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Double-shift schooling and student success: Quasi-experimental evidence from Europe

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HIGHLIGHTS

- This paper examines student performance during double-shift schooling systems.
- We utilize a quasi-experiment where students alternated school blocks every month.
- Estimated models include student–class and month fixed effects.
- Results suggest a small, precisely estimated drop in grades during afternoon blocks.

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ABSTRACT

School scheduling systems are frequently at the forefront of policy discussions around the world. This paper provides the first causal evidence of student performance during double-shift schooling systems. We exploit a six-year quasi-experiment from a country in Eastern Europe where students alternated between morning and afternoon school blocks every month. We estimate models with student–class and month fixed effects using data on over 260,000 assignment-level grades. We find a small, precisely estimated drop in student performance during afternoon blocks.

1. Introduction

Over 45 countries spanning the five major continents currently implement double-shift schooling systems, where two populations of students get split into morning and afternoon blocks.[1] Students in the first session typically attend school from the early morning to the early afternoon, while the second session students arrive soon after the morning session ends and stay until the late afternoon. Because it enables a single set of resources (e.g. facilities, instructors, textbooks) to serve multiple cohorts of students, the main purpose of the double-shift system is to increase the supply of schools while minimizing costs. Policymakers often cite double-shift schooling systems as a way developing countries can attain universal primary and secondary education (Bray, 2008). While being most commonly implemented in developing countries (due to resource constraints) and urban areas (where population density is higher), double-shift schooling systems also exist in some prosperous societies, including the United States (Sagyndykova, 2013).

While the cost-savings resulting from a double-shift schooling system are clear, policymakers shy away from introducing multiple

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[1] These include Argentina, Bangladesh, Botswana, Brazil, Bulgaria, Burkina Faso, Cambodia, Chile, China, Democratic Republic of Congo, Dominican Republic, Egypt, Eritrea, Gambia, Ghana, Guinea, Hong Kong, India, Indonesia, Jamaica, Jordan, Laos, Malaysia, Mozambique, Myanmar, Malawi, Mexico, Namibia, Niger, Palestine, Paraguay, Philippines, Puerto Rico, Romania, Russia, Senegal, Singapore, South Africa, Syria, Trinidad and Tobago, Turkey, Uganda, Uruguay, Thailand, The United States, Zambia, and Zimbabwe.

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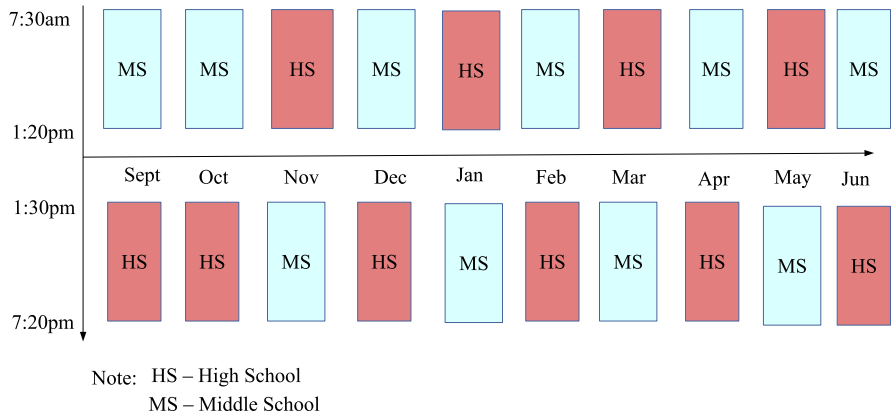

Fig. 1. Quasi-experimental setting.

shifts in schools. The principle debate centers on the lack of causal evidence of how student performance could be affected by taking classes during the afternoon block. Overall, detractors worry about potential drops in student performance during afternoon sessions. For example, students may choose to spend less time studying after school as afternoon hours become relatively scarce. The opportunity costs affiliated with attending school later in the day could also be higher for students. Furthermore, instructors who teach both morning and afternoon blocks may be more fatigued during their afternoon sessions.

The prior literature has focused on using between school variation to document student performance in double-shift systems (e.g. Fuller et al., 1999; Herrán and Rodríguez, 2000; Sagyndykova, 2013). By failing to utilize any exogenous variation in school block, these studies are entirely correlational in nature.[2] This paper provides the first causal evidence on student performance in double-shift schooling systems by exploiting a six-year quasi-experiment where cohorts of students alternated between morning and afternoon school blocks every month.

2. Data and institutional background

Our study focuses on a community of middle and high schoolers from 2008 to 2014. Each incoming middle and high schooler get assigned a cohort based on the student's academic interests, and students only take classes with other students from their cohort for the remainder of their time in school. The data comprise of a complete list of raw, pen-to-paper grades received on all homework, quiz, and exam assignments. Each assignment received one of five integer grades, ranging from 2 (lowest) to 6 (highest). Raw grades were not curved or edited upon being graded.[3] Grades are normalized to a mean of zero and a standard deviation of one within a class,[4] where class is defined as a combination of a course (e.g. 10th grade Biology for science cohort) and school year (e.g. 2009–2010). Summary statistics are presented in Table 1.

Table 1
Summary statistics.

	N	Mean	Std. Dev.
Assignment level			
Grade	262,197	4.360	1.359
Student level			
Male	1,111	0.443	0.497
Native ethnicity		0.778	0.415
Class level			
# of Students	1,212	23.389	3.443
STEM Field		0.399	0.490
Student by class level			
# of Assignments	28,103	9.330	5.379

During the period of our study, a variant of the double-shift schooling system was implemented where students, by cohort, alternated between morning and afternoon blocks each month. All other aspects of the schools were kept constant, including the ordering of classes within block and the teachers who taught the classes. High school cohorts were placed into morning blocks, which started at 7:30 AM and lasted until 1:20 PM, during September and the "even" months (October, December, February, April, and June), while middle school cohorts attended the morning block in all remaining "odd" months (November, January, March, and May). Thus, high (middle) school cohorts attended the afternoon block during odd (September and even) months. The afternoon block started shortly after the end of the morning block at 1:30 PM, and lasted until 7:20 PM (See Fig. 1). The quasi-experiment was implemented in response to local organizers' inabilities to come to an agreement where cohorts remained entrenched in one block for the entire school year.

3. Identification strategy

Our primary analysis estimates the following specification:

$$Grade_{aicmy} = \alpha + \beta LateBlock_{im} + \gamma X_{aicmy} + \delta_{icy} + \lambda_m + \epsilon_{aicmy} \quad (1)$$

where $Grade_{aicmy}$ is the normalized grade student i received on assignment a in course c during month m and school year y. $LateBlock_{im}$ is an indicator variable equal to one if student i's assignment was completed during an afternoon block month. X_{aicmy} is a vector of controls including the order of the assignment a and the number of assignments student i completed in class cy within month m. δ_{icy} are student–class fixed effects, which

[2] A related strand of literature has focused on causally identifying the impacts of school start times on student outcomes (Carrell et al., 2011; Hinrichs, 2011; Edwards, 2012). Pope (2015) investigates the importance of school schedules on student performance.

[3] We do not analyze end-of-semester final grades, which may or may not have been curved.

[4] Meghir and Rivkin (2011) discuss how monotonic transformations of the outcome variable in a difference in difference setting could lead to changes in estimated signs and/or magnitudes. We consider several models using the raw, nonstandardized grades, and the results remain qualitatively similar.