 are recipient schools and 8,862 are

[1] U-DISE can be accessed at http://14.139.60.146/DownloadRawData/RawData/RawData.aspx.

[2] These orders can be accessed at https://education.rajasthan.gov.in/content/raj/education/secondary-education/en/order/Secondary/Sec_Ekikaran.html.

closed schools. In the matched data, 90 per cent of the recipient model schools were formed in 2014, 8 per cent in 2016, and 2 per cent in 2017. These 17,048 schools directly affected by consolidation are 6 per cent of the total of 294,373 schools reported in the U-DISE data.

As discussed in Section 2, the first wave of Rajasthan school consolidation was preceded by the implementation of the RTE Act. The RTE Act led to an increase in the number of schools throughout India in the years 2009–13. A total of 13 per cent of the consolidated schools and 9 per cent of the remaining schools of Rajasthan were established during these years. Villages where schools were established during the RTE Act years could have a differential trend in enrollment in the years leading to consolidation. I explore this in Figure 6.

In the first panel of Figure 6, I present the pre-consolidation trend in school enrollment for villages where at least one school was established during the RTE Act years. Among villages where a new school was started during the RTE Act years, consolidation happened in those villages which historically had higher enrollment but declined during the years preceding consolidation. In the second panel of Figure 6 I present the pre-consolidation trend in school enrollment among villages where no school was established during the RTE Act years. There exists no pre-trend for this sample of villages. In the third panel of Figure 6 I present the pre-consolidation trend in school enrollment for the full sample of villages. The inclusion of villages where a school was established during the RTE Act years creates a pre-trend that can bias my estimates.

In Figure 7 I present the restrictions that I impose on the matched data based on observations from Figure 6. There are 60,783 villages in the data, out of which one village is missing information about the establishment year of its schools. Out of the remaining 60,782 villages, 14,149 have at least one school that was established during the RTE Act years. I exclude these villages from the sample. A total of 31,649 villages out of the remaining 46,633 villages do not appear across all ten years of the analyses. I exclude these villages from the analytical sample. The estimation sample thus has 14,984 villages, out of which 12,632 villages never had a consolidation event. Of the remaining 2,352 villages, 2,125 villages had their earliest consolidation event in 2014, 181 had it in 2016, and 46 had it in 2017.

In Table 2, I present baseline village-level summary statistics of the analytical sample, by consolidation status. Villages which had the earliest consolidation in 2014 and those which had the earliest consolidation in 2016 are similar across most baseline characteristics. On average, each of these villages has four schools, of which three are government schools. There are around 480 school-going children in a village. Girls comprise 45 per cent of school-going children in 2014 consolidated villages, and 47 per cent in 2016 consolidated villages. Each village has 19 teachers across all its schools. There are ten children in each village who take the grade 5 exams and around 66 per cent of them score more than 60 per cent. There are nine children in each village who take the grade 8 exams and half of them score more than 60 per cent.

Villages that had the earliest consolidation in 2017 are smaller in terms of the number of schools and enrollments than other consolidated villages. On average, there are two schools in each village, of which one is a government school. There are 200 school-going children in a village; 49 per cent of these are girls. Each village has ten teachers. There are three children in each village who take the grade 5 exams and two of them score more than 60 per cent. There are three children in each village who take the grade 8 exams and two of them score more than 60 per cent.

Villages that were never consolidated are even smaller than the 2017 consolidated villages in terms of enrollment. On average, there are two schools, of which one is a government school. There are 140 school-going children in a village; 48 per cent of these are girls. Each village has five teachers. There are two children in each village who take the grade 5 exams and one of them scores more than 60 per

cent. There are two children in each village who take the grade 8 exams and one of them scores more than 60 per cent.

5 Empirical strategy

In this section I detail the empirical strategy that I use to estimate the causal effect of school consolidation on outcomes of interest.

In this paper I study how consolidation of schools affects enrollment and achievement. The staggered roll-out of consolidation in Rajasthan allows me to use a TWFE model to identify these effects. I use the method proposed by Callaway and Sant'Anna (2021) to produce the table estimates.

In Table 2 I show that the baseline characteristics of villages consolidated in different years are not similar. However, this doesn't pose any threat to my identification. A TWFE model will produce causal estimates if the common trends assumption is satisfied. In Section 6 I show that each of the outcome variables has common trends in the pre-consolidation period across the villages consolidated in different years. This supports the credibility of my TWFE estimates in identifying the effect of school consolidation on enrollment and achievement.

The identifying assumption to the TWFE model is that, in the absence of school consolidation, the outcome would have evolved similarly in villages where consolidation happened today relative to villages where consolidation happens in the near future and to villages where consolidation does not happen. I also include village fixed effects. Village fixed effects separate the effect of consolidation from outcomes related to sorting of villages into consolidation. My empirical specification takes the following form:

$$Y_{vt} = \alpha_0 + \sum_{j=-m}^{-2} \beta_j D_{v,t+j} + \sum_{j=0}^{n} \beta_j D_{v,t+j} + \gamma_v + \mu_{dt} + \varepsilon_{vt} \tag{1}$$

where Y_{vt} is the outcome (e.g. school enrollment in a village) in village v in year t. γ_v is village fixed effects and μ_{dt} is district–year fixed effects. I cluster standard errors at the village level. The variable $D_{v,t+j}$ is an indicator if the village v at time t is j years after consolidation. For non-consolidated villages, $D_{v,t+j}$ is 0 across all years. The common trends assumption is satisfied if the coefficients β_j bounce around 0 for all years prior to consolidation. The coefficients of interest are β_j for $j = \{0,1,2,...,n\}$. The coefficients β_j for years prior to and after consolidation are plotted in the figures presented in Section 6.

Sun and Abraham (2021) demonstrated that the coefficients β_j cannot be considered as reliable measures of dynamic treatment effects. They argue that standard TWFE estimation, as outlined above, is appropriate if the treatment is homogeneous and is a one-time shock. School consolidation need not be a one-time shock. An example is that if consolidation leads to increased enrollment in the village, private schools could respond by increasing their school inputs to attract even more children to school. This can lead to further increase in school enrollment in the village. In this case, consolidation's effect on enrollment is not a one-time shock.

Callaway and Sant'Anna (2021) propose a method that improves the TWFE estimates by addressing both heterogeneous impacts and the growing effect of treatment. In this method, cohort- and time-specific average treatment effects on the treated are first estimated using two-period, two-group difference-in-difference estimators. These estimates are then aggregated by weighting them by the size of each treatment cohort to produce summary treatment effect estimates. It aggregates the cohort-specific treatment effect parameters only by the share of treated units, unlike TWFE which weights the parameters by treatment variances as well. This aggregate estimate is thus more appropriate than TWFE estimates when

there is treatment heterogeneity. This estimate only uses untreated comparison groups and thus is not biased by time-varying treatment effects. This estimate is thus more appropriate than TWFE estimates when there is a growing effect of treatment. I use the method proposed by Callaway and Sant'Anna (2021) to generate table estimates of the impact of consolidation on enrollment and achievement.

6 Results

In this section I discuss the findings of the paper. I begin by looking at the impact of school consolidation on intermediate outcomes. Following this, I look at the impact of school consolidation on the student outcomes, namely school enrollment and schooling quality.

6.1 Effect of school consolidation: intermediate outcomes

Effect on number of schools in the village

In order to study how school consolidation affects the number of schools in a village, I estimate Equation 1 where the outcome variable Y_{vt} is the number of schools in a village.

Figure 8 illustrates the coefficients of this estimation. The coefficients $D_{v,t+j}$ bounce around zero in the years prior to consolidation. The coefficients $D_{v,t+j}$ for $j = \{0,1,2,3\}$ yield the causal effect of school consolidation on the number of schools in a village j years after consolidation happens in the village. The number of schools in a village declines by 0.9 due to school consolidation.

Government orders on consolidation were to be implemented with immediate effect. The number of schools in a village declines by 0.9 in the same year in which the orders are issued. This decline is persistent three years after consolidation. This suggests that consolidation is not a temporary intervention that is reversed in subsequent years. The decline in the number of schools could lead to a decline in the number of school-enrolled children if adequate arrangements are not made to accommodate the children from closed schools. If children reallocated from closed schools strain the resources of recipient schools, average learning outcomes could decline.

Column (1) of Table 3 presents table estimates of the impact of school consolidation on the number of schools in a village. I use Callaway and Sant'Anna's (2021) methods to generate the average treatment effect on the treated (ATT) estimate. This is estimated on the analytical sample, which consists of 14,984 villages over ten years. The ATT estimate indicates that school consolidation leads to a 0.97 decline in the number of schools in a village. With a baseline mean of 4.28 schools per village, this translates into a 23 per cent decline in the number of schools per village due to consolidation.

Effect on proportion of children attending a school with a principal

Seventy-two per cent of the closed schools are primary schools. On average, the baseline enrollment in a closed school is 98. The RTE Act requires a minimum enrollment of 150 children to allot a principal to a primary school. Thus, it is likely that many of the closed schools did not have a principal. With consolidation, the children of closed schools are reallocated to secondary schools which have a principal. The government orders on consolidation mandate that the principal of the recipient school is responsible for all administrative and academic duties across merged grades as well. In order to see if school consolidation affects the proportion of children attending a school with a principal, I estimate Equation 1.

The outcome variable, Y_{vt} is the proportion of children in a village, among the school-enrolled, who attend a school with a principal. Figure 9 presents the coefficients of this estimation. The coefficients

$D_{v,t+j}$ bounce around zero in the years prior to consolidation. The coefficients $D_{v,t+j}$ for $j = \{0,1,2,3\}$ yield the causal impact of school consolidation on the proportion of children in a village studying in a school with a principal j years after consolidation happens in the village. There is an additional restriction on the sample used to generate these coefficients. The analysis is restricted to villages where none of the government schools experienced a change in the presence of a principal during the RTE Act years. In the absence of this restriction, the outcome of interest does not have common pre-trends, as shown in Figure A3.

School consolidation does not affect the outcome in the year of consolidation. However, in subsequent years, the proportion of children who attend a school with a principal increases. After one year of consolidation there is a 0.05 increase in the proportion of children in a village who attend a school with a principal. The proportion increases by 0.1 two years after consolidation, and by 0.2 three years after consolidation. Having a principal could signal more accountability in terms of the quality of the education imparted by the school. This could persuade more parents to send their children to school, and school enrollment could increase. The government anticipated that the presence of a principal would ensure higher-quality education and thus improve school achievement.

Column (2) of Table 3 presents table estimates of the impact of school consolidation on the proportion of children in a village, among the school-enrolled, who attend a school with a principal. I use Callaway and Sant'Anna's (2021) methods to generate the ATT estimate. This is estimated on a sample of 4,226 villages over ten years. The ATT estimate indicates that school consolidation leads to a 0.1 increase in the proportion of children who attend a school with a principal. At baseline, 38 per cent of the children in a village study in a school with a principal. This increases to 48 per cent because of consolidation.

Effect on number of teachers

With consolidation, teachers of the closed schools are reallocated to the recipient model school. The government orders indicated that the number of teachers required in the model school would be re-evaluated after consolidation, and necessary adjustments made. Until the adjustments are made, teachers of upgraded schools continue to work in the recipient model school. In order to see if consolidation leads to this adjustment, I estimate Equation 1.

The outcome variable, Y_{vt} is the total number of teachers across all schools in a village. Figure 10 presents the coefficients of this estimation. The coefficients $D_{v,t+j}$ bounce around zero in the years prior to consolidation. The coefficients $D_{v,t+j}$ for $j = \{0,1,2,3\}$ yield the causal impact of school consolidation on the number of teachers in a village j years after consolidation happens in the village. There is an additional restriction on the sample used to generate these coefficients. The analysis is restricted to villages that did not experience any change in the total number of teachers during the RTE Act years. In the absence of this restriction, the outcome of interest does not have common pre-trends, as shown in Figure A4.

There is no adjustment to the number of teachers in the year of consolidation. In subsequent years the number of teachers in the village increases. The number of teachers increases by 0.4 after one year of consolidation, by 1 after two years, and by 2 after three years. In Figure A5 I also show that the pupil:teacher ratio in a village decreases by 1 two years after consolidation and stays so in the third year. An increased number of teachers could encourage parents to send their children to school. This could increase school enrollment. An increased number of teachers allows for grade and/or subject specialization. This could lead to improved learning outcomes.

Column (3) of Table 3 presents table estimates of the impact of school consolidation on the total number of teachers in a village. I use Callaway and Sant'Anna's (2021) methods to generate the ATT estimate. This is estimated on a sample of 4,090 villages over ten years. The ATT estimate indicates that the

number of teachers in a village increases by 0.7 because of consolidation. With a baseline mean of 10.48 teachers per village, this translates into a 7 per cent increase in the number of teachers in a village due to consolidation.

6.2 Effect of school consolidation: student outcomes

Effect on school enrollment

Every village has one fewer school because of consolidation. This can lead to a decline in school enrollment if the displaced children are not accommodated in the remaining schools. The consolidation orders mandated that all children of the closed schools have to be admitted to the recipient model school. School enrollment will remain unchanged, even with a decline in the number of schools, given this mandate. Consolidation leads to a 0.1 increase in the proportion of children in a village attending a school with a principal. On consolidation, the government anticipated that a model school will offer a higher quality of education to the displaced children due to the presence of a principal. A principal is responsible for all academic and administrative duties in the recipient school. The presence of a principal can ensure improved infrastructure and personnel by increased monitoring. Consolidation also leads to an average increase of 0.7 teachers in each village. A school with a principal and more teachers can persuade more parents to send their children to school. This will lead to an increase in school enrollment. Having a principal can also signal increased safety in the school, which will lead to increased enrollment among girls.

In order to study how consolidation affects school enrollment, I estimate Equation 1. The outcome variable, Y_{vt} is log school enrollment in a village. Figure 11 presents the coefficients of this estimation. The coefficients $D_{v,t+j}$ bounce around zero in the years prior to consolidation. School enrollment in a village increases by 1 per cent in the year of consolidation and persists one year later. Consolidation increases school enrollment by 2 per cent in two years and by 3 per cent in three years. In Figure A6 I show that the increase in school enrollment due to consolidation remains on adding more pre-period event years and also on running the estimation on an unbalanced panel of villages.

Column (1) of Table 4 presents table estimates of the impact of school consolidation on the total school enrollment in a village. I use Callaway and Sant'Anna's (2021) methods to generate the ATT estimate. This is estimated on a sample of 14,984 villages over ten years. The ATT estimate indicates that school enrollment in a village increases by 2 per cent because of consolidation. With a baseline mean of 473.20 school-enrolled children in a village, this translates into nine additional children going to school in a village due to consolidation.

In Figure 12 I look at how consolidation affects school enrollment of girls versus boys in a village. The left panel presents the coefficients of the estimation of Equation 1 on log enrollment of girls in a village. The right panel presents the coefficients of the estimation of Equation 1 on log enrollment of boys in a village. The coefficients $D_{v,t+j}$ bounce around zero in the years prior to consolidation in both panels. The school enrollment among girls increases by 1 per cent in the year of consolidation and it persists one year later. Consolidation increases the school enrollment among girls by 3 per cent in two years and by 4 per cent in three years. The school enrollment among boys is unaffected by consolidation.

Columns (2) and (3) of Table 4 present the table estimates of the impact of consolidation on school enrollment among girls and boys, respectively. The ATT estimate indicates that school enrollment of girls in a village increases by 2 per cent while that of boys does not change. This suggests that the increase in school enrollment in a village due to consolidation is driven by girls. I discussed earlier that having a principal to monitor the quality of schooling could encourage more parents to send their children to school. The presence of a principal could also increase the confidence of parents about the safety of children at the school. Muralidharan and Prakash (2017) have shown in a similar context that

reduced safety costs can lead to increased enrollment among girls. These table estimates are consistent with this finding.

Effect on school achievement

Every village has one fewer school because of consolidation. However, this has not led to a decline in school enrollment. The possibility of displaced children not being accommodated in the remaining schools can thus be ruled out. Contrary to media reports, consolidation led to a 2 per cent increase in school enrollment in a village. This could have adversely affected the teaching effectiveness if the number of teachers was not adjusted accordingly. I find that consolidation was followed by adjustment of the number of teachers, which led to an increase in the number of teachers in a village by 0.7. Consolidation also increased the proportion of children attending a school with a principal, by 0.1. The government anticipated that the presence of a principal would provide better-quality education to the children who moved to recipient schools due to consolidation. It needs to be tested if the presence of a principal and the increased number of teachers due to consolidation translated into better learning outcomes.

In order to study how consolidation affects achievement, I estimate Equation 1. U-DISE data have two measures on achievement. The first is the proportion of children among exam takers in a village who score more than 60 per cent in grade 5 exams. The second is the proportion of children among exam takers in a village who score more than 60 per cent in grade 8 exams. I use each of these variables as the outcome variable, Y_{vt}. In the left panel of Figure 13 I present the coefficients of the estimation on the proportion of high scorers in grade 5 exams. The proportion of high scorers in grade 5 exams remains unchanged in the year of consolidation and in the subsequent year. Consolidation reduces the proportion of high scorers in grade 5 exams by 0.01 in the second year and by 0.04 in the third year, although these estimates are not statistically significant.

Column (1) of Table 5 presents table estimates of the impact of consolidation on the proportion of high scorers in grade 5 exams in a village. I use Callaway and Sant'Anna's (2021) methods to generate the ATT estimate. This is estimated on a sample of 14,984 villages over five years as the outcome measure is available only in 2009, 2014, 2015, 2016, and 2017. The ATT estimate indicates that the proportion of high scorers in grade 5 exams declines by 0.08. At baseline, 64 per cent of the grade 5 exam takers in a village score above 60 per cent. This declines to 56 per cent due to consolidation. This implies that the presence of a principal or the increased number of teachers has not translated into increased achievement among grade 5 students.

In the right panel of Figure 13 I present the coefficients of the estimation of the proportion of high scorers in grade 8 exams. The proportion of high scorers in grade 8 exams in a village is not affected by school consolidation. Column (2) of Table 5 presents table estimates of the impact of consolidation on the proportion of high scorers in grade 8 exams in a village. I use Callaway and Sant'Anna's (2021) methods to generate the ATT estimate. This is estimated on a sample of 14,984 villages over five years as the outcome measure is available only in 2009, 2014, 2015, 2016, and 2017. The ATT estimate indicates that the proportion of high scorers in grade 8 exams has not increased by more than 0.03 due to consolidation.

Consolidation does not increase achievement. This finding is in line with six of the seven studies on school size and student performance reviewed by Andrews et al. (2002), which found decreasing returns to scale. According to Cotton (1996), reasons for superior performance of students in small schools have not been definitively established. Speculative explanations focus on non-academic factors associated with a smaller school, such as a greater sense of community belonging among students, closer interaction with adults, and more parental involvement.

7 Discussion and conclusion

Until recently, India has been focusing on providing school access to all of its children. Its access-oriented reforms with special attention to universalization of primary education resulted in India having a large number of grade 1–5 schools with one or two teachers and with no principal. Multiple states of the country deem this to be a concern and have resorted to school consolidation. The National Education Policy (NEP 2020), which is India's first attempt to shift its focus from school access to school quality, also advocates school consolidation to channel its resources more efficiently (Kumar and Varghese 2022). Media reports have not been in favour of school consolidation and it is imperative that there is empirical evidence on a policy which is quickly emerging as a nation-wide one.

In order to provide empirical estimates of the impact of consolidation, I exploit the staggered roll-out of the policy in the Indian state of Rajasthan. Rajasthan is the first state to implement school consolidation at scale. Combining government orders on consolidation with administrative data on schools, I find that school consolidation leads to a decline in the number of schools in a village and to an increase in the number of children attending a school with a principal. I also find that consolidation leads to an increase in the number of teachers. I further show that consolidation increases school enrollment, particularly that of girls. Consolidation does not affect school achievement of children who have been studying in the recipient school. I find that school achievement among children who move to the recipient school declines.

I view these results as encouraging. One common criticism against school consolidation is that it reduces access to school. Rajasthan school consolidation, by merging a single grade 1–5 school to a nearby grade 6–10 school rather than merging multiple grade 1–5 schools, ensures that school access is not compromised. This is supported by the result that enrollment has not declined, in spite of the fact that school enrollment is not compulsory in this context. It is also encouraging that the student achievement of children already studying in the recipient school is not declining.

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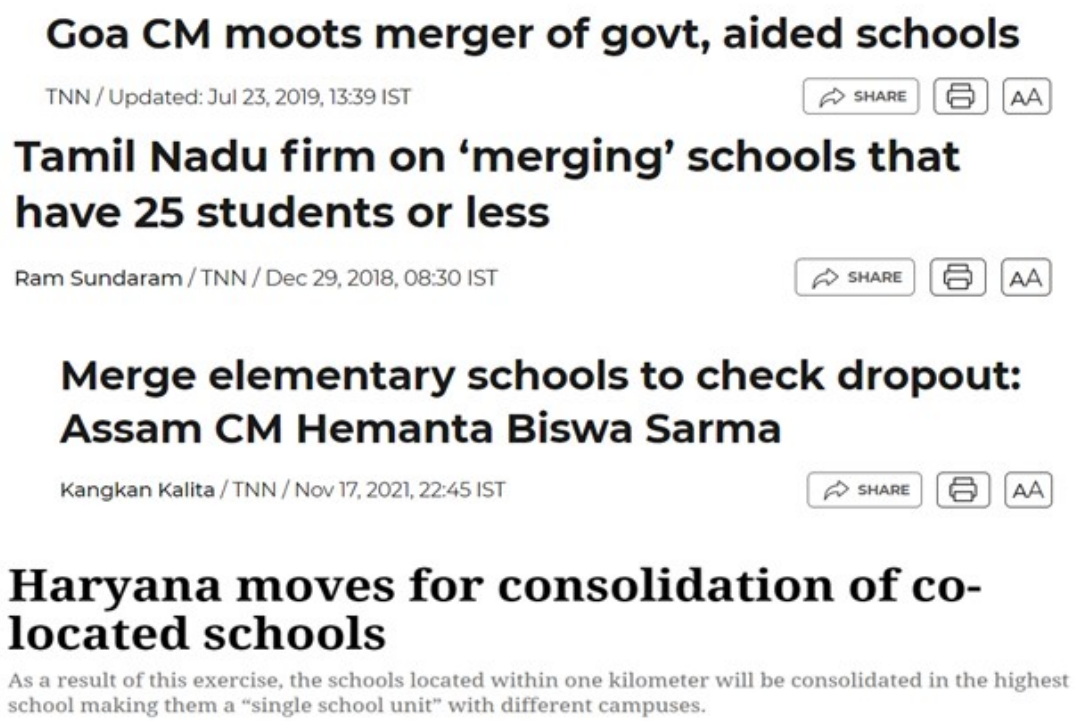
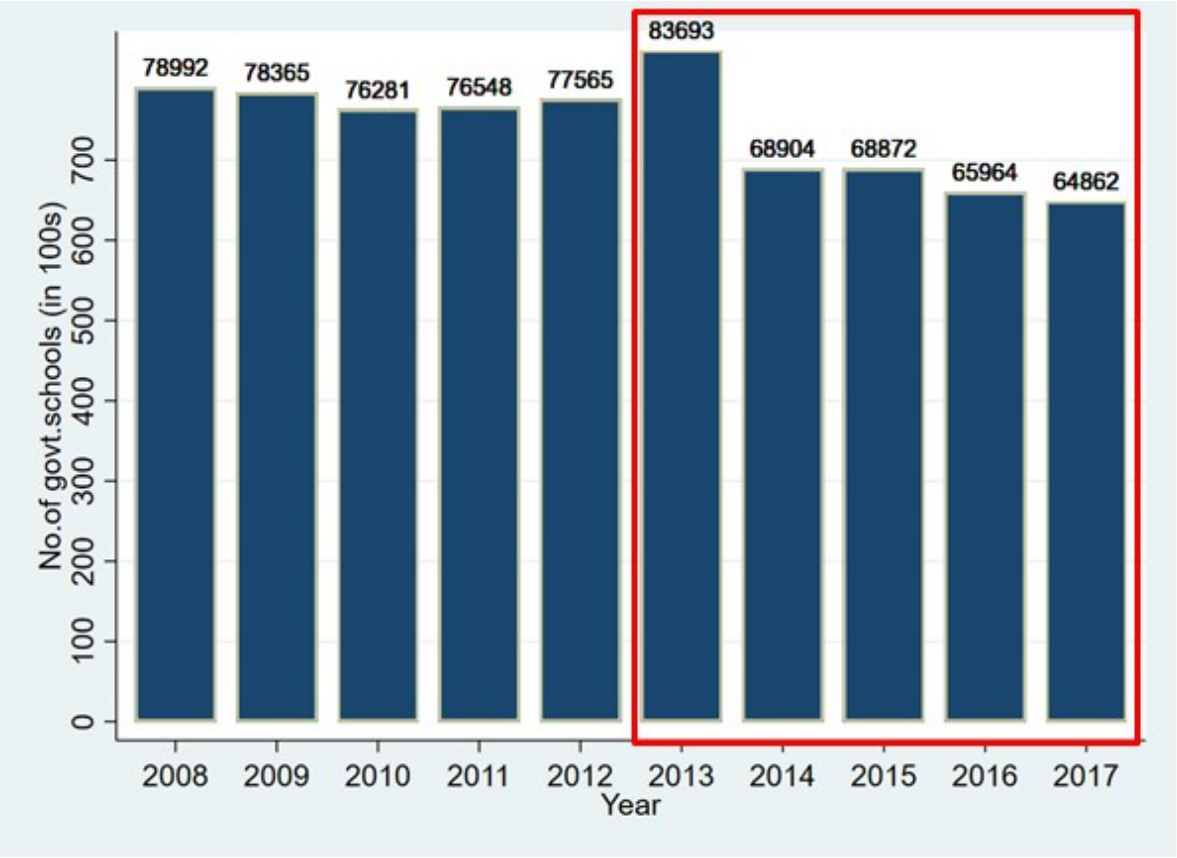
Figures & Tables

Figure 1: News headlines on consolidation in multiple Indian states



Source: author's compilation.

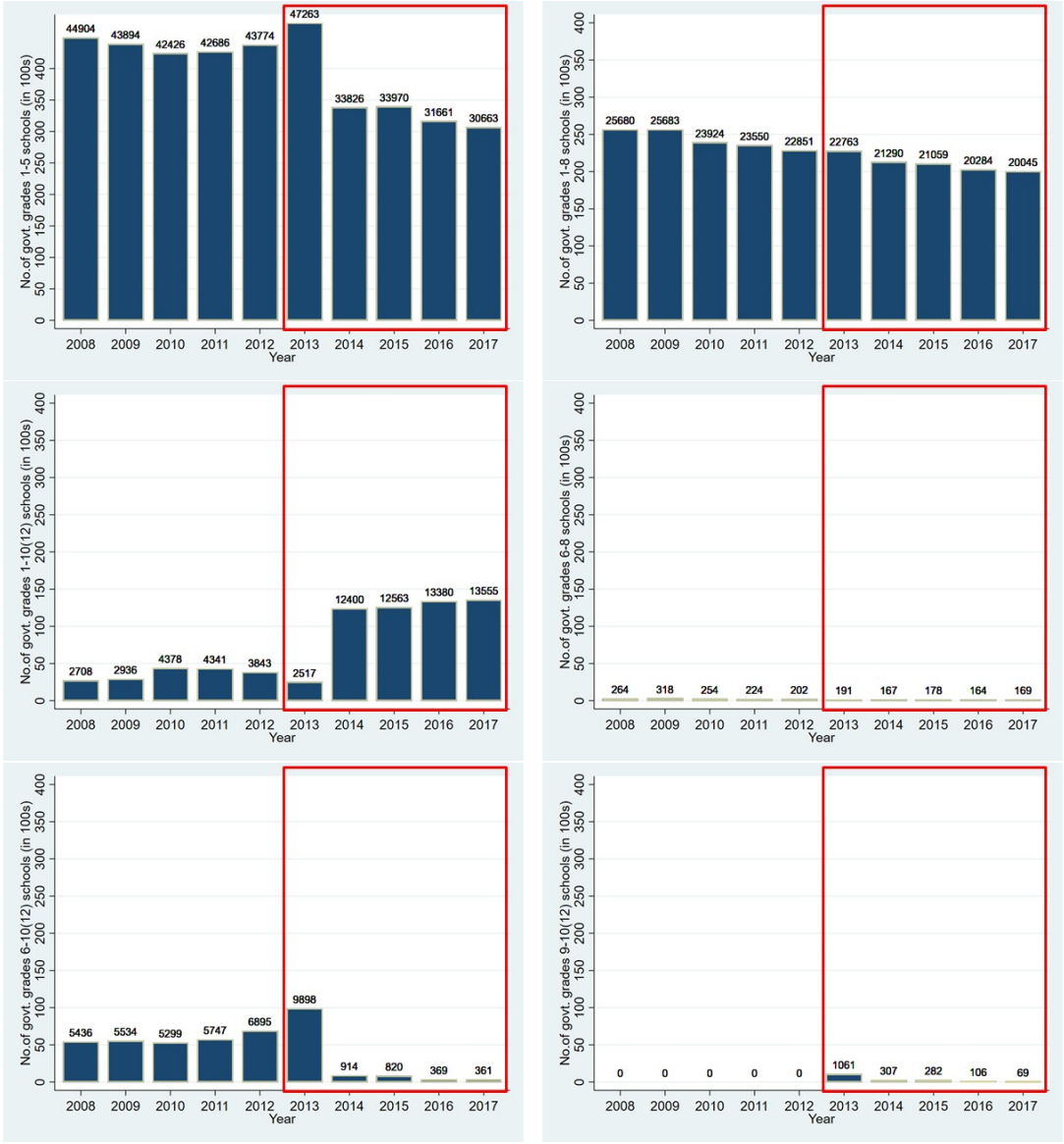
Figure 2: Number of government schools over the years: Rajasthan



Note: this figure shows the number of government schools in Rajasthan during the period of analysis. The years of particular interest are 2014, 2016, and 2017, when the number of government schools in Rajasthan declined. These years correspond to the three waves of school consolidation. The data correspond to 51,539 villages across 32 districts.

Source: author's compilation based on U-DISE data for 2008–17.

Figure 3: Number of government schools by type over the years: Rajasthan



Note: these graphs show the number of government schools by type during the period of analysis. The schools are categorized into types based on the grades to which they cater. The years of particular interest are 2014, 2016, and 2017, which correspond to the three waves of school consolidation. The data correspond to 51,539 villages across 32 districts.

Source: author's compilation based on U-DISE data for 2008–17.

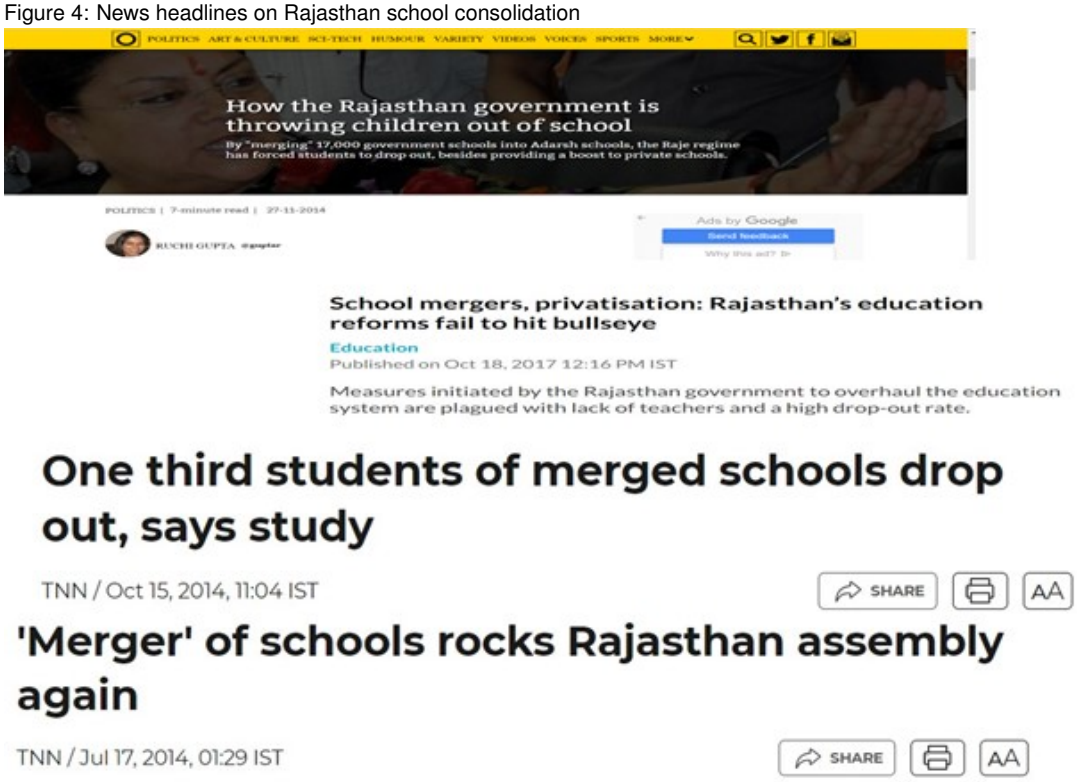
Table 1: Details of Rajasthan school consolidation

	2014 consolidation		2016 consolidation		2017 consolidation	
	N	%	*N*	%	*N*	%
Panel A: School level						
No. model schools	10,399	100	1,325	100	376	100
Multiple elem. schools merged	2,284	22.0	100	7.5	40	10.6
Girls-only school merged	390	3.8	387	29.2	89	23.7
Panel B: Village level						
No. consolidated villages	9,524	100	1,295	100	375	100
High school (HS) as recipient	9,521	99.9	1,295	100	375	100
Upper primary (UP) school as recipient	1	0.01	0	0	0	0
HS and UP schools as recipients	2	0.02	0	0	0	0

Note: this table reports the number of model schools created due to consolidation and the number of villages where at least one consolidation occurred. Across the three waves of consolidation the table reports the number of observations and the share as a percentage of the total number of observations reported in the first row.

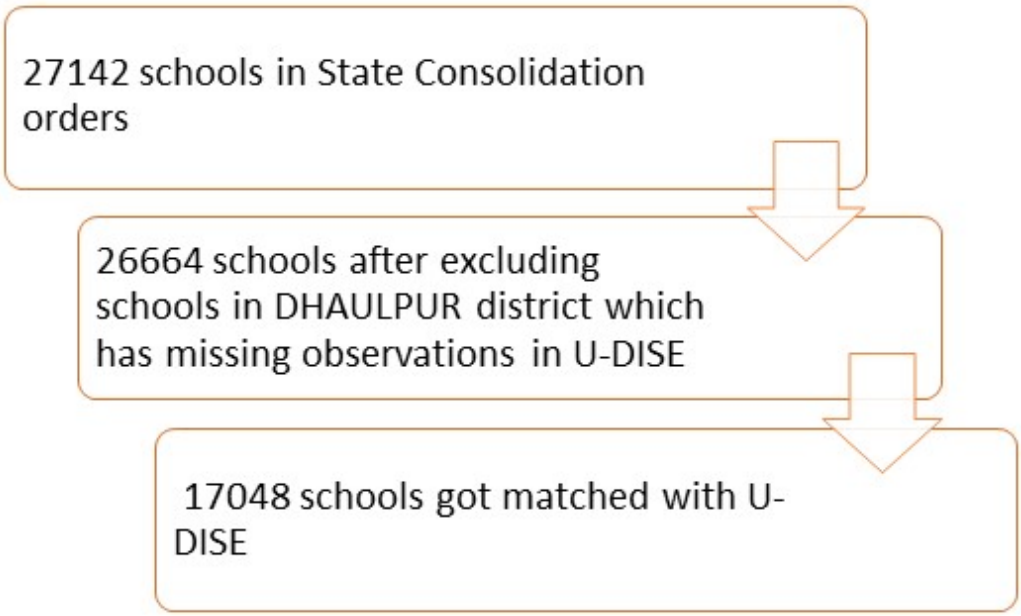
Source: author's compilation.

Figure 4: News headlines on Rajasthan school consolidation



Source: author's compilation.

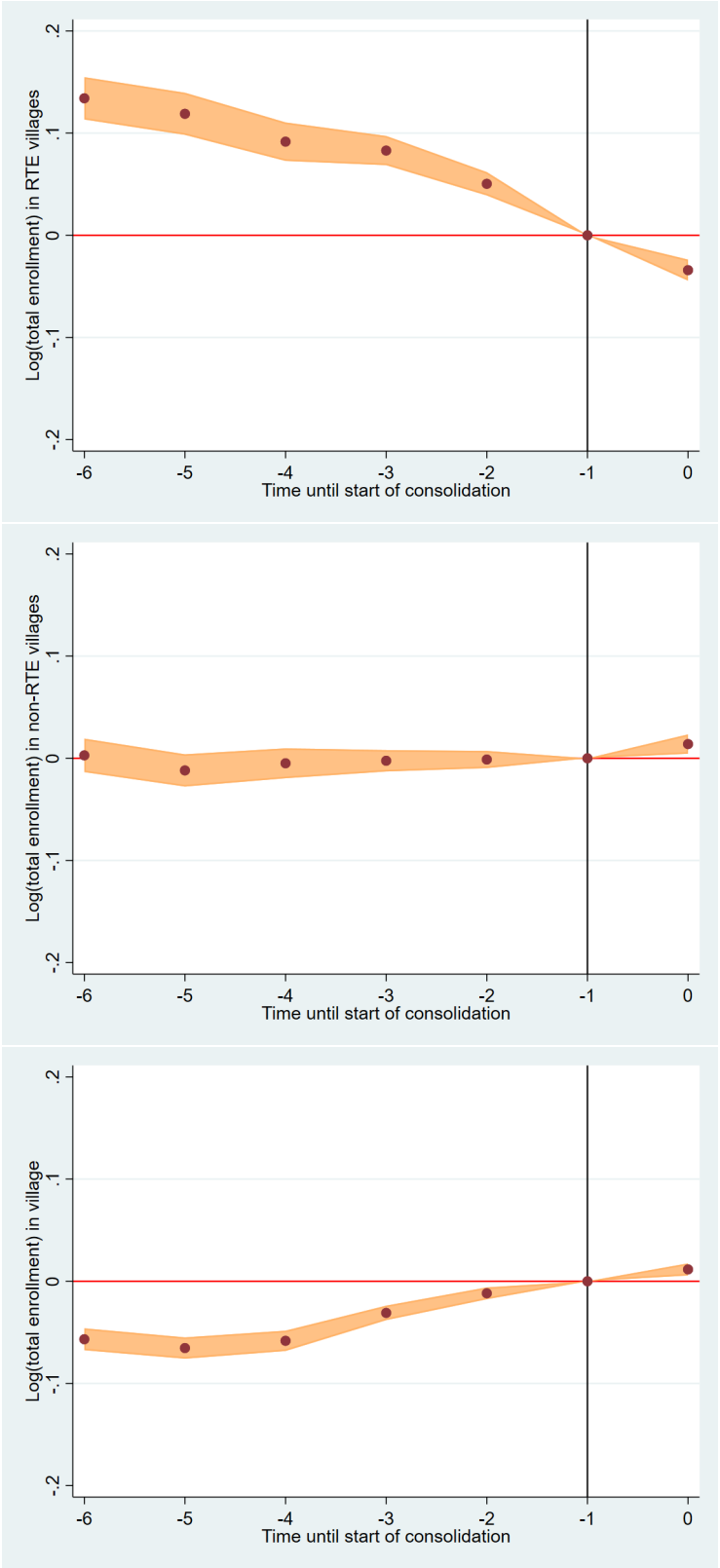
Figure 5: Sampling: matching schools across state consolidation orders and U-DISE data



Note: this figure presents the first step in building the analytical sample from the state consolidation orders. I match the school names across the state consolidation orders and U-DISE data using a custom fuzzy matching script based on the Levenshtein algorithm.

Source: author's compilation.

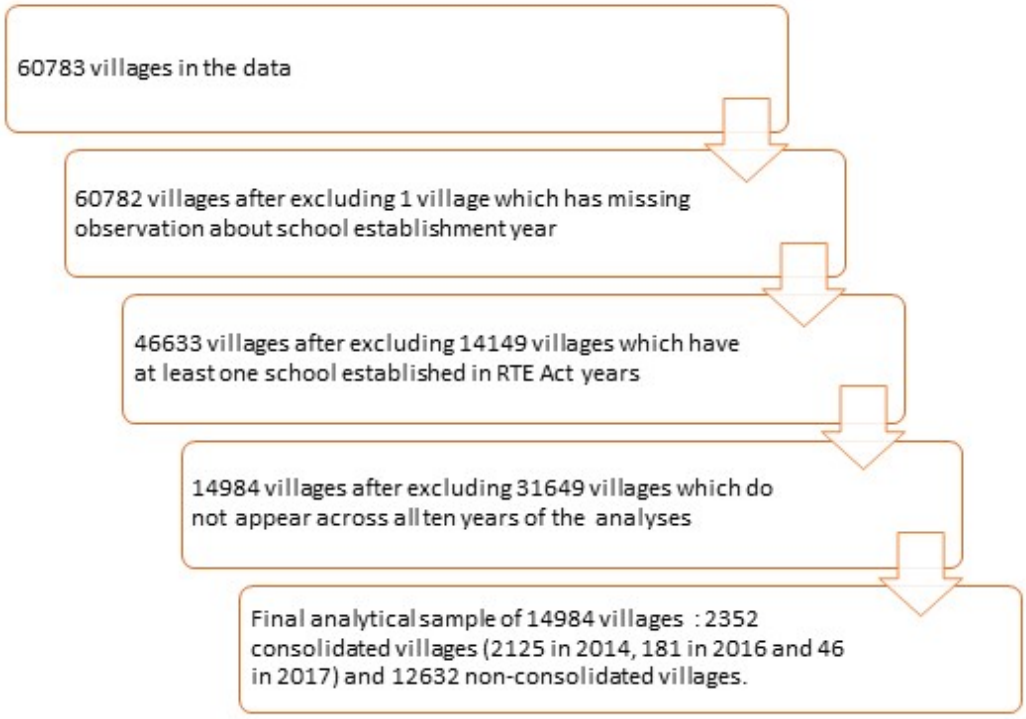
Figure 6: Sampling: pre-trends in school enrollment in RTE villages versus non-RTE villages



Note: these graphs present the pre-consolidation trend in school enrollment among villages where at least one school was established during the RTE Act years (2009–13), among villages where no school was established during the RTE Act years, and among all villages. This is restricted to event years that exist across all villages.

Source: author's compilation.

Figure 7: Sampling: restrictions imposed to build the analytical sample



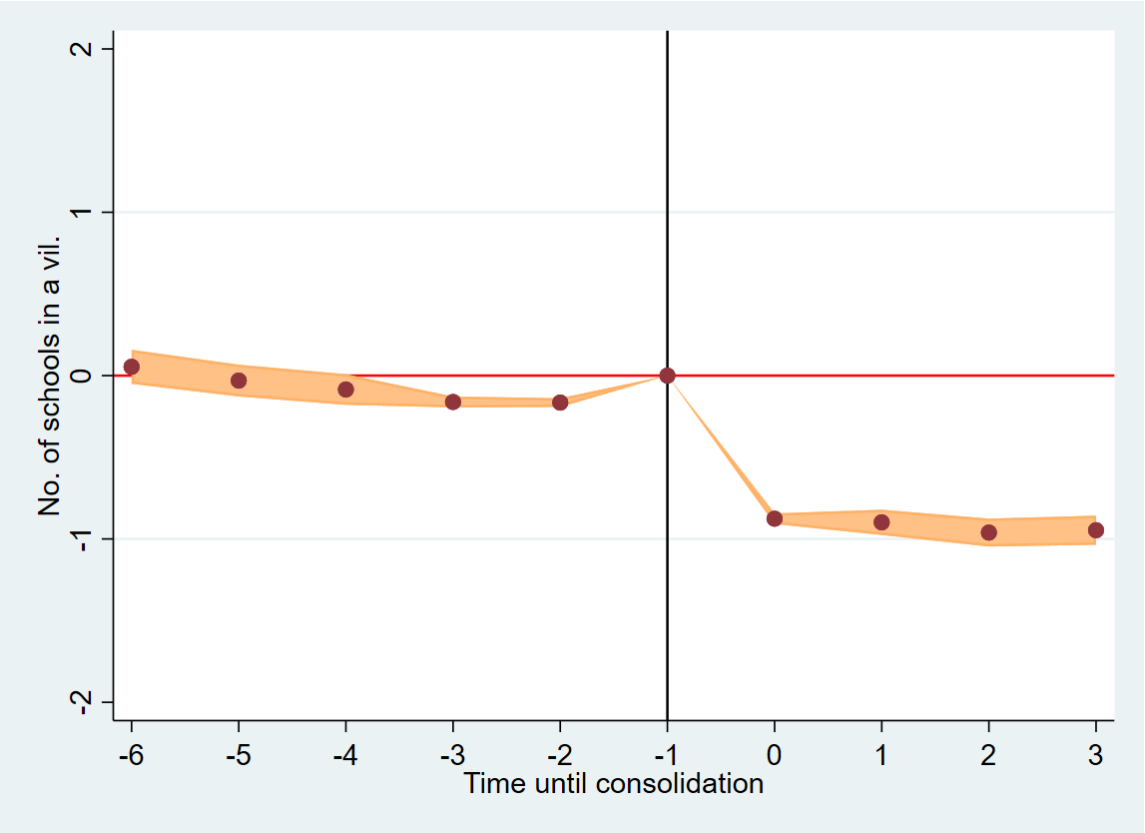
Note: this figure presents the restrictions that I impose on the matched dataset to build the analytical sample.
Source: author's compilation.

Table 2: Baseline village-level summary statistics

Variable	(1) Non-consol.	(2) 2014 consol.	(3) 2016 consol.	(4) 2017 consol.	(5) 2014 vs non.	(6) 2016 vs non.	(7) 2017 vs non.	(8) 2014 vs 2016	(9) 2016 vs 2017	(10) 2014 vs 2017
No. schools	1.59	4.34	4.03	2.24	2.75***	2.44***	0.65***	0.31	1.79***	2.10***
	(1.31)	(3.91)	(2.82)	(1.62)	(0.04)	(0.10)	(0.19)	(0.30)	(0.43)	(0.58)
No. govt. schools	1.44	3.28	3.06	1.74	1.84***	1.62***	0.30**	0.22	1.32***	1.54***
	(0.91)	(2.79)	(2.24)	(1.12)	(0.03)	(0.07)	(0.13)	(0.21)	(0.34)	(0.41)
No. pvt.schools	0.13	0.99	0.93	0.46	0.85***	0.80***	0.32***	0.06	0.47***	0.53**
	(0.59)	(1.49)	(1.05)	(0.78)	(0.02)	(0.05)	(0.09)	(0.11)	(0.17)	(0.22)
Total enrollment	142.47	483.38	421.83	205.43	340.90***	279.36***	62.96**	61.55	216.39***	277.94***
	(188.42)	(517.45)	(339.38)	(133.16)	(6.16)	(14.33)	(27.81)	(39.16)	(51.08)	(76.37)
Prop. girls among enrolled	0.48	0.45	0.47	0.49	-0.03***	-0.01	0.01	-0.02***	-0.02	-0.04***
	(0.08)	(0.07)	(0.07)	(0.08)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
No. teachers	5.31	18.88	17.22	9.54	13.57***	11.91***	4.24***	1.66	7.68***	9.34***
	(7.53)	(20.07)	(13.36)	(7.88)	(0.24)	(0.57)	(1.11)	(1.52)	(2.06)	(2.97)
Takers in grade 5 exams (2009)	2.49	9.52	6.77	2.91	7.03***	4.28***	0.42	2.75*	3.85***	6.60**
	(10.13)	(20.23)	(9.69)	(4.70)	(0.28)	(0.76)	(1.49)	(1.52)	(1.47)	(2.98)
High scorers in grade 5 exams (2009)	1.31	6.25	4.27	1.54	4.95***	2.96***	0.24	1.99	2.72***	4.71*
	(6.09)	(16.69)	(6.74)	(3.13)	(0.20)	(0.46)	(0.90)	(1.25)	(1.02)	(2.46)
Takers in grade 8 exams (2009)	1.43	8.80	7.33	2.98	7.36***	5.90***	1.55	1.47	4.35**	5.82*
	(7.49)	(20.56)	(11.71)	(6.06)	(0.24)	(0.57)	(1.11)	(1.55)	(1.79)	(3.04)
High scorers in grade 8 exams (2009)	0.73	4.74	3.79	1.80	4.01***	3.06***	1.07*	0.95	1.99**	2.94
	(4.20)	(14.70)	(6.51)	(3.92)	(0.16)	(0.32)	(0.62)	(1.10)	(1.00)	(2.17)
Observations	12,632	2,125	181	46	14,984	14,984	14,984	14,984	14,984	14,984

Note: columns (1)–(4) present village-level summary statistics at baseline in villages which had the earliest instance of consolidation, across the three waves of consolidation, and in non-consolidated villages. Columns (5)–(10) present differences and the statistical significance of the differences in baseline characteristics across villages with different consolidation status. Data on exam-takers and high scorers in grade 5 and grade 8 exams were first available in 2009.
Source: author's calculations.

Figure 8: Intermediate outcome of consolidation: number of schools in a village



Note: this figure presents the estimates of the impact of school consolidation on the number of schools in a village as estimated by Equation 1. The specification includes year fixed effects, village fixed effects, and district–year fixed effects. Standard errors are clustered at the village level. In the pre-period this is restricted to event years that exist across all villages. The sample includes 14,984 villages of which 2,352 are consolidated (2,125 villages consolidated in 2014, 181 in 2016, and 46 in 2017) and 12,632 are never consolidated.

Source: author's compilation.

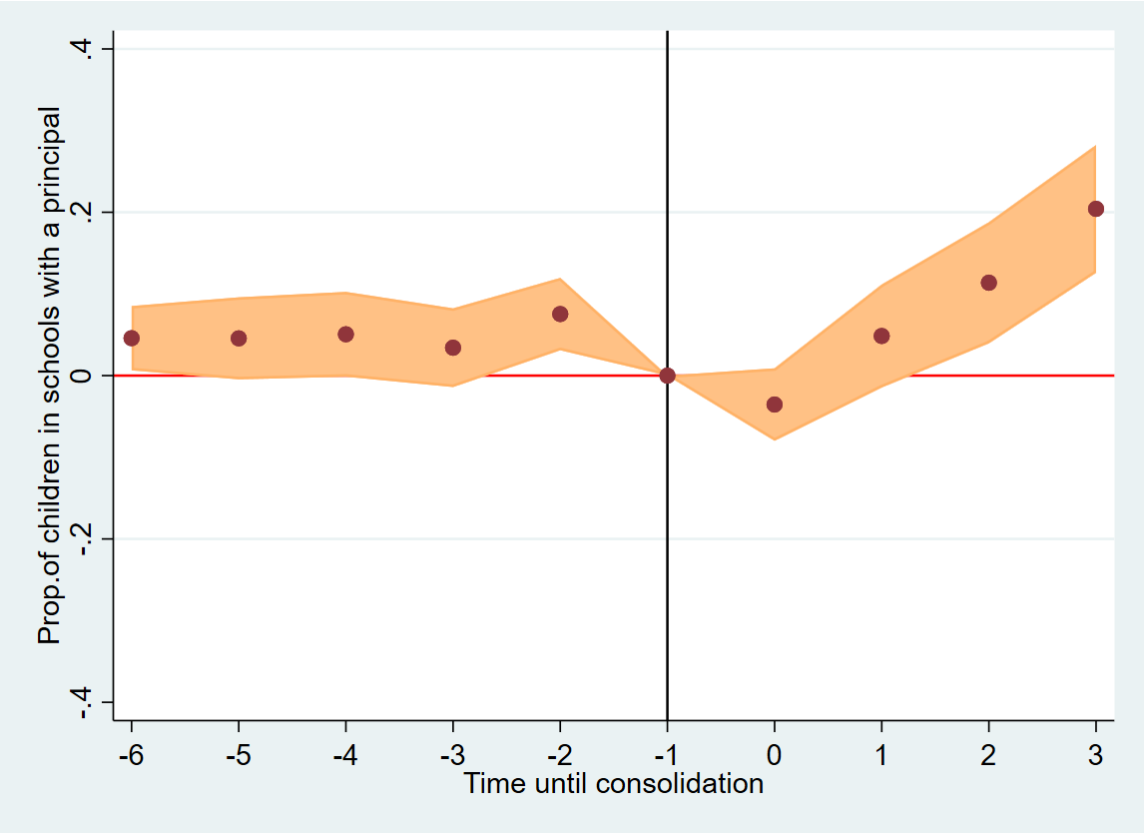
Table 3: Impact of school consolidation: intermediate outcomes

	(1) No. schools	(2) Prop. children with a principal	(3) No. teachers
ATT	–0.97***	0.10***	0.70***
	[–1.03,–0.90]	[0.05,0.15]	[0.29,1.12]
Baseline mean	4.28	0.38	10.48
N	149,840	42,260	40,900

Note: this table presents ATT estimates of the impact of school consolidation on immediate outcomes, using Callaway and Sant'Anna's (2021) methods. Column (1) corresponds to number of schools in a village. Column (2) corresponds to proportion of children in a village, among the school enrolled, who attend a school with a principal. Column (3) corresponds to total number of teachers across all schools in a village. Baseline means of the outcome variables in the consolidated villages are reported. Column (2) is restricted to villages where none of the government schools experienced a change in the presence of head teachers during the RTE Act years. Column (3) is restricted to villages which did not experience any change in the total number of teachers during the RTE Act years. 95% confidence intervals in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: author's calculations.

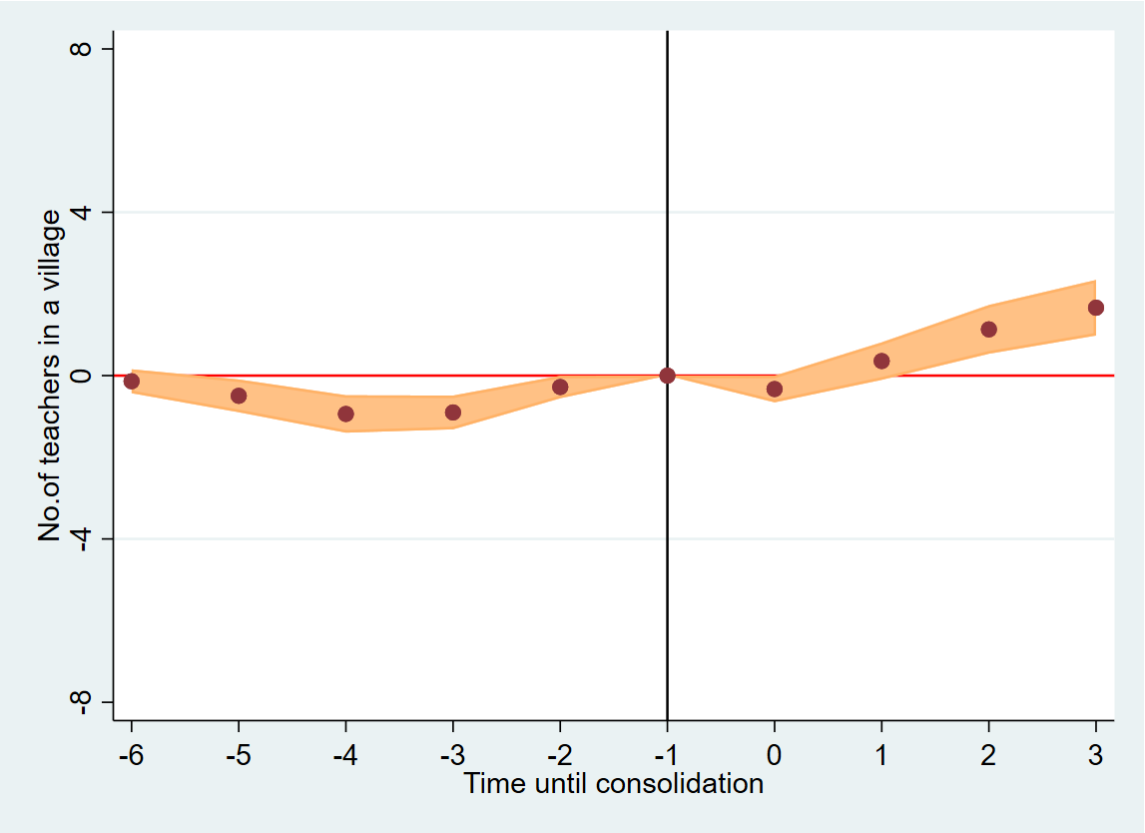
Figure 9: Intermediate outcome of consolidation: proportion of children studying in a school with a principal



Note: this figure presents the estimates of the impact of school consolidation on the proportion of children in a village, among the school-enrolled, studying in a school with a principal as estimated by Equation 1. The specification includes year fixed effects, village fixed effects, and district–year fixed effects. Standard errors are clustered at the village level. In the pre-period this is restricted to event years that exist across all villages. This is also restricted to villages where none of the government schools experienced a change in the presence of principals during the RTE Act years. The sample includes 4,226 villages of which 176 are consolidated (144 villages consolidated in 2014, 22 in 2016, and 10 in 2017) and 4,050 are never consolidated.

Source: author's compilation.

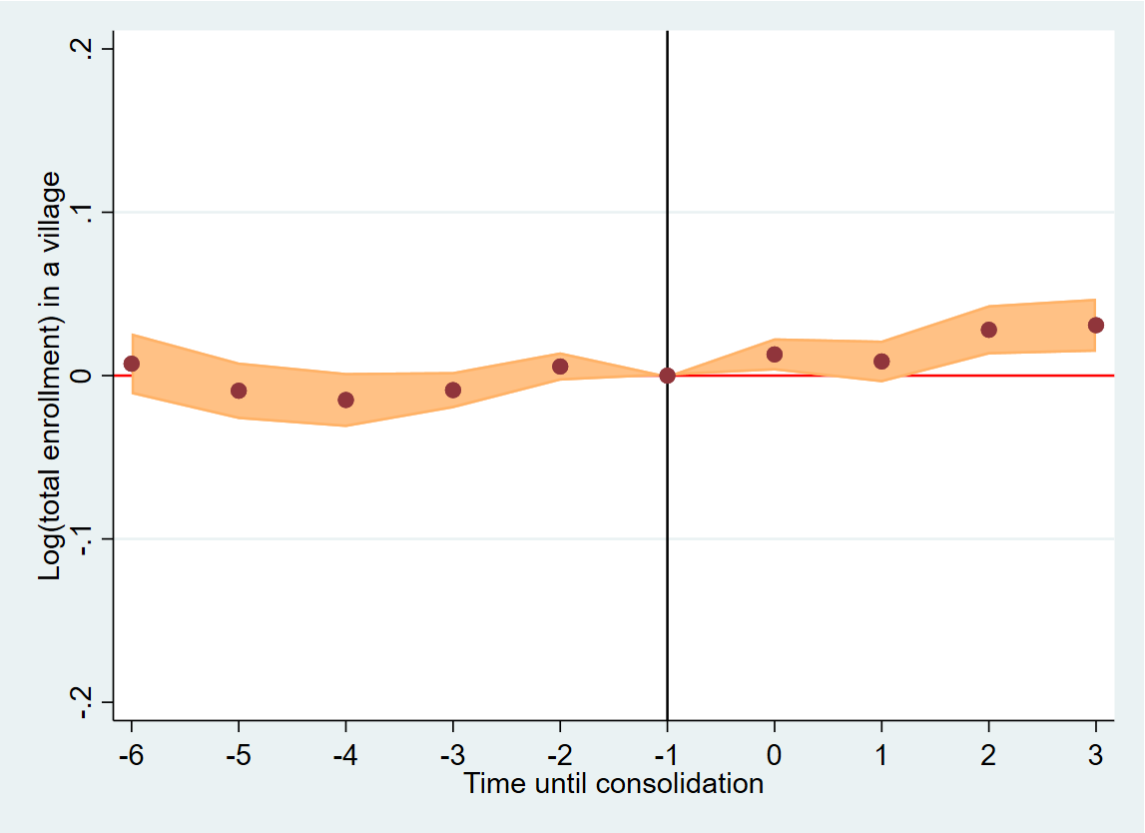
Figure 10: Intermediate outcome of consolidation: number of teachers in a village



Note: this figure presents the estimates of the impact of school consolidation on the total number of teachers in a village as estimated by Equation 1. The specification includes year fixed effects, village fixed effects, and district–year fixed effects. Standard errors are clustered at the village level. In the pre-period this is restricted to event years that exist across all villages. This is also restricted to villages that did not experience any change in the total number of teachers during the RTE Act years. The sample includes 4,090 villages, of which 226 are consolidated (194 villages consolidated in 2014, 29 in 2016, and 3 in 2017) and 3,864 are never consolidated.

Source: author's compilation.

Figure 11: Impact of consolidation: school enrollment



Note: this figure presents the estimates of the impact of school consolidation on school enrollment in a village as estimated by Equation 1. The dependent variable is the log of the number of school-enrolled children in a village. The specification includes year fixed effects, village fixed effects, and district–year fixed effects. Standard errors are clustered at the village level. In the pre-period this is restricted to event years that exist across all villages. Figure A6 presents similar figures for all event years and also for a larger set of villages.

Source: author's compilation.

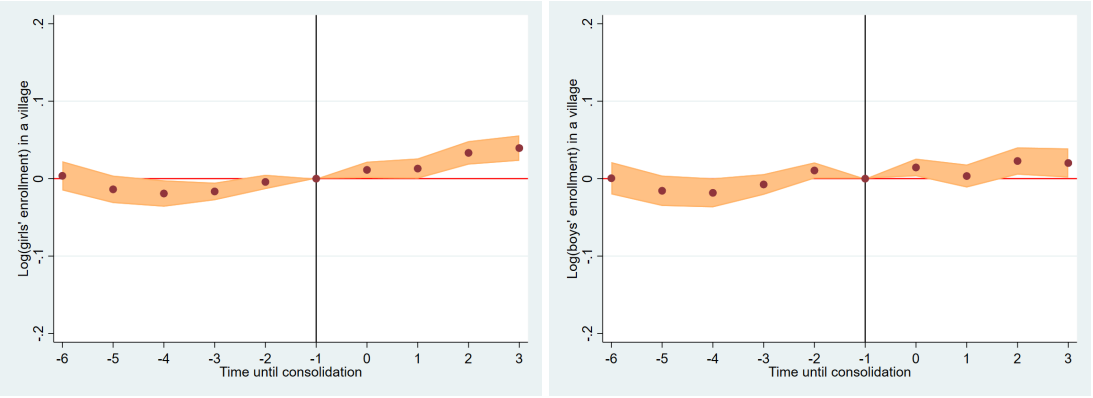
Table 4: Impact of school consolidation on school enrollment in a village

	(1) Total enrollment	(2) Girls' enrollment	(3) Boys' enrollment
ATT	0.02**	0.02***	0.01
	[0.01,0.03]	[0.01,0.03]	[–0.00,0.02]
Baseline mean	473.20	211.44	261.76
N	149,840	149,840	149,840

Note: 95% confidence intervals in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. This table presents ATT estimates of the impact of school consolidation on school enrollment using Callaway and Sant'Anna's (2021) methods. Column (1) corresponds to total school enrollment in a village. Column (2) corresponds to school enrollment of girls in a village. Column (3) corresponds to school enrollment of boys in a village. Baseline mean of the outcome variables in the consolidated villages are reported.

Source: author's compilation.

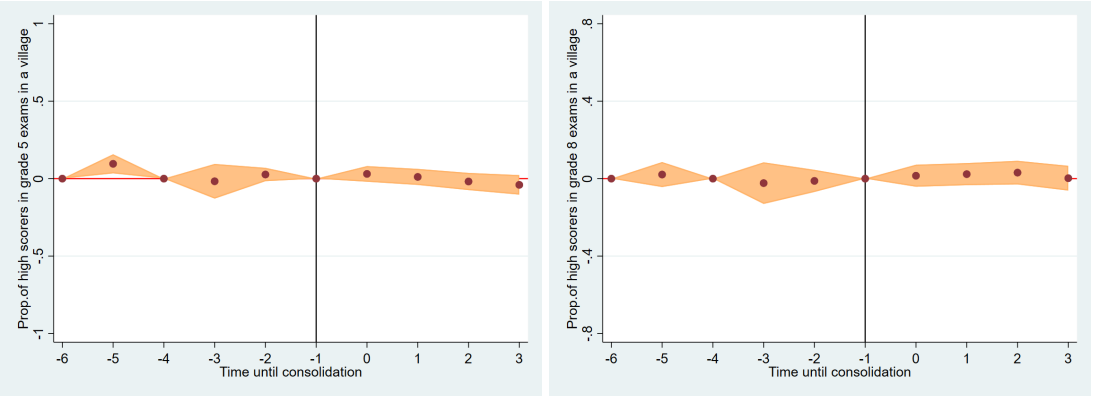
Figure 12: Impact of consolidation: school enrollment among girls versus boys



Note: these figures present the estimates of the impact of school consolidation on school enrollment in a village, separately for girls and boys as estimated by Equation 1. In the first panel the dependent variable is the log of the number of school-enrolled girls in a village. In the second panel the dependent variable is the log of the number of school-enrolled boys in a village. The specification includes year fixed effects, village fixed effects, and district–year fixed effects. Standard errors are clustered at the village level. In the pre-period this is restricted to event years that exist across all villages.

Source: author's compilation.

Figure 13: Impact of consolidation: school achievement



Note: this figure presents the estimates of the impact of school consolidation on school achievement in a village as estimated by Equation 1. The dependent variable is the proportion of children in a village among those who took the exams who scored more than 60 per cent in grade 8 exams. The specification includes year fixed effects, village fixed effects, and district–year fixed effects. Standard errors are clustered at the village level. In the pre-period this is restricted to event years that exist across all villages. The data on the outcome measure is available only in 2009, 2014, 2015, 2016, and 2017. These coefficients are thus missing in event years $j = -6, -4$. The sample includes 14,984 villages across five years.

Source: author's compilation.

Table 5: Impact of school consolidation on achievement

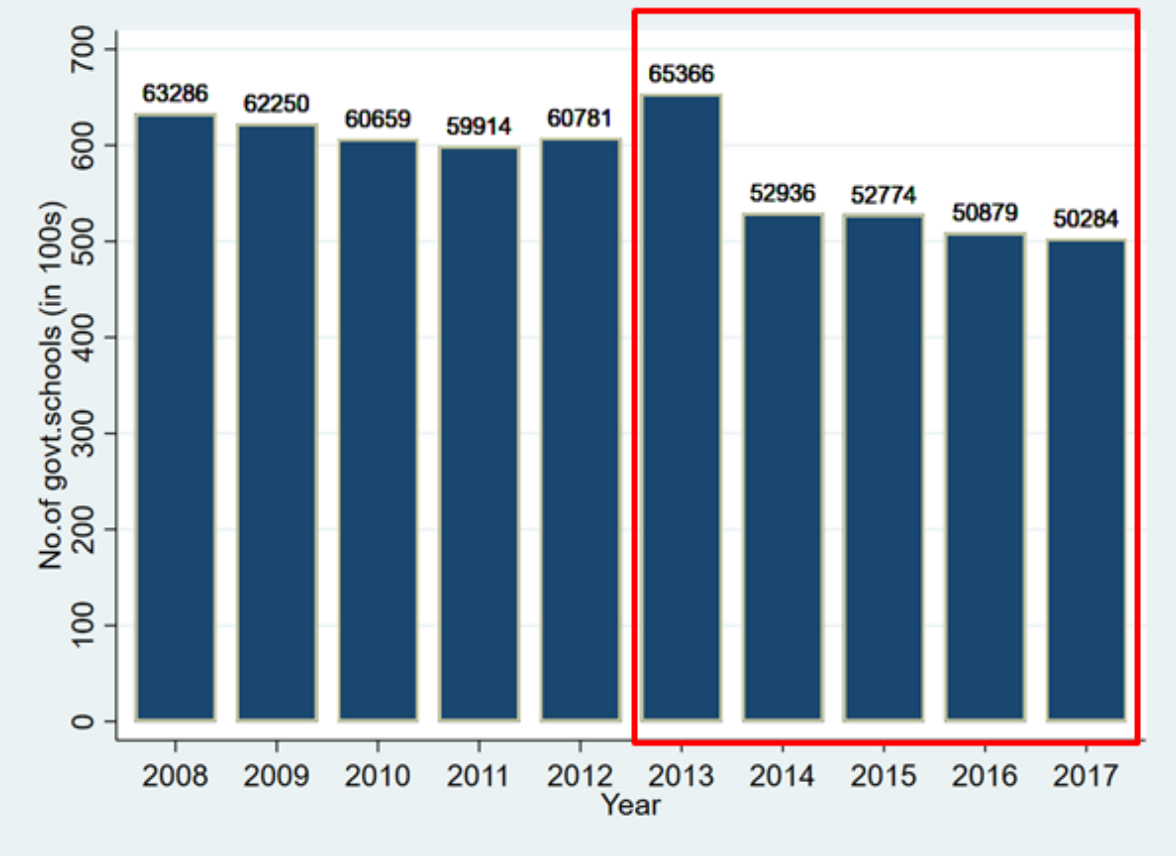
	(1) Prop. high scorers in grade 5 exams	(2) Prop. high scorers in grade 8 exams
ATT	–0.08***	0.01
	[–0.11,–0.05]	[–0.02,0.03]
Baseline mean	0.64	0.51
N	74,920	74,920

Note: 95% confidence intervals in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. This table presents ATT estimates of the impact of school consolidation on achievement using Callaway and Sant'Anna's (2021) methods. Column (1) corresponds to the proportion of children in a village among those who took the exams who scored more than 60 per cent in grade 5 exams. Column (2) corresponds to proportion of children in a village among those who took the exams who scored more than 60 per cent in grade 8 exams. The baseline mean of the outcome variables in the consolidated villages is reported.

Source: author's compilation.

Appendix A

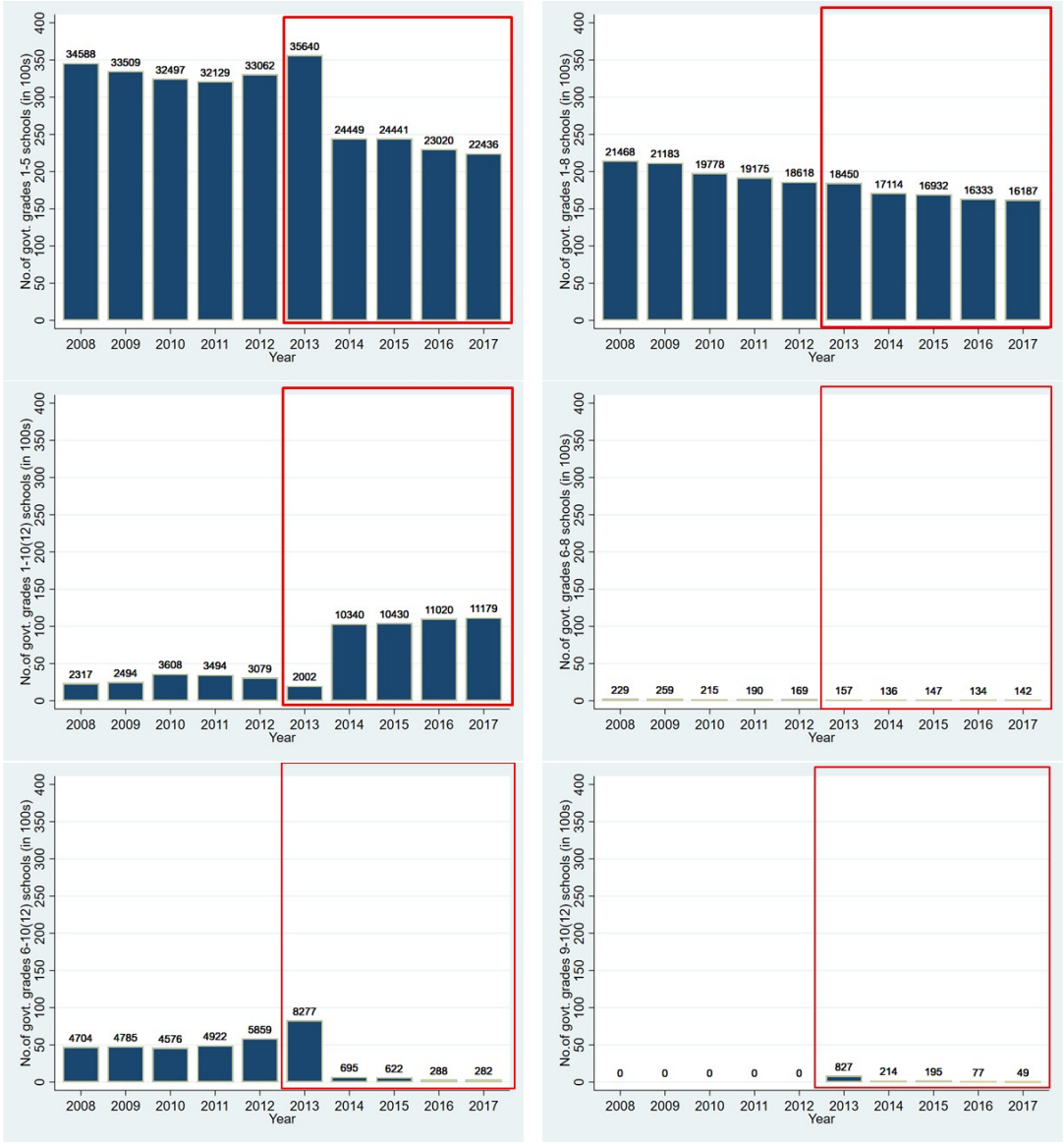
Figure A1: Number of government schools over the years among villages that appear across all ten years of analysis: Rajasthan



Note: this figure presents the number of government schools in Rajasthan among a restricted sample of villages that appear across all years of the analysis. The years of particular interest are 2014, 2016, and 2017, when the number of government schools in Rajasthan declined. These years correspond to the three waves of school consolidation. The data correspond to 29,948 villages across 32 districts.

Source: author's compilation based on U-DISE data for 2008–17.

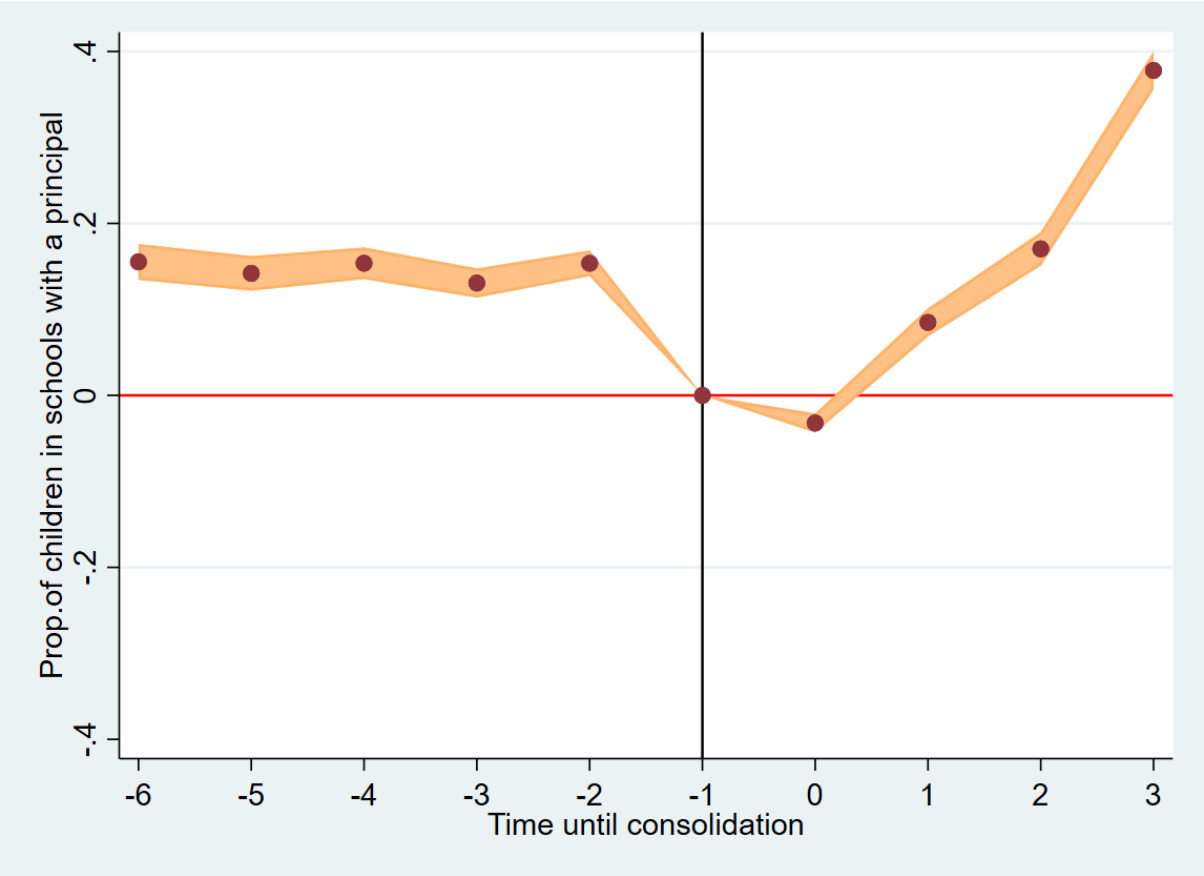
Figure A2: Number of government schools by type over the years: Rajasthan



Note: these graphs present the number of government schools by type among a restricted sample of villages which appear across all years of the analysis. The schools are categorized into types based on the grades to which they cater. The years of particular interest are 2014, 2016, and 2017, which correspond to the three waves of school consolidation. The data correspond to 29,948 villages across 32 districts.

Source: author's compilation based on U-DISE data for 2008–17.

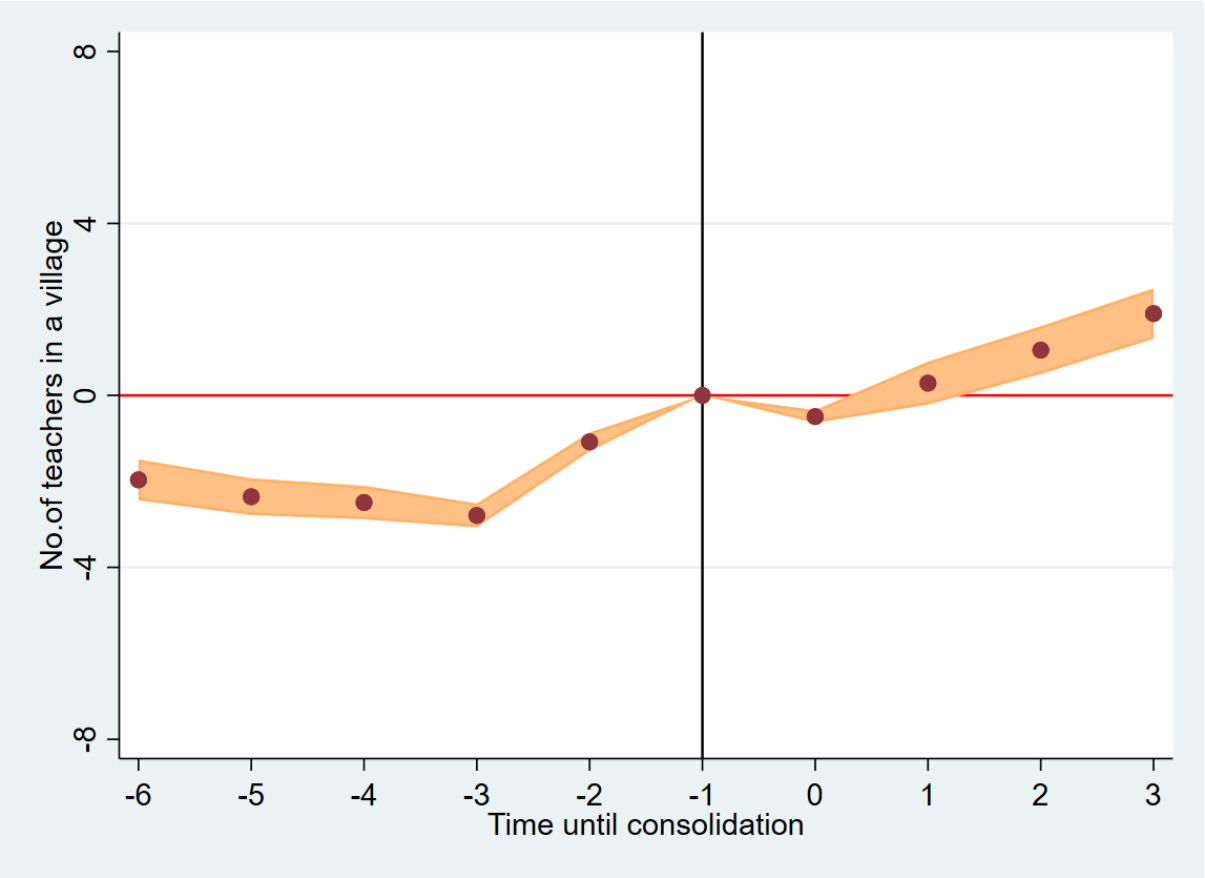
Figure A3: Intermediate outcome of consolidation: proportion of children studying in a school with a principal



Note: this figure presents the estimates of the impact of school consolidation on the proportion of children in a village, among the school-enrolled, studying in a school with a principal as estimated by Equation 1. The specification includes year fixed effects, village fixed effects, and district–year fixed effects. Standard errors are clustered at the village level. In the pre-period this is restricted to event years that exist across all villages. The sample includes 14,984 villages, of which 2,352 are consolidated (2,125 villages consolidated in 2014, 181 in 2016, and 46 in 2017) and 12,632 are never consolidated.

Source: author's compilation.

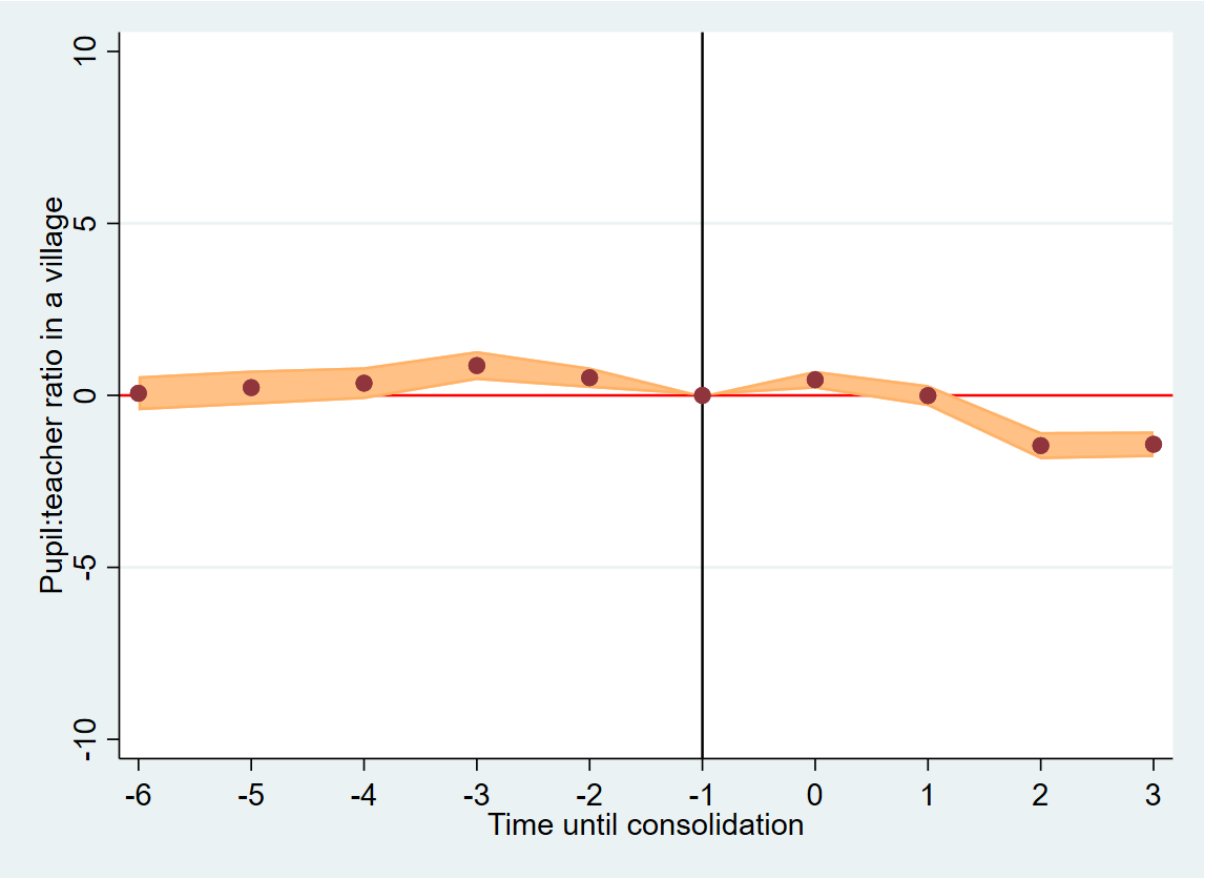
Figure A4: Intermediate outcome of consolidation: number of teachers in a village



Note: this figure presents the estimates of the impact of school consolidation on the total number of teachers in a village as estimated by Equation 1. The specification includes year fixed effects, village fixed effects, and district–year fixed effects. Standard errors are clustered at the village level. In the pre-period this is restricted to event years that exist across all villages. The sample includes 14,984 villages, or which 2,352 are consolidated (2,125 villages consolidated in 2014, 181 in 2016, and 46 in 2017) and 12,632 are never consolidated.

Source: author's compilation.

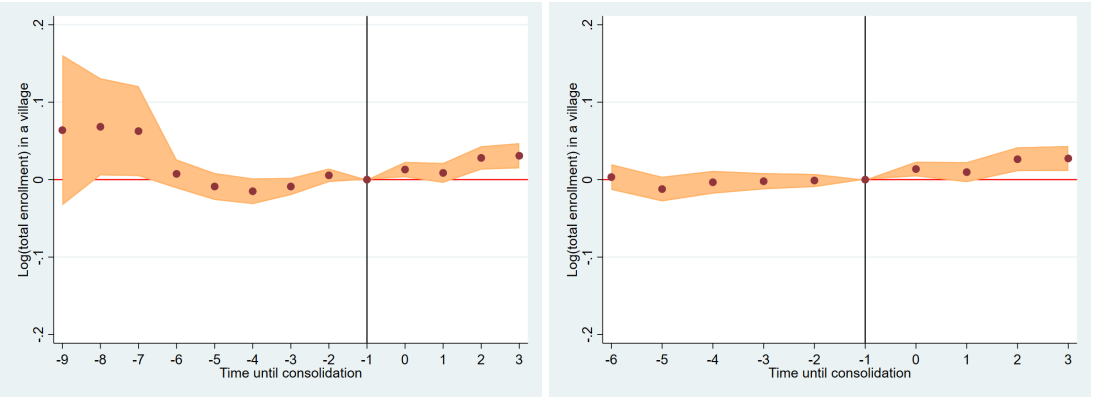
Figure A5: Intermediate outcome of consolidation: pupil–teacher ratio in a village



Note: this figure presents the estimates of the impact of school consolidation on the pupil:teacher ratio in a village as estimated by Equation 1. The specification includes year fixed effects, village fixed effects, and district–year fixed effects. Standard errors are clustered at the village level. In the pre-period this is restricted to event years that exist across all villages. The sample includes 14,984 villages, of which 2,352 are consolidated (2,125 villages consolidated in 2014, 181 in 2016, and 46 in 2017) and 12,632 are never consolidated.

Source: author's compilation.

Figure A6: Impact of consolidation: school enrollment—more event years and a larger sample of villages



Note: these graphs are similar to Figure 11. The first panel presents the estimates of school consolidation on school enrollment where all available pre-period event years are included. The second panel presents the estimates of school consolidation on school enrollment in a village among an unbalanced panel of villages.

Source: author's compilation.