# The Effect of Having Fewer School Days on Student Performance: Evidence from a Natural Experiment in Chile

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## Abstract

The causal effect of time spent by students at school on their academic performance is a question still open to debate in the field of economics of education, and for policy makers. This can be seen from the heterogeneity between countries in the number of hours that children are required to spend at school. In the paper I use the 8.8 earthquake that struck Chile in 2010 as a natural experiment. The earthquake is used as an exogenous variation of the time that children spent at school that year before sitting a national standardised exam approximately 8 months after the natural disaster, using the fact that the earthquake hit a random area of the country. I use a difference-in-differences econometric specification, with data of students observed in 2009 or 2010, in affected or non-affected areas, to answer this question. More than 50% of the students were studying in schools located in the area affected by the earthquake. As the main result, I find a negative and significant effect of the reduction in the potential time spent in school by students on academic achievement in Mathematics, and no significant effect in Spanish. However, the effect is modest even for those students who lost up two months of schooling.

# 1 Introduction

Spending more time at school would appear to be a very obvious thing to do to improve children's achievement. The existing evidence is rather scarce and inconclusive so far. At the country level, a relationship between length of study and achievement is not clear cut (Lavy, 2015). The length of study measured by the average hours per year of instruction time varies substantially across OECD countries. For instance, in Finland the compulsory instruction time per year in primary school is 632 hours, in Spain it is 794 while in Chile it is 1039 hours, and the OECD average is 804 hours (see OECD (2015)). In international comparisons as the Programme for International Student Assessment, PISA, Chilean students perform worse than most of the other OECD countries in all the three subjects measured, Science, Reading and Mathematics (OECD, 2016). Chile is the country with more instructional hours in its curriculum, however is still not performing well. Therefore, one natural question arises: Does it pay to increase the amount of time children spend at school?

To answer this question, I use the earthquake that hit Chile in February 2010, two days before the start of the academic year, officially the first of March. Because of the earthquake more than 50% of the schools were damaged in varying degrees, and some of them were not able to reopen by the start of the school year for up to two months. Every year, all students in fourth grade must sit a national standardised exam, called SIMCE, in October. As a result of the earthquake, by the time of the exam some students had received up to two months less of instruction at school depending on the level of damage of it. Therefore, the earthquake provides an exogenous source of variation of school attendance. To identify the causal effect of instructional time I use a difference-in-differences framework. I compare the change in exam scores before and after the earthquake. The treatment group is composed by students who were attending schools which were damaged by the earthquake. The control group is composed by students who were in schools which were not damaged by the earthquake.

The answer to the previous question is important for many reasons. One of them is about the costs involved. Increasing instructional time is a costly policy and sometimes more space is required, for instance in the case of a change of regime from two shifts (morning and afternoon) to a system in which all students spend the whole day at the school as was the case of the reform implemented in Chile in the early 2000s. (see Bellei (2009)). If the policy is not effective, then it might be worth exploring other options on how to spend that money. Another reason is the opportunity cost of time. It might be worth to consider reducing the number of hours of children exposed to instruction and allow the teachers to use that time in preparing themselves better, for example.

Although the earthquake is random, which helps dealing with the endogeneity issue, it may still affect student exams scores through other channels beyond instructional time, therefore creating potential biases to the results. For example, if there was some disruption at the student's home, it may have an effect on his academic performance. To take this into account in one of the specifications I compare all students attending schools not damaged by the earthquake but separating them by areas affected and non-affected. I assume that the difference between these groups is the effect of the earthquakes through channels other than instruction time.

My first finding is that the earthquake does have a negative effect on the student's test scores in mathematics, which is robust to the different controls included. A negative effect of the earthquake over student's achievement was found in the study by Tincani (2017) as well, although the empirical strategy and the data used are not entirely comparable. In that study there are two cohorts with exam scores observed twice, in fourth and eighth grade. The first cohort is observed entirely before the earthquake, and the second cohort sat the fourth-grade exam before the earthquake and the eighth-grade exam after it. To define the treatment and control groups, Tincani (2017) splits students between affected and non-affected areas. However, it is not the case for language, where no significant results are found in any of the specifications included. Then in the specification that splits the damaged schools according to their damage level, this effect increases as the damage level is higher, although no significant differences can be found between non-damaged schools and schools with minor or moderate damage. Finally, in the specification in which I separate all the students attending schools with no damage in two groups, one in which are students attending schools in non-affected areas and the other with students in affected areas, there are two important results for mathematics. The first one is that students attending schools in the affected area show an achievement lower than expected, which is also similar for the minor and moderate damage schools. Nevertheless, students attending schools that are classified as severely damaged did perform worse than expected compared to the previous three groups. This may be taken as evidence that instruction time does matter and that the earthquake operated at least through two channels, one of them the time spent by students at their schools.

So far one of the few published studies about the effects of instruction time on student performance using Chilean data is Bellei (2009), who looks for the effect ot the full school day reform on academic achievement, using data for students in secondary education. According to the literature, the effects of instructional time seem to differ across ages, as well as across countries (see Lavy (2015) and others). Hence, my study is not directly comparable to Bellei (2009).

One problem when studying this topic is to find an exogenous source of variation in instructional time to overcome endogeneity problems, because attendance rates may be correlated with some unobserved characteristics of the student that are likely to be correlated with their outcomes in standardised exams. In the study by Gottfried (2009) compares excused and unexcused absences finding that students who miss classes with a valid excuse (for instance because of sickness), perform better than students having a similar number of unexcused absences (truancy for instance). The results hold for both reading and math scores.

Some studies have used different kind of quasi-experimental designs to study this research question. Among the papers that use a policy change to explore this question one of the most cited ones is Pischke (2007) who uses a reform in Germany in the late 1960s as a source of exogenous variation in the time that students spent at school. It is one first studies to use that kind of approach at a national level (see Patall et al. (2010) for a review of the literature). While he finds a negative effect of having a shorter school year on the pass rate of students (his measure of student performance), he doesn't find any significant effect on future earnings. A similar approach is used in Aguero and Beleche (2013), using a quasi-experimental design to study the effect of a shorter school year on student achievement in Mexico, finding that having more school days before an examination does improve the results, although with diminishing marginal returns. On the other hand, Huebener et al. (2016) also uses a policy as the source of variation but in the number of weekly hours rather than the number of days, finding a positive significant effect of the increase in the hours on student's achievement. Another paper that uses a policy, claiming to cause exogenous variation, is Marcotte (2007).

Among the literature that uses some sort of unscheduled random school closures to see any effects on student performance, thus a similar source of variation as the one that I use, Sacerdote (2012) finds that in the short run the Katrina hurricane has a negative impact on schooling outcomes. However, in the long run this effect is more than compensated by the fact that the children affected by the hurricane moved to better school districts. Another study that uses hurricanes as a source of variation is the one by Spencer et al. (2016). In their paper they use a number of hurricanes and look for effects on achievement, distinguishing subjects by being related to science or not. They find a significant effect science-related subjects when the hurricane occurs during the academic year. In subjects not science-related as language they do not find any significant effects, which is similar to my results. One paper that attempts to answer a similar research question as mine is Marcotte and Hemelt (2008). In their work the exogenous source of variation in time spent at school is snow. In winter, some schools have to close due to snow and therefore the children attending those schools are exposed to less instructional time. They find that there is a negative effect of school closures on student performance, and that the effect is small for children in 5th and 8th grade compared to children in 3rd grade. Also, the study by Hansen (2011) uses weather-related variation as an empirical strategy to try to answer this question, finding a negative effect of school closures on student outcomes.

On the strand of literature that looks for the relationship of student absences and student achievement, it is important to note that one has to be careful in the interpretation of possible correlations as causal effects. One of the studies, Aucejo and Romano (2014), finds that increasing the number of school days is less effective than reducing student absences by the same amount of time. In addition, the effects are larger in math compared to reading. A similar approach used the study by Goodman (2011).

The rest of the study is organised as follows: section 2 gives an overview to the Chilean school system and the Earthquake, section 3 covers the data, its sources and some descriptive statistics, section 4 is about the empirical strategy, in section 5 I go through the results while in section 6 there is some discussion about those results and the conclusion.

# 2 The Chilean school system and the Earthquake

## 2.1 Chilean school system

The Chilean school system is composed of three types of schools: public, private subsidised and private schools (Valenzuela et al., 2014). The public, or municipal ones, are run by the municipalities, cannot charge any fees to the students and receive funding from the state. The private subsidised also receive funding from the state but in addition they were allowed to charge some tuition fees to the students at the time of the exams analysed in this study. Finally, private schools do not receive any funding from the state and are allowed to charge tuition fees. Around 90% of the students attend either public or subsidised schools, while less than 10% are enrolled in private schools in fourth grade. Public schools cannot select students before seventh grade. On the other hand, private subsidised and private schools interview parents, hold some playing sessions for the children or do other type of selection processes. The system is organised in three tiers: primary school from first to fourth grade, lower secondary school from fifth to eighth grade, and upper secondary school from ninth to twelfth grade. Children usually start primary school at the age of six-seven years old and leave upper secondary school at the age of seventeen-eighteen years old.

To measure the quality of education, there are exams called "SIMCE", that are sat by students in fourth, eighth and tenth grade. In the case of students in fourth grade, this is every year, and for the other two cases only every other year.

In order for a student to progress to the next academic year, the following rules apply. From first to second grade and from third to fourth grade, every student with an attendance rate of at least 85% will be automatically promoted. In addition to this, which also applies for other grades, from second to third grade and from fourth to eighth grade, students must either have approved all their subjects (minimum of 4.0 in a scale from 1 to 7), have an average of 4.5 if they have failed one subject, or an average of 5.0 if they have failed 2 subjects.

## 2.2 Earthquake

Chile is a seismic country. According to the information from the National Seismological Centre (*Centro Sismologico Nacional*), before 2010 there were 109 earthquakes of magnitude at least 7.0, from Arica (northernmost part of the country) to Tierra del Fuego (southernmost part of the country). This, considering all the earthquakes from 1570. More accurate measures are from the beginning of the 20th century, and in that case the number of earthquakes before 2010 is 77. This represents on average 0.7 earthquakes per year, compared to 14.6 in the whole world since 1990 (or 0.07 per country per year).[1] Another way to look at this is to say that Chile's surface is 0.56% of the world's, and it's share of earthquakes is 5%. Chile was struck by an earthquake on 27th February 2010, at 3:34 am local time. Its magnitude was 8.8 Richter in the epicentre, approximately 400 km south of Santiago, the capital and it was the fifth-largest ever instrumentally recorded in the world (Astroza et al., 2010). It affected six of the fifteen regions of the country. Approximately 80% of the population lived in that area. The earthquake occurred just 2 days before the official start of the school year, set to be the 1st of March 2010 and to include 40 weeks of teaching. According to the information retrieved from the Chilean Ministry of Education (MINEDUC), more than half of all schools (4635 out of nearly 9000) were damaged. The damage was classified as no damage minor, moderate, severe or school closed. Schools closed either because the damage was too severe or because they did not have enough students, possibly because of migration due to the earthquake.

In figure 1 there is a map of the whole country at the left and a map of the area affected by the earthquake at the right, which covers the three most populous cities in the country: Santiago, Valparaiso and Concepcion. In the area in which the estimated shaking intensity is marked as "Strong", this intensity was approximate 7.0 in the Richter scale or higher. As can be seen in the maps, the epicentre was on the coast, hence after the earthquake there was a tsunami which was responsible of most of the deaths due to the earthquake. The official number of deaths related to the earthquake and the subsequent tsunami was 525, according to the National Office for Emergencies ONEMI (*Oficina Nacional de Emergencias del Ministerio del Interior*).

[1] Statistics from the United States Geological Survey

# 3 Data

The data comes from the national standardized exam called Sistema de Medicion de la Calidad de la Educacion, SIMCE (System to Measure the Quality of Education) for students in fourth grade, years 2009 and 2010. Information about the students include the results in both Math and Language and their previous performance from first grade.

At the school level it includes type of school, which can be public, private subsidised by the state or private not subsidised by the state, the town where the school is and also if it is located in a rural or urban location In addition, I have another dataset with information about the level of damage suffered by schools in the area affected by the earthquake, which covers about 70% of the students in fourth grade. It classifies the damage (or no damage) in five categories: no damage, minor damage, moderate damage, severe damage and school closed, which means that either the school needs to be rebuilt or that the school was closed due to the lack of students, possibly because of migration after the earthquake. Furthermore, I have data about student scores in previous years, from 2005 onwards and also from 2011 to 2013. However, the information about the student's background and classroom level information is not recorded in a comparable way since the surveys were modified often. the years 2009 and 2010 are the most comparable ones.

## 3.1 Descriptive statistics

I present the summary statistics in four tables, separating the data by year and by area, if it was affected or not by the earthquake. First thing to notice is that nearly three quarters of the students attend schools in affected areas. From the comparison of students in the different areas the year before the earthquake, i.e Table 1, students in the non-affected area show a slightly better performance measured by their average gpa of the 3 years prior to the exam. One possible explanation is that the affected area is the most urbanised area of the country. Thus, less students are attending schools located in rural areas, which are smaller and thus a teacher can give a more personalised attention to those students. In summary statistics not reported here the average score in Mathematics of students in rural schools is approximately fifteen points higher than the average score for students in urban schools, while for Language the same difference is ten points.

It is important to mention that although the data of scores come from the entire population, students attending private schools in the affected areas do not appear in most of the cases. This is due to the fact that the MINEDUC only collected data on the damage for public and private subsidised schools

(see Table 1 and Table 2)

# 4 Empirical Strategy

The main goal of this paper is to identify the causal effect of having less time at school on the student performance, measured by the SIMCE test. I do so by using the earthquake as a source of exogenous variation that is orthogonal to the potential outcomes. This will be done in two steps. The first step is to look for the effect of the earthquake on student performance. Afterwards, the second step is two look for the different channels through which this effect could be working, and in particular try to isolate the channel of instructional time which is the one I am focused in. For simplicity, the effects of the earthquake on students not related to what happened to the school itself will be called ”child damage”, in a very broad sense. This ”child damage” can include for instance the disruption due to the loss of a family member, the destruction of the home place, post-traumatic stress disorder and/or another issue that affects the student in some way because of being exposed to the earthquake. Since in the dataset there is information about the town where the student is living, first I will split the population in three groups: students living in non-affected areas, and therefore attending schools that didn't suffer damage from the earthquake; students living in affected areas but whose schools didn't suffer damage; and finally, students in affected areas whose schools were damaged by the earthquake. This last group will be further split into different treatment levels, depending on the damage level of the school, following the definitions given before.

The idea is that comparing students in non-affected areas to students in affected areas but whose school was not affected will reveal the effect of the earthquake through the "child damage" channel, while further effects may be attributed to the "school damage" channel, and possibly because of less time spent at school.

Although the data consists only in cross sections, I will use a difference-in-differences approach assuming that both cohorts do not differ significantly one from the other, and thus that it is possible to compare them before and after.

The first specification compares students attending schools damaged (treatment group) by the earthquake with students attending schools not damaged (control). The latter group considers both students attending (and in most cases living) in areas affected and non-affected by the earthquake. The regions that are considered "affected", according to the Chilean government, are regions V-VI-VII-VIII-IX-XIII. Therefore, this specification can be written in the following way:

$$TestScore_{istm} = \beta_0 + \beta_1 Post_{istm} + \beta_2 Damaged_{istm} + \beta_3 Post_{istm} * Damaged_{istm} + \beta_4 X_{stm} + c_m + \epsilon_{istm} \quad (1)$$

where $TestScore_{istm}$ is the spanish or mathematics score in SIMCE, $Post_{istm}$ is a dummy that takes value 1 if the score is observed in 2010 or 0 if the score is observed in 2009 and $Damaged_{istm}$ is a dummy that takes value 1 if the score is of a student attending a damaged school or 0 otherwise, for student $i$ in school $s$ located in town $m$, observed at time $t$, while $c_m$ captures town fixed effects.

Also, it would be interesting to observe if there is a relationship between level of damage of the school attended by the student and their score. If in fact the loss of schooling days has a negative effect on the student performance, then one would expect that as the damage of the school is higher, then the student's score should be lower, because the school may be closed for longer. However, I do not observe for how long the school was closed.

First, I use the following specification, in which I split the schools in three groups: schools with no damage or minor damage, schools with moderate damage and schools with severe damage. I am excluding the students in schools closed because since I cannot observe what happened to them I prefer to either consider them as a separate group or not consider them rather than grouping them in another category. This specification can be written as:

$$\begin{aligned} TestScore_{istm} = &\beta_0 + \beta_1 Post_{istm} + \beta_2 ModDamage_{istm} + \beta_3 SevDamage_{istm} \\ &+ \beta_4 Post_{istm} * ModDamage_{istm} + \beta_4 Post_{istm} * SevDamage_{istm} \\ &+ \beta_5 X_{stm} + c_m + \epsilon_{istm} \end{aligned} \quad (2)$$

where $ModDamage_{istm}$ is a dummy variable that takes value 1 if the student $i$ is attending a school $s$ that suffered moderate damage and $SevDamage_{istm}$ is a dummy variable that takes value 1 if the student $i$ observed in time $t$ is attending a school $s$ located in town $m$ that suffered severe damage. Furthermore, the baseline group can be further split in students attending non damaged schools (the new reference group) and students attending schools with minor damage. This specification can be written as:

$$\begin{aligned} TestScore_{istm} = &\beta_0 + \beta_1 Post_{istm} + \beta_2 MinorDamage_{istm} + \beta_3 ModDamage_{istm} \\ &+ \beta_4 SevDamage_{istm} + \beta_5 Post_{istm} * MinorDamage_{istm} \\ &+ \beta_6 Post_{istm} * ModDamage_{istm} + \beta_7 Post_{istm} * SevDamage_{istm} \\ &+ \beta_8 X_{stm} + c_m + \epsilon_{istm} \end{aligned} \quad (3)$$

Then the second step is to try to isolate the channel of instructional time from others through which the earthquake could be operating. To try to see there are at least two ways, in both of them doing a further split of the students in non-damaged schools can be made, to look if the fact of being exposed to the earthquake has some relevance. One way, which follows the previous line of splits is:

$$\begin{aligned} TestScore_{istm} = {} & \beta_0 + \beta_1 Post_{istm} + \beta_2 Affected_{istm} + \beta_3 MinorDamage_{istm} \\ & + \beta_4 ModDamage_{istm} + \beta_5 SevDamage_{istm} \\ & + \beta_6 Post_{istm} * Affected_{istm} + \beta_7 Post_{istm} * MinorDamage_{istm} \\ & + \beta_8 Post_{istm} * ModDamage_{istm} + \beta_9 Post_{istm} * SevDamage_{istm} \\ & + \beta_1 0 X_{stm} + c_m + \epsilon_{istm} \end{aligned} \tag{4}$$

where $Affected_{istm}$ is a dummy that takes value 1 if the student is attending a school in the area affected (therefore "affected" by the earthquake), and $Post_{istm} * Affected_{istm}$ takes value one if the student is attending a school located in the area affected by the earthquake and is observed in 2010.

Another way to try to look for the additional effect of attending a damaged school compared to just attend an affected school can be expressed in the following way:

$$\begin{aligned} TestScore_{istm} = {} & \beta_0 + \beta_1 Post_{istm} + \beta_2 Affected_{istm} \\ & + \beta_3 Post_{istm} * Affected_{istm} \\ & + \beta_4 Post_{istm} * Affected_{istm} * Damaged_{istm} \\ & + \beta_5 X_s + \epsilon_{istm} \end{aligned} \tag{5}$$

where the extra term is the triple interaction term $Post_{istm} * Affected_{istm} * Damaged_{istm}$ if the student is attending a school affected to the earthquake which was damaged by it.

# 5 Results and robustness checks

The results are presented in three steps. First the basic specification, which compares students attending damaged schools and students attending schools which were not damaged by the earthquake. Then the specification that allows for different damage levels of the schools, and finally the results in which I try to separate the different channels through which the earthquake operates.

## 5.1 Students attending damaged vs non damaged schools

The results of the first specification, equation 1, show that students attending schools damaged by the earthquake, regardless the level of damage, performed worse than expected in Mathematics compared to the control group, i.e. students attending schools not damaged by the earthquake. This can be seen in Table 3, where the interacted term of school damaged and the dummy variable of being observed after the earthquake is negative and significant, in all but one case at the 5% level at least. On the other hand, no significant difference was found in Language, Table 4. However, overall there was an important increase in Language scores between 2009 and 2010, which can be noticed by the value of the dummy *post*. The result holds for the inclusion of student and school level covariates.

## 5.2 Students attending schools with different damage levels

The relevant results of this section are in Table 9 and Table 10, for both Mathematics and Language respectively. For these results the reference group is students attending school which were not damaged by the earthquake. In the case of Mathematics, the results after the earthquake worsen as the damage level increases. However, after including all the covariates only the interacted term of attending a severely damaged school after the earthquake remains negatively significant, -2.668 in the specification with all the covariates included and town fixed effects, column 6. Again, for Language no significant effect is seen after including covariates, which is consistent with the results previously mentioned.

## 5.3 "School damage" and "child damage" disentangled

Here the previous reference group of students attending schools not damaged is further split into two groups. The new reference group which is students attending schools located in the area not affected by the earthquake, and the other group is students attending schools non-damaged by the earthquake located in areas affected by it. The results for Mathematics, Table 6, show that the interaction term between being observed after the earthquake and the different "treatment" levels, i.e. from attending a school that was only affected to attending one that was severely damaged, is negative and increasing in magnitude. Nevertheless, it is important to notice that the difference between the coefficients of *affectedXpost*, *treatedXMinorD* and *treatedXModerateD* are very small, but there is a jump to the coefficient of *treatedXSevereD*. Taking the results of column 6, with all the covariates and town fixed effects included, if the total decrease of the score in the exam is 4.150 points, then nearly two thirds of may be explained by the fact of just being affected by the earthquake, while one third is due to other reasons, and the claim here is that it is because of having less instructional hours. As in the other cases, no significant results for the case of Language scores, Table 6

Using the second approach mentioned in the empirical strategy, the results of estimating equation 5 are shown in Table 11 for both Mathematics and Language, but in the case of the latter there are no significant effects of the earthquake after including the controls. However, for Mathematics the results mainly show an effect of the earthquake, but it doesn't exist a large difference between attending a school affected by the earthquake and attending a school damaged by the earthquake, after including all the covariates.

# 6 Discussion and conclusion

I estimated the causal effect of having fewer hours of school on students' academic performance, in the context of a natural experiment, using the earthquake which struck Chile in 2010 as a source of exogenous variation, with a difference-in-differences strategy. The main findings of this study are the following: first that the earthquake had a negative and significant effect on students' performance in Mathematics. It didn't have a significant effect in Language. Second, that this effect can be decomposed in two parts for the students that were affected the most in terms of schooling time lost, roughly a third was through the "school damage" channel, and two thirds through the "child damage" channel. The former refers to the loss of time at school and the latter refers to other effects of the earthquake such as disruption at student's home. The main assumption of this paper is that the school damage is strongly correlated with the loss in instruction time, which in the case of students attending schools severely damaged by the earthquake could be up to two months.

However, it is important to say that the magnitudes may look rather small, with the total effect of the earthquake being less than 0.1 standard deviations in terms of scores. But it is also worth mentioning that, considering a student that started school at first grade (i.e. only has done the compulsory school, not pre-kinder or kindergarten), then 2 months of schooling is roughly 5% of the total time spent at school. Another factor that could explain the modest effect is that Chile is currently the country with the highest amount of compulsory instructional time at school within the OECD members. If we assume that, at least at some point there are decreasing marginal returns, then it could be that since Chilean students are already spending so many hours that having less time at school is not that detrimental to their performance in the test. These days lost were also as far as away from the exams as possible.

Even though the study is using Chilean data, it could be possible to put them in a more general context, but mainly within primary school because the relative importance of time changes as the students are exposed to more and more years of schooling. The main policy implication is that increasing the time spent at school can increase the student performance in some subjects as mathematics, but the question of if it is worth it or not will depend on the particular costs of each place. In the specific context of Chile, I would say that more than in the quantity of time spent at school, the focus should be on the quality and productivity of this time.

It would be interesting to know the reasons behind the difference in the results between Mathematics and Language. One possible explanation could be that children and people in general communicate in a daily basis, and therefore even being absent from school it is an ability that can be developed outside school, also reading for instance. On the contrary, math is not something that most of the children use in their daily activities and since it is more abstract, it may need a more structured way of being studied, at school rather than at home. Also, the next step need the previous one.

About the limitations of this study, one possible drawback is that it is based on repeated cross-sections rather than a proper panel. Therefore, the students observed in 2009 are not the same as the ones observed in 2010. However there doesn't seem to be any reason to think that the two cohorts are particularly different one from each other.

A possible extension of this study could be to look how does the effect of instructional time differs across different students, either comparing them by socioeconomic level for instance or by previous academic achievement.

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# A Figures

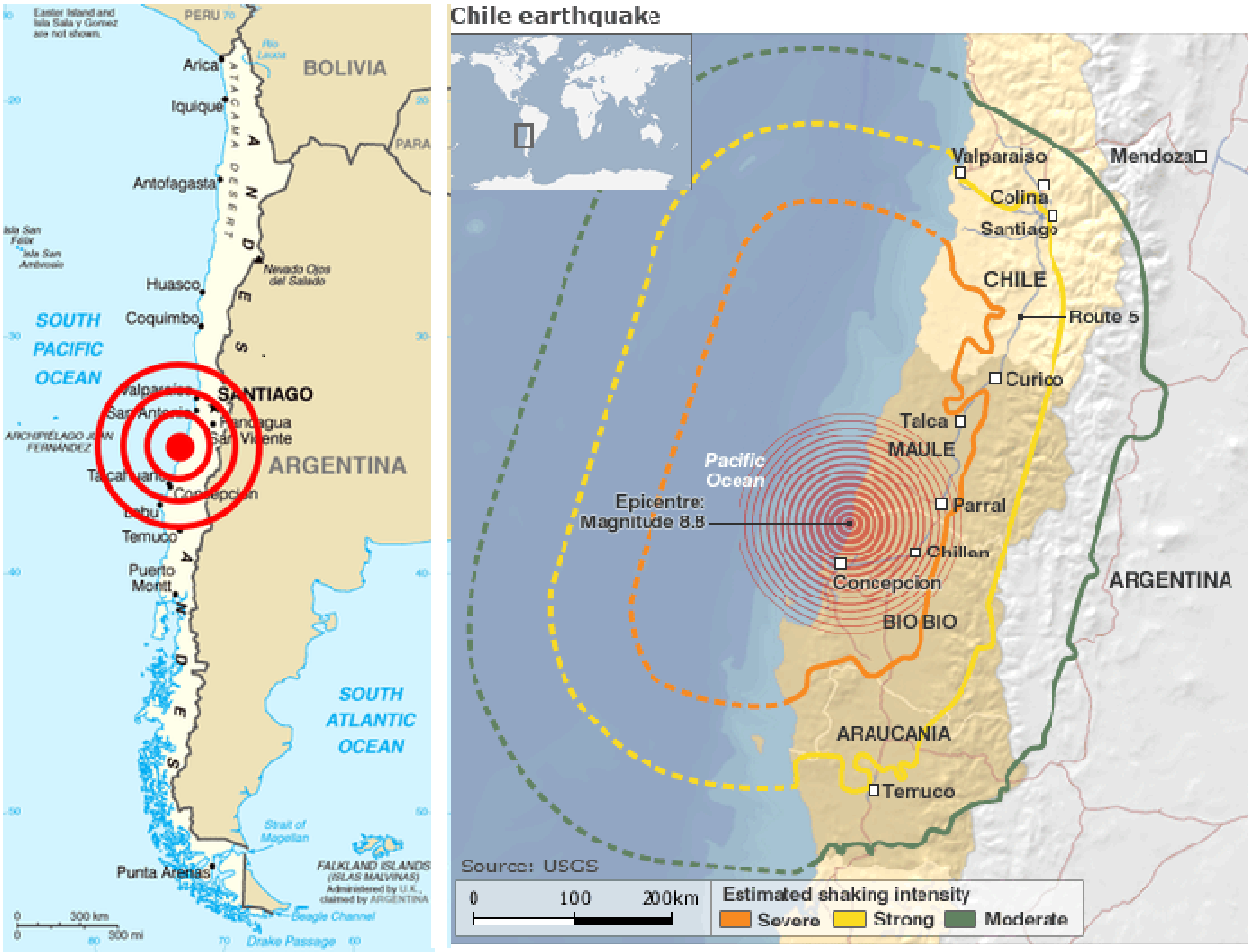


Figure 1: Map of the area affected by the earthquake

# B Tables

Table 1: Summary statistics, year 2009

| **Variable** | **Mean** | **Std. Dev.** | **Mean** | **Std. Dev.** |
|---|---|---|---|---|
| math | 249.175 | 54.015 | 249.422 | 54.069 |
| language | 260.964 | 52.442 | 258.63 | 53.065 |
| damaged | 0 | 0 | 0.685 | 0.465 |
| lag_gpa | 6.048 | 0.577 | 5.968 | 0.58 |
| rural | 0.14 | 0.347 | 0.121 | 0.326 |
| Low | 0.115 | 0.319 | 0.117 | 0.321 |
| MidLow | 0.341 | 0.474 | 0.339 | 0.473 |
| Middle | 0.339 | 0.473 | 0.38 | 0.485 |
| MidHigh | 0.163 | 0.369 | 0.159 | 0.366 |
| High | 0.042 | 0.201 | 0.005 | 0.073 |
| Public | 0.529 | 0.499 | 0.466 | 0.499 |
| Private_Subsidised | 0.432 | 0.495 | 0.534 | 0.499 |
| Private | 0.039 | 0.194 | 0 | 0.02 |
| size | 56.239 | 40.884 | 63.547 | 48.827 |
| srepeated | 0.119 | 0.122 | 0.123 | 0.12 |
| Affected area | No | No | Yes | Yes |

Table 2: Summary statistics, year 2010

| Variable | Mean | Std. Dev. | Mean | Std. Dev. |
|---|---|---|---|---|
| math | 250.63 | 52.641 | 248.947 | 52.587 |
| language | 269.472 | 50.167 | 267.908 | 50.183 |
| damaged | 0 | 0 | 0.679 | 0.467 |
| lag_gpa | 6.045 | 0.563 | 5.967 | 0.567 |
| rural | 0.145 | 0.352 | 0.123 | 0.328 |
| Low | 0.112 | 0.315 | 0.113 | 0.316 |
| MidLow | 0.327 | 0.469 | 0.345 | 0.475 |
| Middle | 0.346 | 0.476 | 0.368 | 0.482 |
| MidHigh | 0.17 | 0.376 | 0.168 | 0.374 |
| High | 0.045 | 0.206 | 0.006 | 0.076 |
| Public | 0.514 | 0.5 | 0.45 | 0.497 |
| Private_Subsidised | 0.448 | 0.497 | 0.55 | 0.497 |
| Private | 0.038 | 0.192 | 0 | 0.016 |
| size | 61.079 | 42.662 | 63.92 | 47.698 |
| srepeated | 0.123 | 0.123 | 0.129 | 0.122 |
| Affected area | No | No | Yes | Yes |

Table 3: Results for Mathematics

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | math | math | math | math | math | math |
| post | 0.781* | 0.968** | 0.849** | 1.215*** | 0.492 | 0.918** |
| | (0.414) | (0.410) | (0.402) | (0.399) | (0.413) | (0.411) |
| damaged | -4.049*** | -7.621*** | 0.0806 | -3.736*** | 2.610*** | -0.660 |
| | (0.977) | (1.128) | (0.815) | (0.918) | (0.750) | (0.849) |
| postXdamaged | -1.637*** | -1.771*** | -1.394** | -1.705*** | -1.066* | -1.506** |
| | (0.590) | (0.583) | (0.586) | (0.581) | (0.598) | (0.594) |
| lag_gpa | | | 55.36*** | 55.86*** | 49.93*** | 50.77*** |
| | | | (0.327) | (0.293) | (0.269) | (0.249) |
| rural | | | | | 2.522*** | 1.473* |
| | | | | | (0.886) | (0.857) |
| MidLow | | | | | 3.281*** | 5.709*** |
| | | | | | (0.872) | (0.802) |
| Middle | | | | | 11.12*** | 13.97*** |
| | | | | | (1.126) | (1.085) |
| MidHigh | | | | | 24.42*** | 27.14*** |
| | | | | | (1.424) | (1.403) |
| High | | | | | 34.81*** | 36.38*** |
| | | | | | (2.792) | (3.175) |
| Private_Subsidised | | | | | 3.926*** | 2.952*** |
| | | | | | (0.816) | (0.733) |
| Private | | | | | 4.323 | 6.289* |
| | | | | | (3.354) | (3.618) |
| size | | | | | 0.0673*** | 0.0829*** |
| | | | | | (0.0134) | (0.0129) |
| srepeated | | | | | -5.663** | -6.430*** |
| | | | | | (2.354) | (2.203) |
| _cons | 251.5*** | 253.3*** | -84.80*** | -85.92*** | -69.51*** | -75.66*** |
| | (0.693) | (0.716) | (2.025) | (1.850) | (1.978) | (1.879) |
| Town FE | No | Yes | No | Yes | No | Yes |
| *N* | 409871 | 409871 | 397279 | 397279 | 393724 | 393724 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Results for Language

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | language | language | language | language | language | language |
| post | 9.158*** | 9.319*** | 9.164*** | 9.462*** | 8.958*** | 9.289*** |
| | (0.377) | (0.373) | (0.360) | (0.356) | (0.363) | (0.360) |
| damaged | -4.766*** | -7.108*** | -1.123* | -3.688*** | 0.961 | -0.826 |
| | (0.823) | (0.949) | (0.671) | (0.754) | (0.626) | (0.696) |
| postXdamaged | -0.162 | -0.300 | 0.0826 | -0.189 | 0.297 | -0.0483 |
| | (0.531) | (0.525) | (0.518) | (0.513) | (0.523) | (0.521) |
| lag_gpa | | | 49.76*** | 50.28*** | 45.67*** | 46.30*** |
| | | | (0.268) | (0.244) | (0.232) | (0.217) |
| rural | | | | | 4.661*** | 3.173*** |
| | | | | | (0.725) | (0.688) |
| MidLow | | | | | 1.042 | 3.672*** |
| | | | | | (0.785) | (0.708) |
| Middle | | | | | 7.849*** | 11.06*** |
| | | | | | (0.992) | (0.939) |
| MidHigh | | | | | 17.02*** | 20.12*** |
| | | | | | (1.172) | (1.144) |
| High | | | | | 23.02*** | 24.97*** |
| | | | | | (2.456) | (2.480) |
| Private_Subsidised | | | | | 3.845*** | 3.349*** |
| | | | | | (0.665) | (0.605) |
| Private | | | | | 2.659 | 4.070 |
| | | | | | (2.795) | (2.829) |
| size | | | | | 0.0387*** | 0.0563*** |
| | | | | | (0.00910) | (0.00912) |
| srepeated | | | | | -6.670*** | -6.081*** |
| | | | | | (2.041) | (1.899) |
| _cons | 261.7*** | 262.8*** | -40.57*** | -42.44*** | -27.93*** | -34.33*** |
| | (0.583) | (0.609) | (1.713) | (1.585) | (1.709) | (1.606) |
| Town FE | No | Yes | No | Yes | No | Yes |
| $N$ | 410019 | 410019 | 397436 | 397436 | 393844 | 393844 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Results for Math and Language, all damage levels from Minor to School Closed

| | (1)<br>math | (2)<br>math | (3)<br>math | (4)<br>language | (5)<br>language | (6)<br>language |
|---|---|---|---|---|---|---|
| post | 0.781* | 0.849** | 0.551 | 9.158*** | 9.164*** | 8.973*** |
| | (0.414) | (0.402) | (0.410) | (0.377) | (0.360) | (0.360) |
| Minor_Damage | -4.269*** | 0.0923 | 2.716*** | -4.960*** | -1.139 | 0.937 |
| | (1.131) | (0.927) | (0.806) | (0.943) | (0.757) | (0.675) |
| Moderate_Damage | -4.289*** | 0.120 | 2.523* | -4.281*** | -0.349 | 1.635 |
| | (1.630) | (1.410) | (1.426) | (1.403) | (1.144) | (1.078) |
| Severe_Damage | -1.950 | 0.658 | 2.255 | -3.573** | -1.228 | 0.348 |
| | (1.839) | (1.511) | (1.428) | (1.586) | (1.287) | (1.202) |
| School_Closed | -11.96*** | -4.884* | 1.620 | -12.37*** | -6.031** | -0.711 |
| | (3.478) | (2.553) | (2.388) | (3.027) | (2.357) | (2.323) |
| treatedXMinorD | -1.072 | -0.830 | -0.572 | 0.453 | 0.722 | 0.890 |
| | (0.672) | (0.664) | (0.667) | (0.606) | (0.589) | (0.586) |
| treatedXModerateD | -1.253 | -1.392 | -1.189 | -0.703 | -0.855 | -0.681 |
| | (1.027) | (1.031) | (1.059) | (0.899) | (0.869) | (0.881) |
| treatedXSevereD | -3.946*** | -3.196*** | -2.453* | -2.056** | -1.388 | -0.818 |
| | (1.155) | (1.219) | (1.273) | (1.017) | (1.076) | (1.119) |
| treatedXSchool_Closed | -2.928 | -3.769 | -3.189 | 1.318 | 0.589 | 0.968 |
| | (2.415) | (2.587) | (2.577) | (2.186) | (2.368) | (2.387) |
| lag_gpa | | 55.36*** | 50.10*** | | 49.76*** | 45.89*** |
| | | (0.327) | (0.277) | | (0.268) | (0.238) |
| rural | | | 2.753*** | | | 4.969*** |
| | | | (0.867) | | | (0.712) |
| MidLow | | | 3.739*** | | | 1.604** |
| | | | (0.860) | | | (0.768) |
| Middle | | | 12.00*** | | | 8.901*** |
| | | | (1.074) | | | (0.936) |
| MidHigh | | | 25.55*** | | | 18.36*** |
| | | | (1.348) | | | (1.095) |
| High | | | 36.00*** | | | 24.42*** |
| | | | (2.775) | | | (2.410) |
| Private_Subsidised | | | 3.964*** | | | 3.916*** |
| | | | (0.813) | | | (0.665) |
| Private | | | 4.237 | | | 2.621 |
| | | | (3.380) | | | (2.803) |
| size | | | 0.0699*** | | | 0.0413*** |
| | | | (0.0132) | | | (0.00904) |
| _cons | 251.5*** | -84.75*** | -72.16*** | 261.7*** | -40.56*** | -31.14*** |
| | (0.693) | (2.027) | (1.875) | (0.583) | (1.714) | (1.638) |
| $N$ | 409871 | 397279 | 397279 | 410019 | 397436 | 397436 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Results for Math and Language for all damage levels, no Town FE

| | (1) math | (2) math | (3) math | (4) language | (5) language | (6) language |
|---|---|---|---|---|---|---|
| post | 1.455** | 2.130*** | 1.802*** | 8.509*** | 9.025*** | 8.861*** |
| | (0.609) | (0.585) | (0.583) | (0.546) | (0.510) | (0.504) |
| Affected | 4.399*** | 8.064*** | 6.235*** | 1.319 | 4.547*** | 2.866*** |
| | (1.388) | (1.160) | (1.043) | (1.168) | (0.968) | (0.897) |
| Minor_Damage | -1.956 | 4.352*** | 5.899*** | -4.269*** | 1.255 | 2.379*** |
| | (1.368) | (1.109) | (0.958) | (1.137) | (0.911) | (0.810) |
| Moderate_Damage | -1.976 | 4.380*** | 5.672*** | -3.590** | 2.045 | 3.056*** |
| | (1.802) | (1.535) | (1.503) | (1.540) | (1.250) | (1.164) |
| Severe_Damage | 0.363 | 4.912*** | 5.352*** | -2.882* | 1.162 | 1.736 |
| | (1.993) | (1.628) | (1.520) | (1.709) | (1.383) | (1.283) |
| School_Closed | -9.647*** | -0.614 | 4.665* | -11.68*** | -3.631 | 0.645 |
| | (3.563) | (2.622) | (2.442) | (3.093) | (2.409) | (2.365) |
| affectedXpost | -1.161 | -2.229*** | -2.260*** | 1.330* | 0.423 | 0.300 |
| | (0.830) | (0.803) | (0.820) | (0.753) | (0.718) | (0.718) |
| treatedXMinorD | -1.747** | -2.111*** | -1.814** | 1.102 | 0.862 | 1.006 |
| | (0.807) | (0.788) | (0.785) | (0.723) | (0.691) | (0.684) |
| treatedXModerateD | -1.928* | -2.674** | -2.438** | -0.0545 | -0.715 | -0.568 |
| | (1.120) | (1.115) | (1.135) | (0.982) | (0.942) | (0.949) |
| treatedXSevereD | -4.620*** | -4.474*** | -3.697*** | -1.407 | -1.246 | -0.703 |
| | (1.238) | (1.291) | (1.337) | (1.091) | (1.136) | (1.172) |
| treatedXSchool_Closed | -3.602 | -5.054* | -4.442* | 1.967 | 0.727 | 1.079 |
| | (2.456) | (2.623) | (2.613) | (2.222) | (2.396) | (2.414) |
| lag_gpa | | 55.52*** | 50.27*** | | 49.87*** | 45.99*** |
| | | (0.326) | (0.274) | | (0.267) | (0.236) |
| rural | | | 2.818*** | | | 5.006*** |
| | | | (0.873) | | | (0.715) |
| MidLow | | | 3.747*** | | | 1.610** |
| | | | (0.861) | | | (0.770) |
| Middle | | | 12.03*** | | | 8.925*** |
| | | | (1.072) | | | (0.935) |
| MidHigh | | | 25.79*** | | | 18.51*** |
| | | | (1.337) | | | (1.090) |
| High | | | 36.49*** | | | 24.77*** |
| | | | (2.768) | | | (2.385) |
| Private_Subsidised | | | 3.057*** | | | 3.361*** |
| | | | (0.811) | | | (0.664) |
| Private | | | 5.769* | | | 3.457 |
| | | | (3.389) | | | (2.804) |
| size | | | 0.0705*** | | | 0.0417*** |
| | | | (0.0132) | | | (0.00902) |
| _cons | 249.2*** | -90.01*** | -76.06*** | 261.0*** | -43.61*** | -33.00*** |
| | (1.036) | (2.040) | (1.914) | (0.862) | (1.732) | (1.666) |
| $N$ | 409871 | 397279 | 397279 | 410019 | 397436 | 397436 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Results for Math for all treatment levels without damage levels

| | (1)<br>math | (2)<br>math | (3)<br>math | (4)<br>math | (5)<br>math | (6)<br>math |
|---|---|---|---|---|---|---|
| post | 1.264 | 1.776*** | -2.159*** | 2.622*** | -2.668*** | 2.411*** |
| | (0.879) | (0.593) | (0.754) | (0.573) | (0.676) | (0.574) |
| affectedXpost | 3.237** | 3.360*** | 5.831*** | -0.00363 | 3.804*** | -2.002** |
| | (1.307) | (0.973) | (1.128) | (0.892) | (1.019) | (0.871) |
| treatedXMinorD | -3.702*** | -3.995*** | 2.231** | -3.679*** | 3.975*** | -2.720*** |
| | (1.269) | (0.899) | (1.057) | (0.824) | (0.917) | (0.790) |
| treatedXModerateD | -3.904** | -6.474*** | 1.696 | -5.291*** | 3.129** | -4.193*** |
| | (1.715) | (1.461) | (1.435) | (1.228) | (1.269) | (1.137) |
| treatedXSevereD | -4.257** | -5.823*** | 0.430 | -5.635*** | 1.559 | -4.911*** |
| | (1.775) | (1.411) | (1.466) | (1.245) | (1.249) | (1.157) |
| treatedXSchool_Closed | -13.25*** | -11.57*** | -5.682* | -8.323** | 0.163 | -3.826 |
| | (4.101) | (4.039) | (3.256) | (3.274) | (2.844) | (2.905) |
| lag_gpa | | | 55.42*** | 55.93*** | 50.13*** | 50.92*** |
| | | | (0.325) | (0.291) | (0.276) | (0.255) |
| rural | | | | | 2.745*** | 1.696** |
| | | | | | (0.866) | (0.848) |
| MidLow | | | | | 3.704*** | 6.184*** |
| | | | | | (0.857) | (0.793) |
| Middle | | | | | 11.96*** | 14.97*** |
| | | | | | (1.068) | (1.036) |
| MidHigh | | | | | 25.60*** | 28.43*** |
| | | | | | (1.336) | (1.336) |
| High | | | | | 36.24*** | 37.70*** |
| | | | | | (2.740) | (3.168) |
| Private_Subsidised | | | | | 3.303*** | 3.233*** |
| | | | | | (0.789) | (0.706) |
| Private | | | | | 3.925 | 6.462* |
| | | | | | (3.331) | (3.647) |
| size | | | | | 0.0714*** | 0.0852*** |
| | | | | | (0.0131) | (0.0128) |
| _cons | 249.4*** | 249.3*** | -85.12*** | -88.30*** | -70.71*** | -78.85*** |
| | (0.491) | (0.458) | (1.913) | (1.714) | (1.789) | (1.628) |
| Town FE | No | Yes | No | Yes | No | Yes |
| $N$ | 409871 | 409871 | 397279 | 397279 | 397279 | 397279 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Results for Language for all treatment levels without damage levels

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | language | language | language | language | language | language |
| post | 10.31*** | 8.804*** | 7.224*** | 9.444*** | 6.960*** | 9.300*** |
| | (0.710) | (0.537) | (0.604) | (0.501) | (0.563) | (0.497) |
| affectedXpost | 2.649** | 5.222*** | 4.970*** | 2.301*** | 3.075*** | 0.439 |
| | (1.031) | (0.822) | (0.874) | (0.740) | (0.813) | (0.717) |
| treatedXMinorD | -3.167*** | -0.962 | 2.115** | -0.605 | 3.338*** | 0.220 |
| | (1.014) | (0.779) | (0.822) | (0.693) | (0.738) | (0.664) |
| treatedXModerateD | -3.644*** | -3.229*** | 1.328 | -2.105** | 2.444** | -1.115 |
| | (1.376) | (1.219) | (1.118) | (1.010) | (1.021) | (0.955) |
| treatedXSevereD | -4.288*** | -2.801** | -0.0859 | -2.530** | 0.998 | -1.680 |
| | (1.451) | (1.221) | (1.206) | (1.085) | (1.101) | (1.041) |
| treatedXSchool_Closed | -9.710*** | -5.794* | -2.907 | -2.833 | 1.709 | 1.064 |
| | (3.132) | (3.123) | (2.422) | (2.512) | (2.224) | (2.357) |
| lag_gpa | | | 49.85*** | 50.34*** | 45.92*** | 46.45*** |
| | | | (0.266) | (0.243) | (0.237) | (0.220) |
| rural | | | | | 4.986*** | 3.402*** |
| | | | | | (0.712) | (0.681) |
| MidLow | | | | | 1.591** | 4.147*** |
| | | | | | (0.768) | (0.694) |
| Middle | | | | | 8.896*** | 12.03*** |
| | | | | | (0.932) | (0.884) |
| MidHigh | | | | | 18.41*** | 21.36*** |
| | | | | | (1.088) | (1.074) |
| High | | | | | 24.66*** | 26.30*** |
| | | | | | (2.390) | (2.438) |
| Private_Subsidised | | | | | 3.522*** | 3.572*** |
| | | | | | (0.649) | (0.593) |
| Private | | | | | 2.693 | 4.137 |
| | | | | | (2.773) | (2.832) |
| size | | | | | 0.0421*** | 0.0586*** |
| | | | | | (0.00898) | (0.00906) |
| _cons | 259.2*** | 259.1*** | -41.70*** | -44.70*** | -30.73*** | -37.47*** |
| | (0.414) | (0.388) | (1.629) | (1.477) | (1.578) | (1.438) |
| Town FE | No | Yes | No | Yes | No | Yes |
| $N$ | 410019 | 410019 | 397436 | 397436 | 397436 | 397436 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Results for Math for all treatment levels except Schools Closed, with and without Town FE

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | math | math | math | math | math | math |
| post | 0.781* | 0.963** | 0.849** | 1.213*** | 0.553 | 0.925** |
| | (0.414) | (0.410) | (0.402) | (0.399) | (0.410) | (0.408) |
| Minor_Damage | -4.269*** | -7.196*** | 0.0963 | -3.569*** | 2.718*** | -0.582 |
| | (1.131) | (1.235) | (0.927) | (1.000) | (0.806) | (0.891) |
| Moderate_Damage | -4.289*** | -9.732*** | 0.124 | -4.754*** | 2.525* | -1.631 |
| | (1.630) | (1.811) | (1.410) | (1.502) | (1.425) | (1.479) |
| Severe_Damage | -1.950 | -6.629*** | 0.660 | -3.573** | 2.258 | -1.315 |
| | (1.839) | (1.855) | (1.510) | (1.487) | (1.428) | (1.404) |
| treatedXMinorD | -1.072 | -1.230* | -0.830 | -1.169* | -0.573 | -1.060 |
| | (0.672) | (0.665) | (0.664) | (0.659) | (0.667) | (0.666) |
| treatedXModerateD | -1.253 | -1.447 | -1.392 | -1.714* | -1.190 | -1.566 |
| | (1.027) | (1.020) | (1.031) | (1.026) | (1.059) | (1.062) |
| treatedXSevereD | -3.946*** | -3.879*** | -3.195*** | -3.284*** | -2.455* | -2.668** |
| | (1.155) | (1.134) | (1.219) | (1.200) | (1.273) | (1.268) |
| lag_gpa | | | 55.41*** | 55.90*** | 50.14*** | 50.98*** |
| | | | (0.329) | (0.294) | (0.279) | (0.257) |
| rural | | | | | 2.746*** | 1.688** |
| | | | | | (0.873) | (0.856) |
| MidLow | | | | | 3.808*** | 6.271*** |
| | | | | | (0.868) | (0.799) |
| Middle | | | | | 12.06*** | 15.00*** |
| | | | | | (1.084) | (1.043) |
| MidHigh | | | | | 25.57*** | 28.43*** |
| | | | | | (1.357) | (1.341) |
| High | | | | | 36.04*** | 37.72*** |
| | | | | | (2.777) | (3.179) |
| Private_Subsidised | | | | | 3.961*** | 3.013*** |
| | | | | | (0.819) | (0.729) |
| Private | | | | | 4.225 | 6.323* |
| | | | | | (3.382) | (3.651) |
| size | | | | | 0.0696*** | 0.0859*** |
| | | | | | (0.0132) | (0.0127) |
| _cons | 251.5*** | 253.3*** | -85.05*** | -86.09*** | -72.46*** | -78.70*** |
| | (0.693) | (0.715) | (2.037) | (1.853) | (1.889) | (1.728) |
| Town FE | No | Yes | No | Yes | No | Yes |
| $N$ | 404985 | 404985 | 392562 | 392562 | 392562 | 392562 |

Standard errors in parentheses
$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

Table 10: Results for Language for all treatment levels except Schools Closed, with and without Town FE

| | (1) language | (2) language | (3) language | (4) language | (5) language | (6) language |
|---|---|---|---|---|---|---|
| post | 9.158*** | 9.315*** | 9.164*** | 9.460*** | 8.974*** | 9.238*** |
| | (0.377) | (0.373) | (0.360) | (0.356) | (0.360) | (0.357) |
| Minor_Damage | -4.960*** | -6.844*** | -1.136 | -3.678*** | 0.941 | -0.928 |
| | (0.943) | (1.038) | (0.757) | (0.821) | (0.676) | (0.736) |
| Moderate_Damage | -4.281*** | -8.156*** | -0.345 | -3.707*** | 1.641 | -0.832 |
| | (1.403) | (1.518) | (1.144) | (1.174) | (1.077) | (1.094) |
| Severe_Damage | -3.573** | -6.539*** | -1.226 | -3.808*** | 0.353 | -1.429 |
| | (1.586) | (1.576) | (1.287) | (1.252) | (1.201) | (1.169) |
| treatedXMinorD | 0.453 | 0.302 | 0.722 | 0.431 | 0.890 | 0.522 |
| | (0.606) | (0.600) | (0.589) | (0.584) | (0.586) | (0.584) |
| treatedXModerateD | -0.703 | -0.863 | -0.855 | -1.103 | -0.682 | -0.931 |
| | (0.899) | (0.893) | (0.869) | (0.862) | (0.881) | (0.883) |
| treatedXSevereD | -2.056** | -2.093** | -1.387 | -1.530 | -0.817 | -0.996 |
| | (1.017) | (0.999) | (1.076) | (1.064) | (1.119) | (1.122) |
| lag_gpa | | | 49.81*** | 50.32*** | 45.93*** | 46.51*** |
| | | | (0.270) | (0.246) | (0.240) | (0.222) |
| rural | | | | | 5.010*** | 3.440*** |
| | | | | | (0.718) | (0.686) |
| MidLow | | | | | 1.650** | 4.200*** |
| | | | | | (0.775) | (0.698) |
| Middle | | | | | 8.984*** | 12.08*** |
| | | | | | (0.945) | (0.890) |
| MidHigh | | | | | 18.43*** | 21.42*** |
| | | | | | (1.103) | (1.079) |
| High | | | | | 24.48*** | 26.35*** |
| | | | | | (2.413) | (2.444) |
| Private_Subsidised | | | | | 3.901*** | 3.422*** |
| | | | | | (0.669) | (0.605) |
| Private | | | | | 2.591 | 4.042 |
| | | | | | (2.804) | (2.835) |
| size | | | | | 0.0409*** | 0.0587*** |
| | | | | | (0.00904) | (0.00901) |
| _cons | 261.7*** | 262.9*** | -40.83*** | -42.64*** | -31.41*** | -37.26*** |
| | (0.583) | (0.608) | (1.726) | (1.591) | (1.652) | (1.509) |
| Town FE | No | Yes | No | Yes | No | Yes |
| $N$ | 405180 | 405180 | 392764 | 392764 | 392764 | 392764 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Results for Math and Language for affected and damaged schools, no Town FE

| | (1) math | (2) math | (3) math | (4) language | (5) language | (6) language |
|---|---|---|---|---|---|---|
| post | 1.455** | 2.131*** | 1.808*** | 8.509*** | 9.025*** | 8.919*** |
| | (0.609) | (0.585) | (0.587) | (0.546) | (0.511) | (0.509) |
| affectedschool | 0.247 | 5.552*** | 5.989*** | -2.334** | 2.334*** | 2.614*** |
| | (1.176) | (0.964) | (0.864) | (0.983) | (0.800) | (0.738) |
| affectedXpost | 2.991*** | 0.287 | -2.033** | 4.983*** | 2.639*** | 0.511 |
| | (1.020) | (0.938) | (0.922) | (0.855) | (0.768) | (0.752) |
| affectedXpostXdamaged | -4.294*** | -3.882*** | -2.525*** | -1.254* | -0.837 | 0.181 |
| | (0.791) | (0.752) | (0.733) | (0.694) | (0.645) | (0.633) |
| lag_gpa | | 55.58*** | 50.10*** | | 49.91*** | 45.77*** |
| | | (0.324) | (0.266) | | (0.265) | (0.230) |
| rural | | | 2.576*** | | | 4.694*** |
| | | | (0.892) | | | (0.728) |
| MidLow | | | 3.287*** | | | 1.050 |
| | | | (0.873) | | | (0.787) |
| Middle | | | 11.15*** | | | 7.878*** |
| | | | (1.124) | | | (0.991) |
| MidHigh | | | 24.65*** | | | 17.17*** |
| | | | (1.412) | | | (1.166) |
| High | | | 35.29*** | | | 23.36*** |
| | | | (2.784) | | | (2.429) |
| Private_Subsidised | | | 3.083*** | | | 3.357*** |
| | | | (0.787) | | | (0.648) |
| Private | | | 5.909* | | | 3.559 |
| | | | (3.361) | | | (2.795) |
| size | | | 0.0677*** | | | 0.0389*** |
| | | | (0.0134) | | | (0.00911) |
| srepeated | | | -5.731** | | | -6.690*** |
| | | | (2.349) | | | (2.043) |
| _cons | 249.2*** | -90.34*** | -73.47*** | 261.0*** | -43.87*** | -29.86*** |
| | (1.036) | (2.027) | (2.001) | (0.862) | (1.721) | (1.732) |
| $N$ | 409871 | 397279 | 393724 | 410019 | 397436 | 393844 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$