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School attendance during a pandemic

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ABSTRACT

When officials relax school attendance requirements as a prophylactic measure against a pandemic, students of higher prior performance take more absences, while students of lower prior performance keep going to school. Prior performance is positively associated with neighborhood income.

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1. Introduction

During the COVID-19 pandemic in 2020, officials in many countries used school closures to mitigate the virus spread. School closures may be an effective prophylactic measure against influenza-type outbreaks because children may amplify the virus transmission even if they do not often suffer severe symptoms themselves (Ferguson et al., 2006). School closures are often implemented partially (e.g., in Australia and the United Kingdom) with students still being able to attend school if they choose to (Richardson and Sellgren, 2020). As officials assess the impact of school closures during a pandemic, there are lessons to be learned from earlier pandemics.

We combine higher frequency panel data with exogenous variation from a one-time policy Greece implemented allowing high school students to miss 30 percent more school periods without penalty during the Spring semester of 2010, a period when officials feared a swine influenza (H1N1-09 virus) outbreak. We answer the following policy-related question: What is the effect of relaxed attendance policy as a prophylactic measure against an epidemic on school attendance and performance? Motivated from the fact that pandemics have most harmful effects on students in the poorest neighborhoods (United Nations, 2020), we also ask: Is there heterogeneity by socioeconomic status?

2. Background

High school in Greece starts at 10th grade and ends at 12th grade. Students are assessed during each semester (Fall and Spring) and receive report cards at the end of each semester. Teachers assess student performance via homework and at least one written midterm assessment in each subject each semester. At the end of the Spring semester, students take a cumulative exam in each subject. Cumulative exams are designed, administered, and graded by more than one school teachers. Students must demonstrate both satisfactory performance and sufficient school attendance in order to progress to the next grade or graduate, otherwise, they are retained.

In late Spring of 2009, the first, sporadic cases of “swine flu” surfaced in Europe. In Greece, there were 20 cases on June 14th, 2009. On September 16th the total number of cases had reached 2149. The number of new H1N1 cases started declining after September 2009 (Sypsa et al., 2011). Schools started on September 12th, 2009.

The Hellenic Center of Disease Control & Prevention reported very few cases among high school-aged people as shown in Fig. 1.¹ The very few H1N1 cases in the population of high school

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¹ For 12th- and 11th-graders of school year 2009–2010 we use the number of students who participated in national exams for university admission, provided by the Hellenic Ministry of Education. For the number of 10th graders of 2009–2010 we use the number of 11th graders of 2009–10 estimated in Goulas et al. (2018).

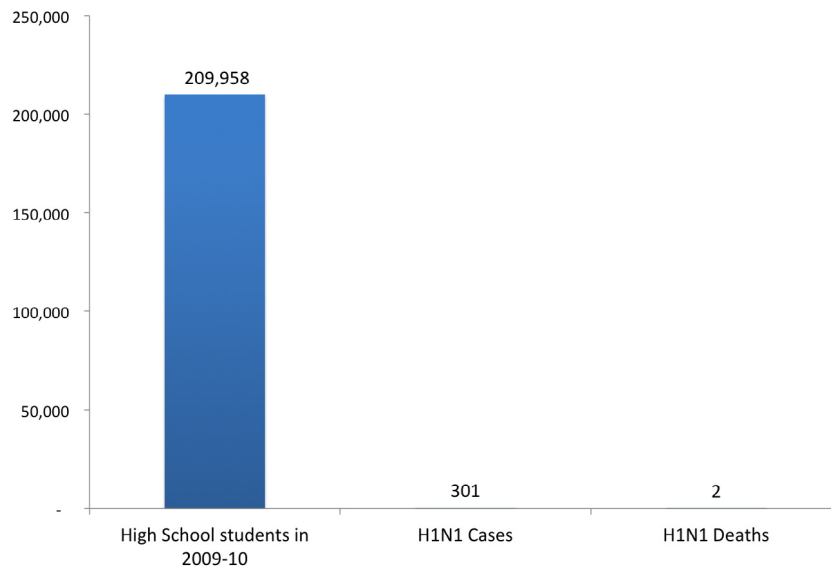


Fig. 1. H1N1-infected high school students in Greece.

Table 1
Descriptive statistics during pandemic and control years.

Variable	Control years		Pandemic year	
	Fall	Spring	Fall	Spring
Student characteristic				
Early high school GPA	0.005 (.773)		0.001 (.774)	
Outcomes				
Absences	22.257 (18.462)	32.907 (24.668)	26.404 (21.005)	44.838 (30.481)
Mathematics	0.002 (0.993)	0.007 (0.991)	0.004 (0.995)	0.008 (0.992)
Greek	−0.006 (0.991)	0.006 (0.978)	−0.001 (0.994)	0.005 (0.980)
English	0.003 (0.991)	0.010 (0.978)	0.001 (0.992)	0.004 (0.988)
GPA	0.002 (0.749)	0.008 (0.756)	0.004 (0.737)	0.008 (0.743)
Pandemic policy	No	No	No	Yes
# of observations	8329	8329	1523	1523
# of students	3959	3959	1523	1523

Notes: Scores are standardized at the school, grade, year, subject, and semester level. Standard deviations are reported in parentheses.

goers appease potential worries about a direct effect of H1N1 on scholastic performance.

The Hellenic Ministry of Education, fearing an H1N1 recurrence, announced on April 12th, 2010 an increase in the upper limit of absences before retention from 114 to 148 for that academic year only. Students did not need to provide a doctor's note or their parents' approval to use the extra absences.

3. Data and descriptives

We use longitudinally linked transcript information from 10 schools covering more than 4000 students in grades 10, 11, and 12 between the 2005–06 and the 2010–11 school year. The transcript data contain student identifier, school year, grade, courses taken, semester scores for each course, the Grade Point Average (GPA) for each semester,² and the number of absences (in

periods) per semester. Fall semester scores reflect midterm assessment scores before the beginning of the Spring semester. Spring semester scores reflect cumulative assessment scores at the end of the Spring semester. We standardize scores at the school, grade, year, subject, and semester level. Table 1 summarizes our data for pandemic (2009–10) and control years. Fig. 2 plots the distributions of school semester-level absences under the standard attendance policy before or after Spring '10 and the relaxed attendance policy during Spring '10, showing a shift of the distribution to the right in Spring '10. Fig. 3 presents the estimates (and 95% CI) from a regression of absences on individual semester indicators (a Spring semester indicator is included), showing a jump in absences in Spring '10.

4. Empirical methodology

To measure the impact of relaxed attendance regulation associated with H1N1, we regress outcomes, Y (school attendance and

² In each grade, 13–15 subjects contribute to the GPA, depending on electives.

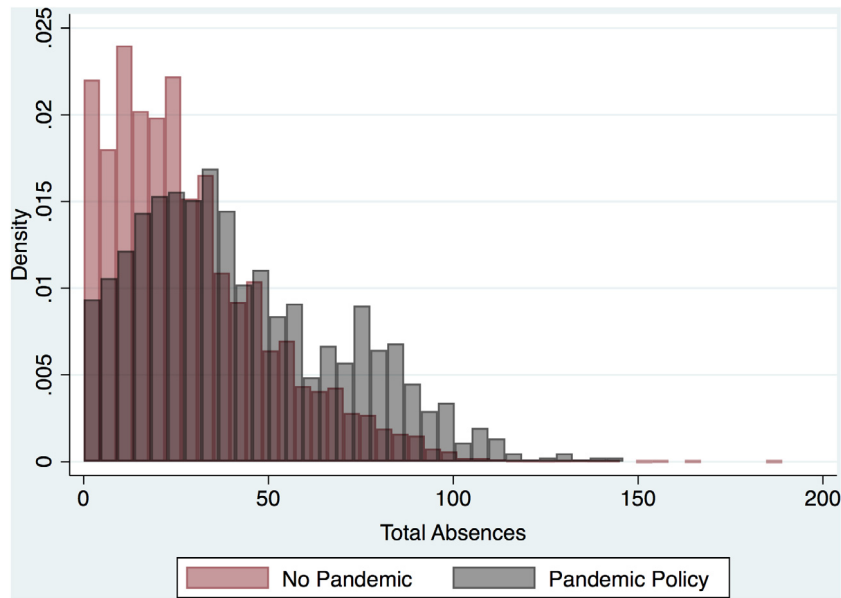


Fig. 2. School absences distribution with and without a pandemic policy.

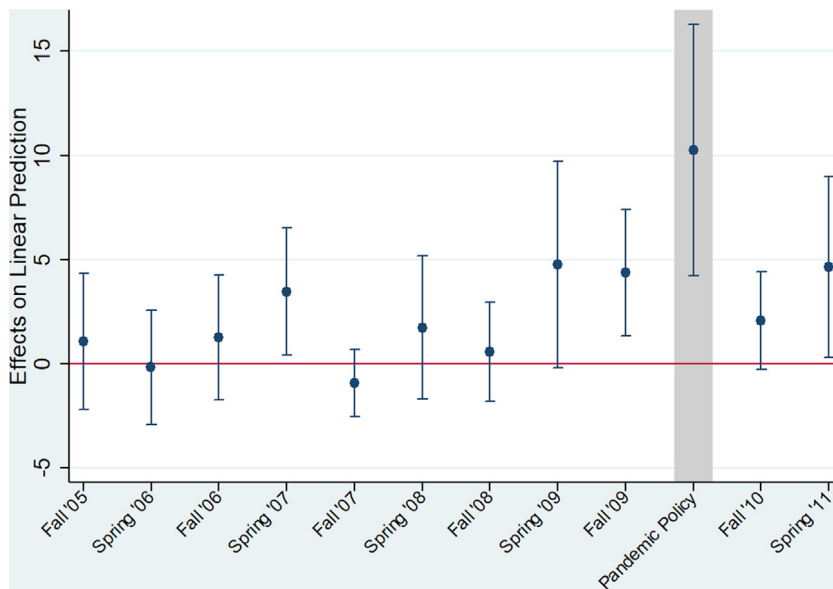


Fig. 3. School absences over time.

performance measures), of student i , in school s , semester f , grade g , year t , on an indicator variable taking the value one during the Spring semester of 2010 ($Pandemic Policy = 1$), when relaxed school attendance policy was in effect, as shown in regression model (1).

$$Y_{i,s,f,g,t} = \alpha + Pandemic Policy_{ft} + \lambda_t + \kappa_f + \tau_g + \mu_i + \phi_{st} + \epsilon_{i,s,f,g,t} \quad (1)$$

Our performance measures include semester-level GPA, semester-level midterm scores in Greek, English, and Mathematics. All regressions include indicators for school year (λ_t), Spring semester indicator (κ_f), grade fixed effects (τ_g), student fixed effects (μ_i), and school-specific linear time trends (ϕ_{st}).

We investigate whether students in different parts of the prior performance distribution used the relaxed attendance policy to different extents and the associated impact on their performance.

We use Fall semester GPA of grade 10 (“early high school performance”), the first instance of performance measurement in high school, to proxy prior performance. We augment model (1) with interactions of indicators of the quintiles of early high school GPA with the *Pandemic Policy* indicator.

One may consider our estimated impact of relaxed attendance policy as a lower bound of the performance loss from skipping school if students who are less likely to suffer severe performance losses from skipping school are also less likely to use the extra absences.

5. Results

Table 2 summarizes our results. A naive regression shows a negative association between absences and performance. We find a positive overall effect of relaxed attendance policy on absences, which masks significant heterogeneity.

Table 2

Who goes to school during a pandemic and how they Do?

	Absences	GPA	Greek	English	Math
Naive regression estimates					
Absences		−0.002 (0.0002) [0.0099]	−0.002 (0.0003) [0.0099]	−0.002 (0.0003) [0.0099]	−0.002 (0.0002) [0.0099]
Reduced-form estimates					
Pandemic policy	7.784 (6.169) [0.1980]	−0.002 (0.008) [0.7624]	−0.006 (0.004) [0.6238]	−0.004 (0.003) [0.7525]	−0.001 (0.005) [0.9109]
Heterogeneity by Early high school GPA					
Lowest quintile × Pandemic policy	−0.123 (6.221) [1.0000]	0.072 (0.021) [0.4158]	0.096 (0.035) [0.5941]	0.114 (0.048) [0.5347]	0.114 (0.038) [0.5347]
Second quintile × Pandemic policy	1.464 (5.444) [0.8515]	0.024 (0.012) [0.8020]	0.069 (0.030) [0.7723]	−0.028 (0.037) [0.8515]	0.061 (0.026) [0.7723]
Third quintile × Pandemic policy	10.116 (6.872) [0.0990]	0.004 (0.019) [0.9901]	−0.038 (0.029) [0.6931]	0.019 (0.025) [0.9109]	−0.010 (0.028) [0.9901]
Fourth quintile × Pandemic policy	10.673 (5.374) [0.0396]	−0.031 (0.013) [0.3267]	−0.014 (0.024) [0.7129]	−0.022 (0.038) [0.7129]	−0.052 (0.039) [0.4752]
Highest quintile × Pandemic policy	14.360 (7.258) [0.0198]	−0.060 (0.016) [0.0297]	−0.111 (0.024) [0.0495]	−0.081 (0.023) [0.0792]	−0.087 (0.039) [0.0792]

Notes: Sample: 19,704 observations. Standard errors clustered at the school by cohort level are reported in parentheses. Four, five, and 25 tests of statistical significance were simultaneously performed in the top, middle, and bottom panel, respectively, using the Romano and Wolf (2005) procedure. The retrieved p-values are reported in brackets.

We find that students at the highest quintile of prior performance took 14 additional absences as a result of the precautionary relaxed school attendance policy and their associated school performance decreased by 0.06 standard deviations. Students at the lowest quintile of prior performance kept going to school despite the relaxed attendance policy and their associated school performance increased by 0.072 standard deviations, which is not statistically different from zero. Fig. 4 summarizes the effects of the H1N1 pandemic-related relaxed attendance policy on absences and GPA.

6. Mechanism

The previous section has shown that academically weaker students are less likely to make use of a relaxed school attendance policy during a pandemic. One may expect that academically weaker students may be more likely to be found in the poorest neighborhoods. If that is true, low socioeconomic status might be a driver of the differential effects of relaxed attendance policy. We combine data from (Goulas et al., 2018) and Goulas et al. (2020) to build a dataset on *early high school performance* and income (in 2009 Euro) at the school's postcode, covering 123 schools in Greece in the same year-span as our results presented above, to test whether prior performance is associated with neighborhood income.

Fig. 5 shows that *early high school performance* is positively associated with income at the school's postcode, a proxy for socioeconomic status ($\rho = 0.15$). This suggests that students in the poorest neighborhoods may be less likely to distance themselves from school during a pandemic.

Students in the poorest neighborhoods may have limited out-of-school resources available to make up for lost school learning during a pandemic, while their families may have limited work flexibility, potentially decreasing the students' propensity to distance themselves from school during a pandemic.

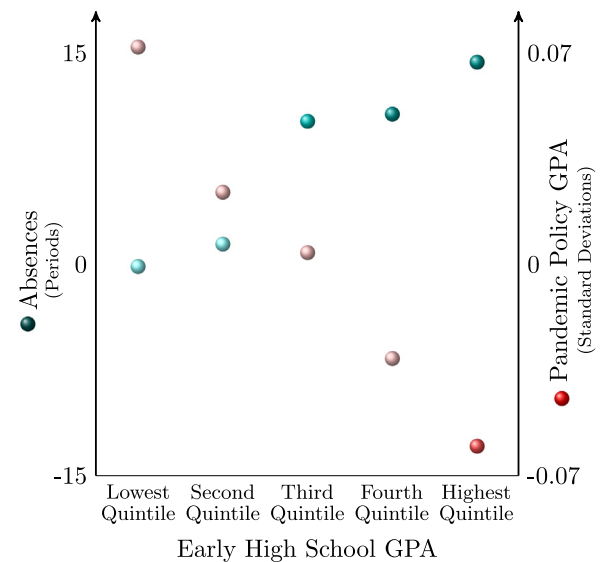


Fig. 4. Who goes to school during a pandemic and how they Do? Notes: Lighter colors represent statistical significance at weaker confidence levels. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

7. Conclusion

Our findings speak to policy-makers facing precautionary school closures as a prophylactic measure against health-related situations. Students in the poorest neighborhoods may be less likely to follow school distancing guidelines during a pandemic. At the same time, school distancing during a pandemic is associated with decreased performance.

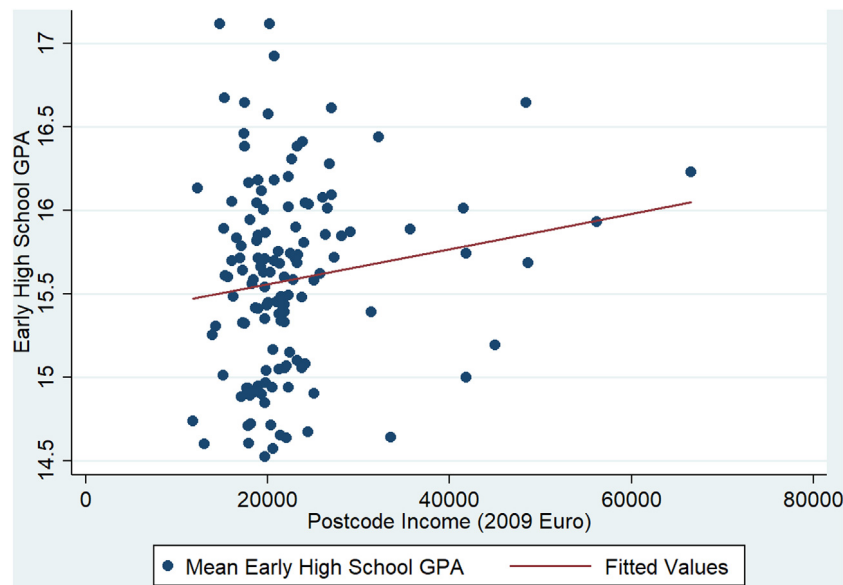


Fig. 5. The association between early high school GPA and postcode income.

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