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Do longer school days improve learning? The case of the Dominican Republic *

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Abstract

This paper examines the possible impact of a longer school day on student learning. We specifically analyze the *Jornada Escolar Extendida* program (JEE), which significantly increased the school-day length of public schools in the Dominican Republic from 4 to 8 hours, and exploit its gradual implementation over time and by geographical area. For this purpose, we apply an event study approach using national tests scores data for secondary students during the 2010-2019 period, which is matched with the administrative data of the JEE implementation at the school level. Although we find a relatively low and not so stable pattern of the JEE impact on secondary students' tests scores, the evidence suggests that the program generated relevant changes on learning gender gaps. In particular and consistent with the previous literature, the program seems to have favored girls' learning in the low-stakes evaluation and improved boys' relative scores in the high-stakes exams. However, we do not find such a clear heterogeneity impact between subjects where girls or boys have a typical relative learning advantage.

JEL Classification: H52, I25, I38
Keywords: School day extension, learning, Dominican Republic

*We thank the MINERD for access to data. All remaining errors are ours.

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1 Introduction

The knowledge and skills accumulated during the educational process determine to a large extent the prospects of individuals: they increase the chances of successfully continuing higher education, allow for better labor market insertion in the form of access to better jobs and higher wages, and facilitate full participation in the political and social life of a nation (Chetty et al., 2011). Despite the recent strong increase in formal education attendance rates in Latin America, educational quality does not seem to have followed the same trend. For instance, the latest results of the PISA 2018 tests reveal the existence of large learning gaps between 15-year-old students in the region and those in more developed economies. Figure 1 shows the average scores obtained in mathematics and reading for all participating countries.[1] As can be seen, Latin American countries are at the bottom of the score distribution, and the Dominican Republic stands out in the last position. The improvement of student learning in the country, as well as understanding how it is affected by different school input factors, are key challenges for policymakers who face the dilemma of allocating scarce resources.

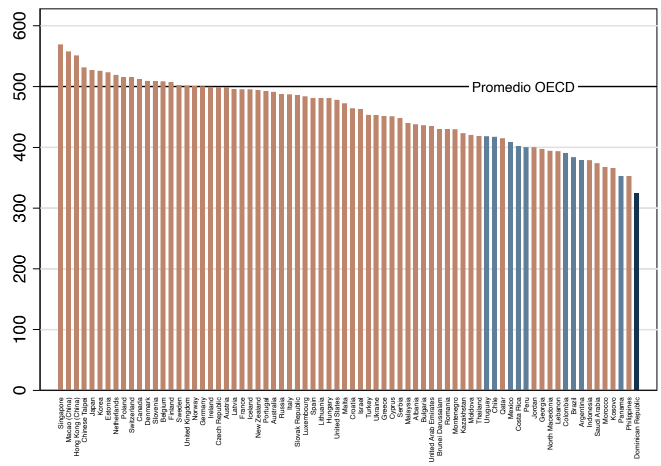
Intending to improve students' academic skills, many countries have introduced policies to extend the school day. Indeed, increasing the duration of classroom hours has become a key part of policy discussions across countries (Gromada and Shewbridge, 2016). However, despite the expansion of this type of policy, its effects on learning and school trajectories have received relatively little attention, possibly because of the difficulty in ruling out potential biases (Patall et al., 2010). This challenge arises mainly because students might endogenously select themselves into varying amounts of instructional time: for instance, low-performing students may need extra tutoring to understand some of the contents covered in class and catch up with their classmates.

One approach used in the literature to address this endogeneity problem has been to exploit quasi-experimental variation in the exposure to instruction time. For instance, some studies have exploited variations in unscheduled school closures due to weather variations or random variations in teachers' or students' absenteeism that affected the amount of instruction time (Aucejo and Romano, 2016, Goodman, 2014, Herrmann and Rockoff, 2012, Marcotte, 2007). These studies have generally found positive impacts of increases in instruction time on students' achievement.

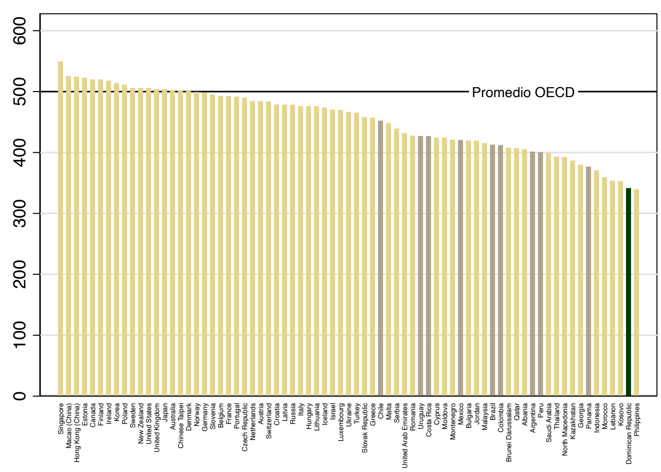
[1]PISA is the OECD's Programme for International Student Assessment, which measures the knowledge and abilities of 15-year-old students in reading, mathematics, and science.

Figure 1: Average scores in the 2018 PISA tests

(a) Mathematics



(b) Reading



Note: Latin American countries are shown in light blue (panel 1a) and gray (panel 1b), and the Dominican Republic in dark blue or dark green, respectively.

Another group of studies has exploited variations in instruction time induced by large-scale policy changes. For instance, Cerdan-Infantes and Vermeersch (2007) analyzed the extension of the school day in Uruguay and found that it improved the math and language performance of 6th-grade students. Similarly, Hincapie (2016) finds an improvement in the scores of 5th and 9th-grade students after an extension of the school day in Colombia, and Bellei (2009) finds positive but small effects in language and mathematics for second graders when evaluating an increase in the length of the school day in Chile. In contrast, Meyer and Van Klaveren (2013) conducted a randomized controlled experiment in primary schools in Denmark and concluded that the school-day extension had no significant effect on performance, neither in language nor mathematics.

Yet, an interesting but less explored question is whether the extension of the school day could contribute to a decrease in learning inequality. One may think that a school day extension may benefit disadvantaged students relatively more than students from a higher socioeconomic background, for whom the additional instruction time might simply crowd out private tutoring. On the contrary, additional classroom time could widen the learning gap between low and high-achieving students if additional time is devoted to covering new content and low-achieving students need more time than high-achieving ones to learn and process new content. For instance, Huebener et al. (2017) study a large education reform in German academic track schools and find small positive effects of instruction time on learning on average, but heterogeneously distributed: while the effect is virtually zero at the bottom of the performance distribution, it increases in the upper part. The authors attribute this finding to the fact that additional time was devoted to covering new learning content. Cerdan-Infantes and Vermeersch (2007) explore the heterogeneous effects of the full-day school in Uruguay and show that its impact on learning comes mostly from disadvantaged schools.

This paper adds further evidence to this literature by analyzing the impact of the *Jornada Escolar Extendida* (JEE), a program that doubled the length of the school day in public schools in the Dominican Republic from 4 to 8 hours. The JEE was implemented progressively throughout the country since 2013, providing a source of arguably exogenous variation in students' exposure to longer school days. We combine information about students' test scores in *Pruebas Nacionales*, a standardized high-stakes exam that evaluates students' learning in the last grade of secondary education, with school-level administrative data about the program implementation. We follow an event study approach (in the spirit of Kleven et al. 2019a) and analyze the changes in student learning after the event of the implementation of the JEE in each school.

Our main results suggest that the JEE increased the scores in a high-stakes exam for students in the last year of secondary education. However, the effect sizes are relatively small given the considerable increase in school hours, and heterogeneous across subjects. For instance, students' test scores in language and natural sciences increase after the program. Five years after the inception of the JEE in each school, test scores in language and natural sciences increased by about 5 percent of a standard deviation. In both cases, the effect persists, at least for the next five years we observe in our data. However, in the case of social sciences there is a strong initial effect that vanishes after the third year under the JEE, and the impact is zero in the case of math. On the other hand, we find no impact of the JEE on low-stakes exams on average.

Additionally, we take advantage of the fact that our data contains both the score in a high-stakes exam as well as the scores obtained in several previous low-stakes evaluations, and explore gender differences in performance. We find the JEE had a very small (and only marginally significant) impact on the gender gap in high-stakes exams. This gap, that initially favored boys over girls, remains practically unchanged, meaning that the program did not contribute to reducing the gender gaps in learning. If anything, the gap seems to widen in favor of boys after the JEE. However, we do observe an impact of the JEE on the gender difference in the scores in low-stakes exams. Specifically, we observe a relative improvement in girls' scores in the low-stakes exam. This is an interesting result, given that it implies that the initial advantage of women in this type of exam would actually widen after the JEE.

The rest of the paper is organized as follows. Section 2 provides details about the JEE program, and Section 3 presents the data sources used. Section 4 describes the empirical strategy and presents the main results of the paper, including the results by gender. Finally, Section 5 concludes.

2 The *Jornada Escolar Extendida (JEE)* program

The JEE program was the flagship policy of an ambitious plan of the government of the Dominican Republic to improve educational achievement and to reinforce the role of schools as spaces providing social protection to vulnerable children and youth in the country (MINERD, 2013). After piloting the program in a few schools during 2011 and 2012, the JEE was launched in 2013 and was gradually extended to different areas of the country. The relevance of the program is reflected in the increase in government spending: between 2012 and 2013, public spending on education went from 2.5 to 4.2 percent of GDP, which represents a 75 percent increase in one year.[2] For more than a decade, the JEE has been the main educational program in the Dominican Republic.

The JEE established an 8-hour school day in all public schools of the country. Before the beginning of the program, most public schools offered two (or even three) shifts of four hours each. In 2012, there were almost 36 thousand classrooms that served 1.75 million students organized into 73 thousand four-hour shifts.[3] The initiative aimed at establishing an extended school day throughout the country, and to reach 80 percent of students in public schools by 2016. Naturally, doubling the length of the school day from 4 to 8 hours without the necessary investments in infrastructure, teachers, and staff, would have resulted in overcrowded classrooms. To avoid this, the JEE program was accompanied by the (*Programa Nacional de Edificaciones Escolares* - PNEE), a national school construction program that had the objective of constructing 28,000 classrooms over a four year-period, that is, an increase of 78 percent in the number of classrooms existing in 2013 (Damaris, 2014a, Dinerstein et al., 2020).

There was considerable heterogeneity in the timing of adoption of the JEE by schools. Some schools started offering an 8-hour school day as early as 2013, while others did it in later years. As might be expected, the JEE adoption by schools was not random. There was a school selection process to determine which schools would start offering an 8-hour shift each year. For this, a National Commission with district and regional authorities was created, that verified the overall status of every school across the country. Based on this verification, the JEE was adopted first by schools that: (i) had enough available space to fit students into a single full-day shift with no more than 35 students per class; (ii) had an infrastructure in good condition already or that was under reparation and would be finished before the next academic year; and (iii) had a total enrollment of at least 200 students, to take advantage of economies of scale at the early stages of the program (Damaris, 2014b). However, it is worth noting that, although which schools would adopt the JEE each year was

[2]As a share of GDP, this increase is equivalent to the cost of the INPRES primary school construction program evaluated by Duflo (2001), which had a cost of about 1.5 percent of GDP in 1973 (Dinerstein et al., 2020).

[3]According to the Statistical Yearbook of the Ministry of Education, only 2 percent of students attended full-day schooling, while 53 percent attended a morning shift and 32 percent an afternoon shift (the remaining proportion was distributed between night shifts for adult education and blended education) (Anuario Estadístico MINERD 2012-2013).

decided by the Government through this National Commission and based on the criteria mentioned above, the timing of program implementation was arbitrary from the point of view of students.

The logistic and infrastructure constraints implied that the implementation of the JEE was gradual (see Figure 2): in 2013, a bit less than 10 percent of public schools were operating under full-day schooling, and this share increased to about 70 percent in 2019. Similarly, about 10 percent of students in public schools attended a school with JEE in 2013, while the percentage increased to 64 in 2019.[4] Moreover, the percentage of students in public schools covered by the JEE (black dashed line) increased initially faster than the percentage of public schools under JEE (orange solid line), which is consistent with one of the criteria of the school selection process mentioned above: larger schools had a priority in the adoption of the JEE. This staggered adoption of the JEE by different schools over time is what we exploit in this paper to identify the causal impact of an extension of the school day on students' learning outcomes.

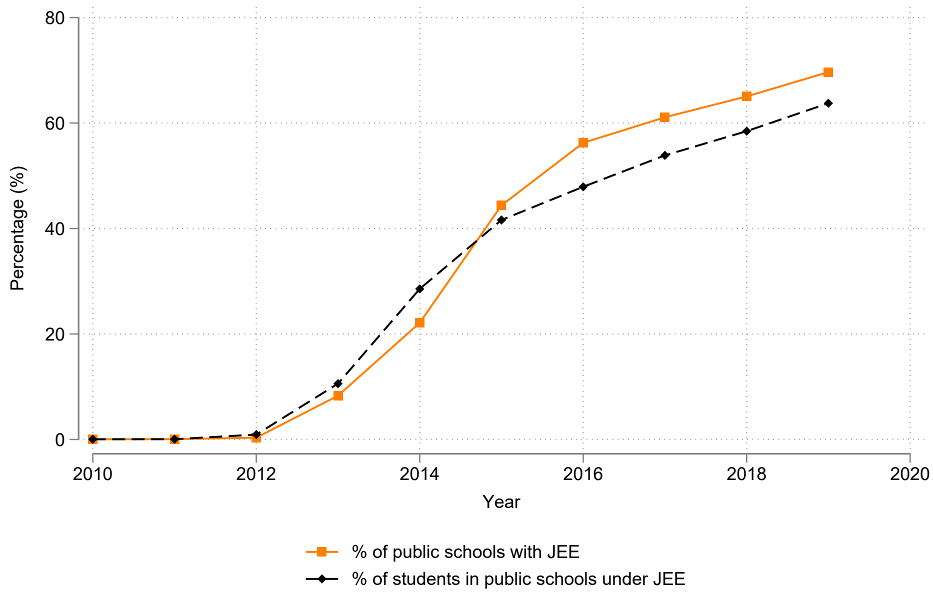
3 Data

The main source of data that we use comes from *Pruebas Nacionales* (PN hereafter), one of the main components of the national evaluation system in the Dominican Republic, conducted by the *Dirección de Evaluación de la Calidad* of the Ministry of Education. The PN is a high-stakes exam that measures the knowledge and abilities of all students in the last grade of each cycle. The first edition of the PN took place in 1993, and they have been applied every year since then, although with some changes in the design and periodicity. In 2010, the tests started to use item-response theory and to evaluate students' knowledge in four main areas: mathematics, language, natural sciences, and social sciences.

These tests have a dual objective. In the first place, they provide useful information about the performance of the educational system, which can serve as a benchmark tool for policymakers. The availability of reliable and up-to-date information allows policymakers to track the evolution of students' learning in the formal education system over time, evaluate their progress toward their own educational quality goals, and take actions to improve the quality of education, by enhancing the planning processes, improving curriculum development, or investing in teacher training (MINERD, 2011).

[4] The number of public schools, however, increased only slightly over time, suggesting that most of the increase in JEE availability was driven by within-school expansions.

Figure 2: Percentage of public schools and students in public schools with JEE



Source: authors' elaboration based on data from MINERD.
Note: The orange and black lines represent the percentage of public schools and students in public schools, respectively, under JEE.

In the second place, the score obtained in the PN is used to certify students' learning achievements upon completing an educational level, i.e., they are part of the requirements to obtain the official certification of study completion. In the case of secondary education, the certification of level completion is based on two components. Specifically, the final grade in a given year t is a weighted average between the average grade in the school exams in a given subject over the last three years (i.e., years t, $t-1$, and $t-2$)[5], known as *nota de presentación* (or presentation grade), and the score obtained in the PN in year t in that particular subject, with a weight for each component of 70% and 30%, respectively. For simplicity, in the remainder of this paper, we use the acronyms PG and PN to refer to the first and second component, respectively. At the secondary level, students pass and obtain the certification once they achieve at least 70 points out of 100 in each of the evaluated areas (MINERD, 2020).[6]

[5]Before 2016, the average grade in school exams took into account the grades of the last four years.
[6]This threshold is 65 for primary education.

The PN tests are composed of multiple-choice items with one correct answer. Each area is evaluated using a different booklet or form with several multiple-choice questions, and each student answers a booklet that is randomly assigned to them. There are three test sessions each year. The first session is aimed at evaluating all students who passed all subjects at their school. The second session is for students who were unsuccessful in the first one as well as those who passed all subjects after the recovery period in their school. Finally, the third session is for students who were unsuccessful in the second session and for those who did not take the test before for some reason.

Our data contains both the score obtained in the PN as well as the PG (the average grade over the last three years, or four years before 2016), in each subject, for all students in sixth grade of secondary public schools, for the period 2010-2019. We also have the final grade for each subject, an indicator of whether the student obtained the final certification of secondary level completion, as well as the gender and date of birth of each student. In addition, our data contains school-level information including the school's name, school district, whether it imparts general or vocational education, and whether it is located in a rural or urban area.

Based on the name of the school and school district where it belongs, we match the data from *Pruebas Nacionales* with a school-level dataset that indicates, for every public school in the country, the year in which it adopted the JEE. We are able to match almost 85% of all students included in our main data of tests scores, and hence identify the average learning evolution of their schools for which we have complete information about whether they were operating under 4-hour shifts or under extended 8-hour shifts. In summary, our final database contains secondary students' test scores of both a high-stakes exam (PN test) and a low-stakes gradual evaluation (PG), attending schools with or without JEE. This constitutes a great opportunity to enlarge the evidence regarding the causal effects of the extended school day on students' learning, focusing particularly on the potential gender differences.

3.1 Summary statistics

Table 1 presents basic descriptive statistics of our working sample in 2012, the year before the beginning of the JEE program. The statistics are broken down for schools that eventually implemented the JEE (at some point up to 2019) and schools that did not. The last two columns show the difference between the mean of the variables for JEE and non-JEE schools and the associated standard error of the difference.

Table 1: Summary statistics for JEE and non-JEE schools, 2012

	JEE	Non-JEE	Diff	Std error
Student is male	0.37	0.38	-0.01	0.007
Student's age	19.26	19.71	-0.45	0.089
School is in urban area	0.84	0.84	0.00	0.005
PN score in language	0.25	0.23	0.02	0.012
PN score in math	0.21	0.27	-0.05	0.011
PN score in social sciences	0.15	0.16	-0.01	0.012
PN score in natural sciences	0.17	0.19	-0.02	0.012
PG score in language	0.01	0.07	-0.06	0.013
PG score in math	-0.05	-0.02	-0.03	0.013
PG score in social sciences	0.02	0.04	-0.02	0.013
PG score in natural sciences	-0.05	-0.02	-0.04	0.013
Approved language	0.85	0.86	-0.01	0.005
Approved math	0.80	0.83	-0.03	0.006
Approved social sciences	0.85	0.87	-0.02	0.005
Approved natural sciences	0.83	0.85	-0.02	0.006
Student graduated from secondary school	0.64	0.68	-0.05	0.007

Source: authors' calculations based on data from PN and data from JEE (MINERD).
Note: The score corresponds to the standardized score obtained in the PN test for the corresponding subject.

In terms of students' characteristics, 38 percent of students are male in both JEE and non-JEE schools, which reflects the higher dropout rate for boys than for girls in secondary school. On average, students in the sample are 19 years old -they are a few months older in schools that did not adopt the JEE, but the difference is not statistically significant. Regarding test scores, there are some differences between schools that eventually adopted the JEE and schools that did not, although they do not follow a clear pattern. For instance, students in schools that adopted the JEE at some point score 0.02 standard deviations higher in language than in schools that never adopted the JEE, which would suggest that JEE schools were positively selected. The opposite happens when we look at math: students in non-JEE schools have an advantage of 0.5 standard deviations than students in JEE schools. For sciences, we do not see significant differences between both groups of schools before the JEE implementation. However, when we analyze the scores obtained in the presentation (PG) for each subject, the pattern is clearer: students in schools that did not adopt the JEE have better presentation scores than students in JEE schools.

We also explore the probability that students obtain the certification in each subject. As explained above, this depends on the final grade obtained, which is a weighted average of the score in the PN of that year and the average grades obtained by the student in the school exams in that subject over the last four years (PG). Naturally, a consequence of the higher scores obtained in PN and PG for students in non-JEE-adopting schools is that they have a higher probability of approving each of the subjects relative to students in JEE-adopting schools. Finally, we observe a 2 percentage point higher probability of graduating from secondary school for students in JEE schools than in schools that never adopted the JEE.

Table 2: Summary statistics for boys and girls, 2012

	Boys	Girls	Diff	Std error
PN score in language	0.256	0.334	-0.077	0.006
PN score in math	0.338	0.318	0.021	0.006
PN score in social sciences	0.378	0.356	0.022	0.006
PN score in natural sciences	0.270	0.258	0.012	0.006
PG score in language	-0.140	0.212	-0.352	0.008
PG score in math	-0.061	0.077	-0.138	0.008
PG score in social sciences	-0.070	0.177	-0.247	0.008
PG score in natural sciences	-0.108	0.104	-0.212	0.008
Approved language	0.877	0.935	-0.057	0.003
Approved math	0.731	0.764	-0.033	0.004
Approved social sciences	0.874	0.909	-0.035	0.003
Approved natural sciences	0.789	0.837	-0.048	0.004
Student graduated from secondary school	0.609	0.675	-0.066	0.005

Source: authors' calculations based on data from PN and data from JEE (MINERD).
Note: The score corresponds to the standardized score obtained in the PN test for the corresponding subject.

In addition, Table 2 presents summary statistics related to academic achievement broken down by gender, for the last year before the inception of the JEE. As we can see, when it comes to the PN score, there is a gender gap that favors girls over boys in language: Dominican girls score 0.08 standard deviations higher than boys. However, this relative advantage reverses for all the other subjects, where boys outperform girls, although the magnitude of the gap is smaller.

It is interesting to see what happens with the PG score. In the four subjects analyzed, the gap favors girls over boys. The gap is particularly large in the case of language, where girls obtain test scores 0.35 standard deviations higher than boys' scores. A possible explanation for this reversal in the sign of gender gaps between PN and PG scores may be related to the different nature of the two assessments: while the PN is a high-stakes exam (the score obtained in that single test will directly weigh 30 percent of the final score used for certification), the PG depends on the performance in low-stakes assessments over several years. There is a literature showing that boys tend to do better than girls in high-stakes exams but not in low-stakes cumulative assessments (Ballen et al., 2017). Related, Arenas and Calsamiglia (2022) show that after a reform in Spain that increased the weight of standardized high-stakes exams at the expense of high school grades for college admissions, women's admission scores decreased. Also, Schlosser et al. (2019) find a relative advantage of girls over boys in low-stakes exams (when comparing mock versus actual GRE tests), and Azmat et al. (2016) show that throughout secondary school, girls always outperform boys, particularly in lower-stakes assessments.

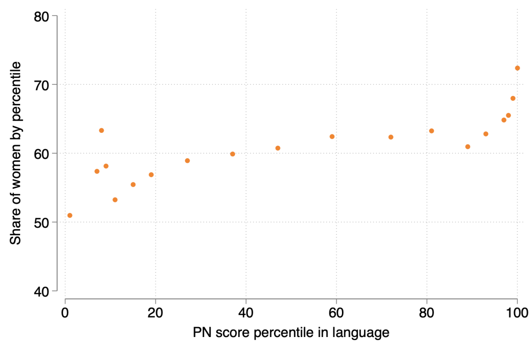
Finally, the probability of promotion reflects the fact that the PG score weighs 70 percent of the final score, naturally resulting in a higher probability of promotion for girls across all subjects (rows 9 to 12 in Table 2). The probability of graduation from secondary school also shows a gap that favors girls over boys: girls are 6.8 percentage points more likely than boys to obtain the certification of secondary school graduation.

Another way of looking at these gaps in performance across different types of exams between boys and girls is by looking at how well-represented are girls across different parts of the test score distribution. Figure 3 shows, for each subject, the percentage of women against percentiles of the PN score distribution. As we can see, girls' participation increases across the language PN score distribution: while they represent slightly more than 50 percent of students in the lower percentiles, they make up about 70 percent of top performers. The opposite is true in the case of math, social sciences, and natural sciences, where girls are more concentrated at the lower part of the distribution. This is not surprising, given the well-documented gender gap that favors boys over girls in math or other STEM fields.

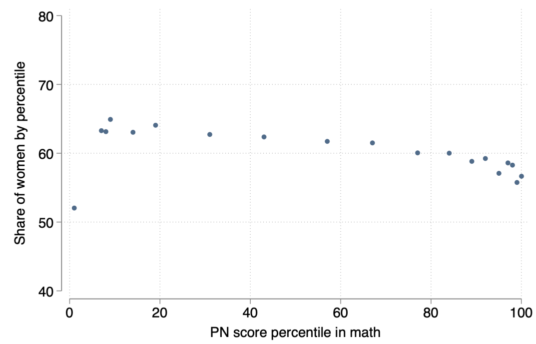
However, Figure 4 tells a different story. When we look at the PG score (which corresponds to the score obtained in low-stakes cummulative assessments rather than a

Figure 3: Percentage of women by percentile of PN score, by subject

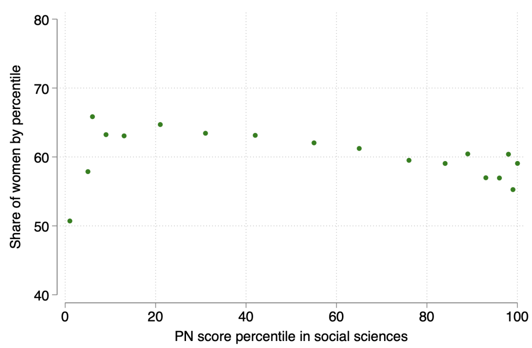
(a) Language



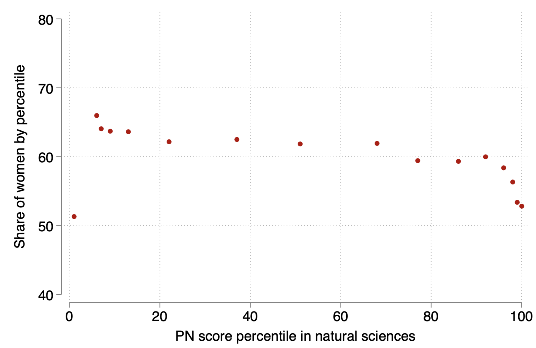
(b) Math



(c) Social sciences



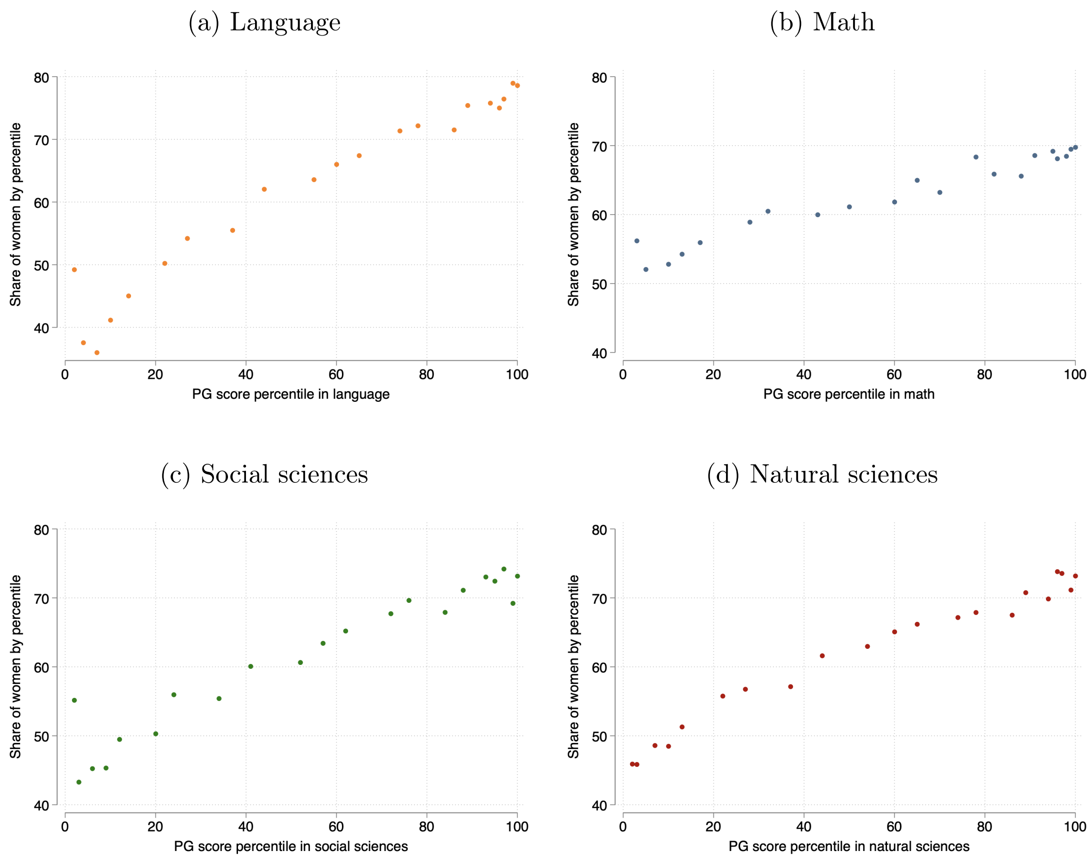
(d) Natural sciences



Source: authors' elaboration based on test scores data and JEE data (MINERD).
Note: The figure graphs the percentage of women against percentiles of the PN score distribution in the corresponding subject.

high-stakes exam such as the PN), girls' participation increases across the score distribution for all subjects. Furthermore, this relationship has a much steeper gradient, suggesting a stronger under-representation (over-representation) of girls in the lower(upper) part of the PG scores distribution.

Figure 4: Percentage of women by percentile of PG score, by subject



Source: authors' elaboration based on test scores data and JEE data (MINERD).
Note: The figure graphs the percentage of women against percentiles of the PG score distribution in the corresponding subject.

Given these differences in performance across subjects and, especially, across different types of exams between boys and girls, we ask ourselves whether an increase in instruction time could have affected gender gaps.

4 Empirical strategy and main results

Assessing the causal impact of the JEE on educational quality and student learning is not straightforward. Naturally, the starting of the program at the school level may be correlated with unobserved factors that are likely correlated with students' academic outcomes. To estimate the causal impact of the JEE on learning and deal with potential biases, we exploit the fact that the program was implemented gradually in public schools over time. In particular, we analyze the dynamics of the JEE impact following an event study approach (Kleven et al., 2019b), where the event is the adoption of the JEE by the school. Taking the event date as the year in which each school adopts the JEE, we measure the impact of the JEE on learning and promotion by estimating the following standard event study specification:

$$TS_{i,s,t} = \sum_{j=-4}^{4} \gamma_j D_{s,t}^{j} + X_{i,s,t} + S_{s,t} + \mu_s + \mu_t + \lambda_{dt} + \epsilon_{i,s,t} \tag{1}$$

$TS_{i,s,t}$ is a given outcome of interest, for secondary student i, attending public school s, in year t. The outcomes of interest are the PN and PG scores obtained in each of the four subjects evaluated (i.e., language, mathematics, social sciences, and natural sciences) and the probability of promoting each discipline. The main independent variables are $D_{s,t}^{j} = \mathbb{1}\{t = e_s + j\}$, a set of j dummy variables indicating the event happening j years away of the event date at school s, time t (e_s refers to the event date in school s, and $j = 0$ for the initial year of adoption). A negative (positive) j refers to the pre-JEE (post-JEE) years before (after) the event. All the coefficients γ_j are measured relative to $j = -1$ (the last year before JEE implementation in each public school s) and capture the effect of the JEE relative to the last year before the event. We set an event window of nine years, from four years before the JEE adoption to four years after, which means that, in our sample, j runs from -4 to 4.

We also include a set of individual and school-level characteristics, $X_{i,s,t}$ and $S_{s,t}$, that may affect student academic outcomes: the student's age and gender, the type of school and a dummy variable that indicates whether the school is in an urban or a rural area. The model also contains school fixed effects μ_s and year fixed effects μ_t that control for time-invariant school characteristics that may be correlated with the JEE adoption and for other time trends in academic performance of students not related to the JEE implementation. Finally, we include a set of educational district-specific time trends, λ_{dt}, in order to control for the evolution in test scores at the district level not related to the JEE policy.

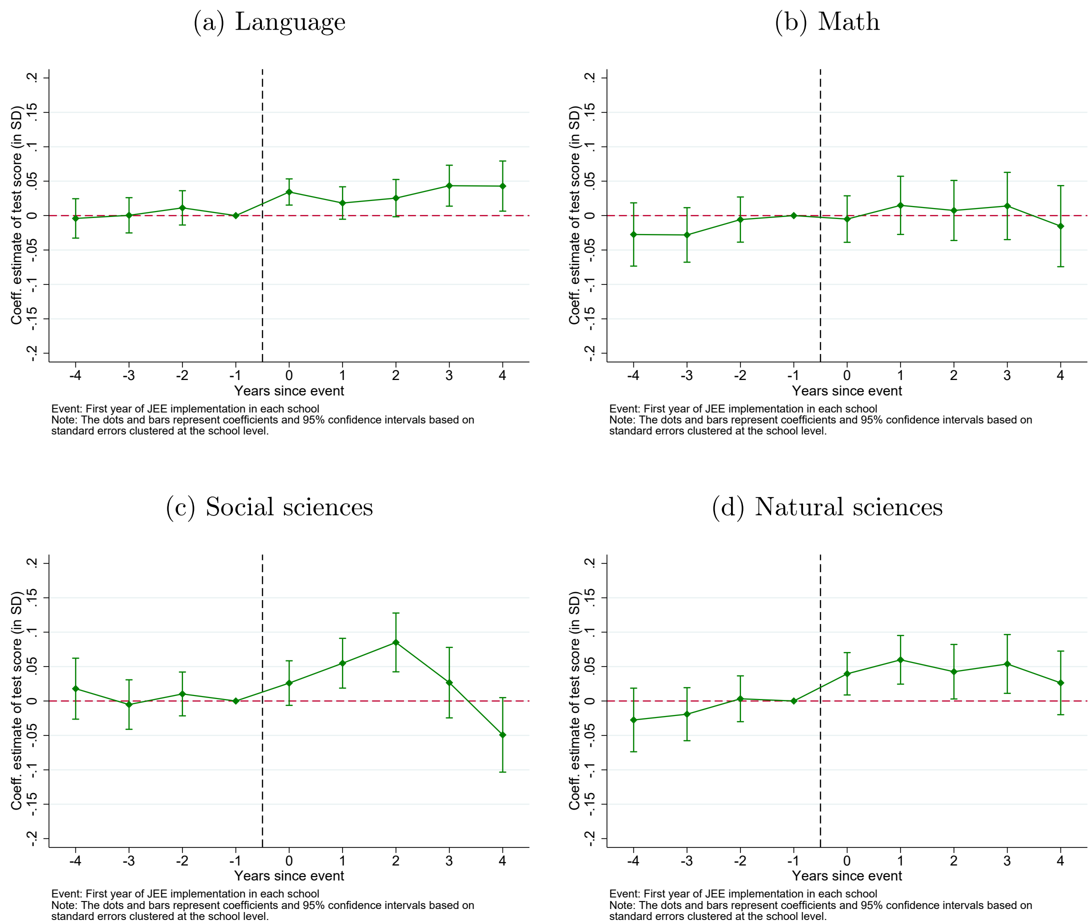
The results of the event study for the PN scores are presented in Figure 5. Each panel reports the results of regression 1with the fullest set of controls for a different subject. Each dot represents the point estimate for a different event time coefficient γ_j, and the bars represent the 95% confidence interval around each coefficient. The first thing to note in all cases is the absence of differential pre-trends. As we can see, the point estimates for all the event time coefficients before the adoption of the JEE are not statistically different from zero. This implies that schools do not seem to select into the treatment, at least in terms of PN scores.

The effects that we find vary across subjects. For language (Panel 5a), we find a positive impact that appears already in the first year after the event and persists over the following four years. Five years after the JEE, students' PN scores in language are almost 5 percent of a standard deviation higher than the last pre-program year. Taken on average over the entire period under analysis, language PN scores increase by almost 2 percent of a standard deviation (Table 3). For the case of math, we find no significant impact and very close to zero in magnitude. We do find an impact on PN scores in social sciences, that increases steeply during the first three years but then declines and becomes not statistically significant (Panel 5c), reflecting an average impact of more than 0.05 standard deviations throughout the period. Finally, we found an increase in PN scores in natural sciences of about 4 to 5 percent of a standard deviation (Panel 5d).

Regarding the PG scores, Figure 6 presents the estimated impact of the JEE on the PN of each subject using the same event study specification as before. An important point deserves clarification here. The PG in a given year depends on the student's performance not only in that particular year but also in the previous two or three years. Thus, the changes observed in the presentation test scores right after the JEE adoption are not necessarily attributable to the policy, given that part of the PG corresponds to grades obtained in previous years, when the JEE was not undergoing yet. As expected, the longer a school has been under the JEE, the higher the influence of the JEE on the grades obtained by their students.

Figure 6 shows that the PG scores increased after the JEE in all four subjects. Although the confidence intervals are large, in most cases the impacts are significant at the 10% level. However, it is worth noting that the PG scores one year after the JEE adoption are a weighted average of grades over that year and previous years (not under the JEE). In general, Table 4 shows that when we consider the average JEE effect over time, our results

Figure 5: Effect of the JEE on PN test scores



Source: authors' elaboration based on test scores data and JEE data (MINERD).
Note: The score corresponds to the standardized test score obtained in the PN test for the corresponding subject.

Table 3: Average effect of the JEE over time on PN test score for secondary students

	Dep. variable: PN test score			
	Language	Math	Social Sci.	Natural Sci.
=1 if school has JEE	0.0179*	0.0080	0.0522***	0.0463***
	(0.0096)	(0.0166)	(0.0181)	(0.0163)
School and year fixed effects	Yes	Yes	Yes	Yes
Student and school characteristics	Yes	Yes	Yes	Yes
School district time trends	Yes	Yes	Yes	Yes
Observations	230,721	230,721	230,721	230,721

Source: authors' calculations based on *Pruebas Nacionales* data and JEE data (MINERD).
Note: The results correspond to the estimation of the average JEE effect over time following Equation 1 and considering the 9 period time window of the Event Study approach. Standard errors are clustered at the school level in parentheses. The score corresponds to the standardized test score obtained in the PN test for each subject. All specifications include school and year fixed effects and educational district-specific time trends. The student and school characteristics include the student's age and gender, and a dummy variable indicating whether the public school is located in an urban or rural area.

suggest that the program had no significant impact on the PG test scores in any subject. It is worth clarifying, however, that the average effects of the program on PG test scores in Table 4 are estimated using a binary treatment variable (JEE=1 if school has JEE). But, as we mentioned above, the influence of the JEE on the PG scores in each post-JEE period is variable. Hence, if we consider instead a continuous treatment variable to estimate these average treatment effects over time, results remain relatively unchanged for math and natural science, but in the cases of language and social sciences the estimated average effect turns to be positive and significant.[7]

Table 4: Average effect of the JEE over time on PG test score for secondary students

	Dep. variable: PG test score			
	Language	Math	Social Sci.	Natural Sci.
=1 if school has JEE	0.0088	0.0197	-0.0004	0.0206
	(0.0180)	(0.0165)	(0.0162)	(0.0199)
School and year fixed effects	Yes	Yes	Yes	Yes
Student and school characteristics	Yes	Yes	Yes	Yes
School district time trends	Yes	Yes	Yes	Yes
Observations	230,721	230,721	230,721	230,721

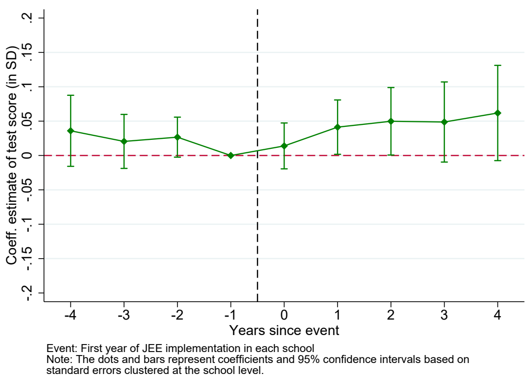
Source: authors' calculations based on *Pruebas Nacionales* data and JEE data (MINERD).
Note: The results correspond to the estimation of the average JEE effect over time following Equation 1 and considering the 9 period time window of the Event Study approach. Standard errors are clustered at the school level in parentheses. The score corresponds to the standardized test score obtained in the PN test for each subject. All specifications include school and year fixed effects and educational district-specific time trends. The student and school characteristics include the student's age and gender, and a dummy variable indicating whether the public school is located in an urban or rural area.

Finally, we also analyze the impact of having an extended school day on the probability of promotion. The results of the event study are shown in Figure 7, with each panel referring to a different subject. In this case, the outcome of interest is a dummy variable that equals one if the student promoted each subject and zero otherwise. (i.e., the final weighted score obtained was 70 points or above). Promotion depends on a final grade which is a weighted

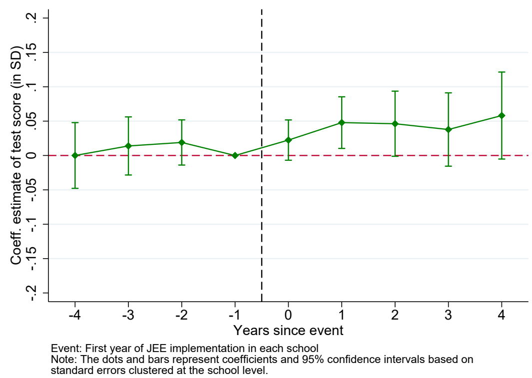
[7]These last results are disposable upon request.

Figure 6: Effect of the JEE on PG scores

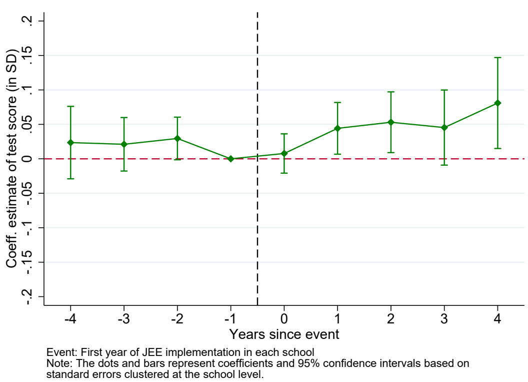
(a) Language



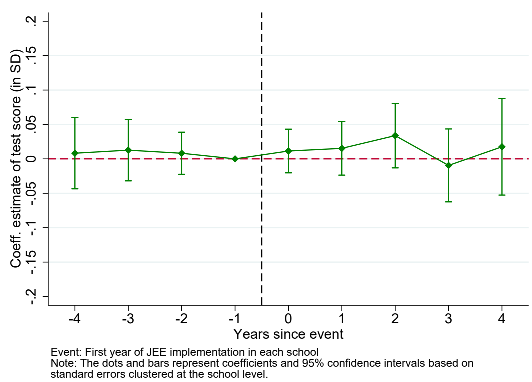
(b) Math



(c) Social sciences



(d) Natural sciences

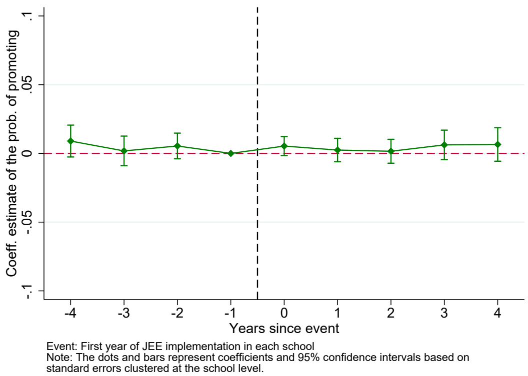


Source: authors' elaboration based on test scores data and JEE data (MINERD).
Note: The score corresponds to the standardized presentation grade (PG) for the corresponding subject.

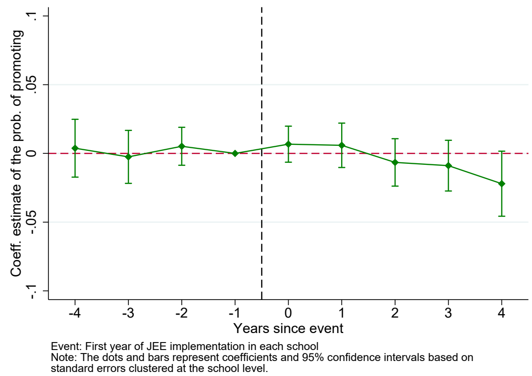
average of the score obtained in the PN examination and the student's average grades achieved over the last 3 (or 4) years of secondary school (the PG score). The total score must be at least 70 to be promoted.

Figure 7: Effect of the JEE on the probability of promotion of each subject

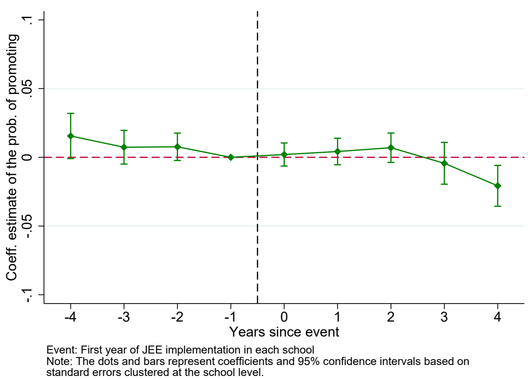
(a) Language



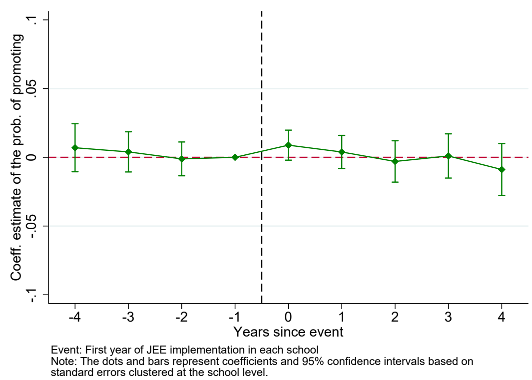
(b) Math



(c) Social sciences



(d) Natural sciences



Source: authors' elaboration based on PN data and JEE data (MINERD).

Once again, the absence of pre-trends gives support to our identification strategy. Overall, the results suggest that the JEE did not generate a sufficient increase in PN and PG scores to ultimately alter the likelihood of students to promote each subject. For the case of language (Figure 7a), we find no impact of the JEE on the likelihood of approval during the period analyzed. The impact is close to zero and is never statistically significant. Similarly, we find no effect of the JEE on the probability of promoting math (Figure 7b). If anything, the point estimate shows a decrease after the second year (though not significant). Something similar happens in the case of social sciences (Figure 7c). Finally, the probability of promotion in natural sciences did not change either (Figure 7d). In short, the evidence in Figure 7 reflects that the probability of promotion of each subject does not seem to have reacted to the adoption of an extended school day.

So far, the results of this section show that the JEE does not seem to have had a strong impact on student learning, at least in the short term. That is, there is evidence of a positive effect on PN scores in some of the subjects, but not in others. When looking at the PG scores, we find positive effects in language, math, and social sciences, but with large confidence intervals, resulting in a non-significant average impact over time. As a consequence of this, we find effects close to zero on the probability of promotion.

An interesting question though is whether we can say something in terms of gender differences. The are well-documented differences by gender in performance on different subjects. Moreover, these gender gaps are not only reflected in terms of their performance in different subjects (e.g. math vs. language) but also related to their abilities to cope with different types of assessments. The evidence has shown, for instance, that females have a relative advantage in low-stakes exams, while males tend to outperform women in high-stakes evaluations. For these reasons, and taking advantage of the fact that we have the information on the test scores for men and women in both high and low-stakes exams, in the following section we further inspect the potential impact of the JEE on learning, focusing on the possible changes generated by this educational policy on gender gaps.

4.1 Effects by gender

As described in section 3, the knowledge and skills acquired in the education system vary by gender. In particular, girls in public secondary schools in the Dominican Republic outperform boys in language in 2012, but the picture is the opposite in the remaining three subjects: boys obtain significantly higher scores than girls in math, social sciences, and natural sciences. Therefore, one may ask whether the adoption of the JEE could have affected the gaps in performance. For instance, we find a small but persistent improvement in PN test scores in language, where girls have a relative advantage over boys. If the positive effect of the JEE was mostly coming from boys, we should observe a reduction in the gap, as boys get closer to girls' performance. In the opposite direction, we also find a general average improvement in the PN test scores of subjects where boys have a relative learning advantage, such as social sciences and natural sciences. Moreover, the previous evidence shows a greater JEE impact on the high-stakes evaluation (PN test), in which the literature highlights a relative advantage for boys. However, our findings also reflect in most subjects a positive change and an increasing impact trend over time (although not strongly significant) in the low-stakes scores exam (PG test), which typically favors girls. Hence, this solely evidence do not reflect a theoretical clear pattern and direction of the potential incidence of the program on the learning gender gaps, or maybe it hints at the existence of a heterogeneous effect in this sense as well. The actual relevance of the JEE impact on the learning gender gaps can only be determined with empirical evidence.

In this section, we analyze whether the JEE has differential impacts on the learning of girls and boys, and thus contributes to the widening or narrowing of the gender gaps. Figures 8, 9 and 10 plot the estimated coefficients of an event study regression, similar to regression 1 but interacting each of the event study coefficients with a dummy that equals one for boys and zero for girls. Again, the dependent variables in each panel of these figures correspond to the PN and PG test score in a different subject, and the probability of promoting each discipline. The dots represent the point estimates, and the bars the 95% confidence interval around each coefficient.

The pattern that emerges from inspecting Figure 8 is not entirely clear and varies by subject. For instance, while in the case of language there are no signs that the program has altered PN test scores gender gaps, we observe a small and marginally significant relative increase in the PN test scores of boys in math and natural sciences. In the case of social sciences, the PN test score gap between boys and girls seems to have temporally increased (favoring boys) during the third year after the JEE adoption, but it narrowed and became not significantly different than the pre-JEE gap four years after the introduction of the program in each school. All in all, the results from this analysis suggest that the JEE did not contribute to altering the gender gaps in the scores of this high-stakes exam. If anything, there is some evidence in this regard of a slight widening of the gaps in favor of boys.

Similar evidence arises when we analyze the changes in the gender gaps related to the probability of promotion (see Figure 10): once again, the pattern is not clear. Figure 10 presents the same results but looks at the probability of promotion in each of the four subjects. Once again, the pattern is not clear. There seems to be a small increase in the male-female gap of the probability of promotion in language (relative to the last year before the JEE), although not statistically significant during the whole period after the JEE. Similarly, we do not find a clear change in the gender gap of promoting math or social sciences. However, a possible exception is natural sciences: in this case, there is a statistically significant increase in the gender gap in favor of boys. After the adoption of the JEE, the likelihood of promotion in natural sciences increased relatively more for boys than girls. Moreover, this increase is persistent across several post-program periods.

The above results suggest that the JEE has relatively favored men in terms of the students' learning measured by the PN test scores. Although the analysis of the evolution of the effects found does not reflect such a clear and sustained impact over time (see Figures 8 and 10), this JEE impact in favor of boys is in line with the previous literature since the PN test constitutes a high-stakes exam. However, but still consistent with the existing evidence, we also find that the JEE strongly increased women's PG assessment scores. Figure 9 shows a clear and generalized relative improvement of girls in the scores of this low-stakes evaluation. Moreover, the change in this learning gap in favor of women grows as schools accumulate more years under the extended school day scheme. It is worth noting, however, that it is possible to observe this same dynamic even if the actual JEE impact on this gender gap is homogeneous over time. As mentioned in section 3, while the PN test scores are contemporaneous to the JEE adoption in equation 1, the presentation score (PG) is not, as it depends on the student's performance over previous years, some of which were possibly not under JEE.

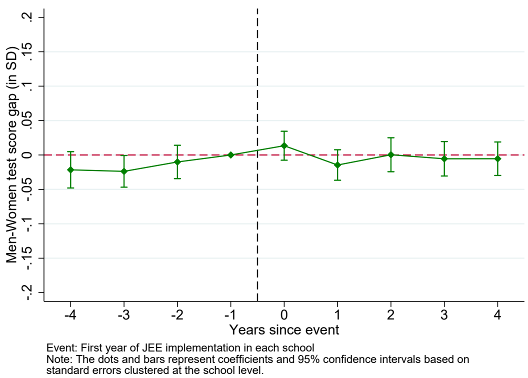
In summary, the JEE seems to have affected learning gender gaps heterogeneously. As expected according to the previous literature, the program favored girls' learning in the low-stakes evaluation and improved boys' relative scores in the high-stakes exams. However, we do not find such a clear heterogeneity between subjects where girls or boys have a typical relative learning advantage (language vs math). These findings could also contribute to the literature in terms of the relative importance of both the subject itself and the type of evaluation to determine the potential changes of an increase in the school day on the academic performance of women and men.

5 Conclusion

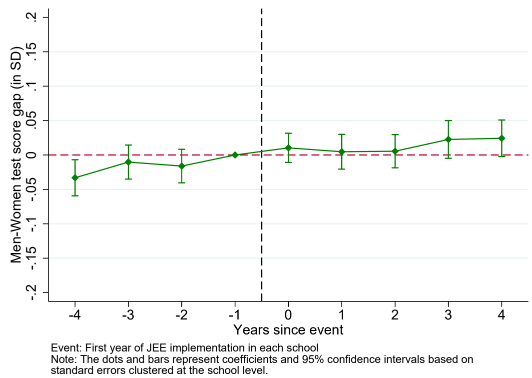
The improvement of students' learning is a major concern and a crucial challenge in Latin America in general, and in the Dominican Republic in particular. Thus, it is no

Figure 8: Effect of the JEE on the gender gap in PN test scores

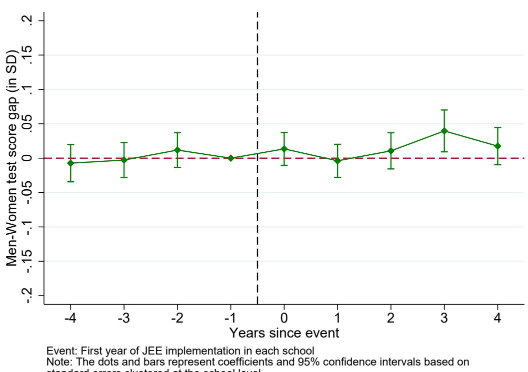
(a) Language



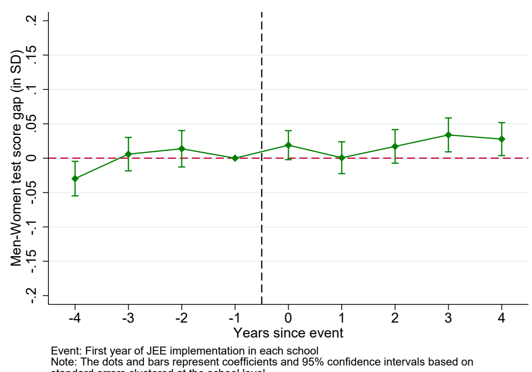
(b) Math



(c) Social sciences



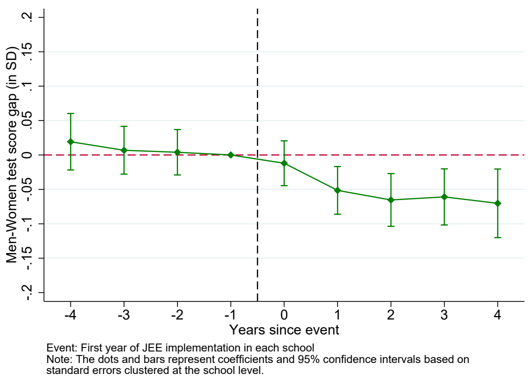
(d) Natural sciences



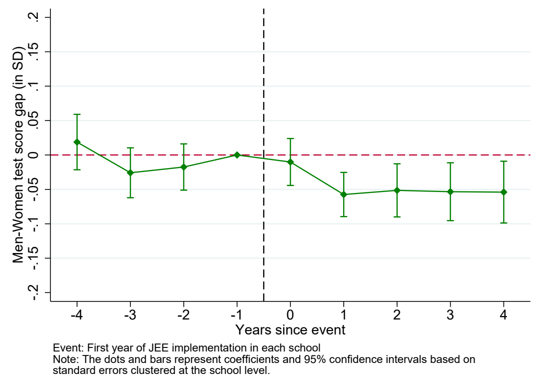
Source: authors' elaboration based on test scores data and JEE data (MINERD).
Note: The score corresponds to the standardized test score obtained in the PN test for the corresponding subject. The gender gap in test scores is calculated as the difference in average scores between boys and girls.

Figure 9: Effect of the JEE on the gender gap in PG test scores

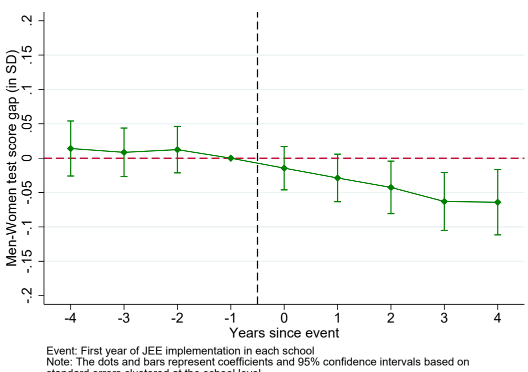
(a) Language



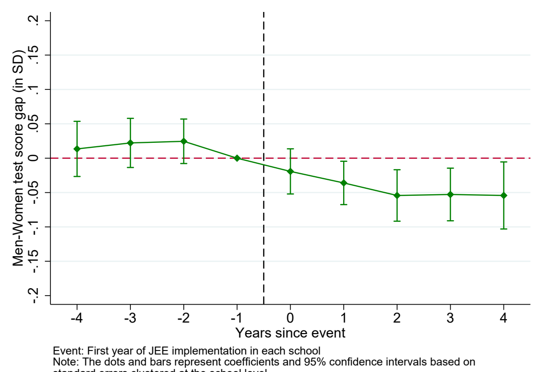
(b) Math



(c) Social sciences



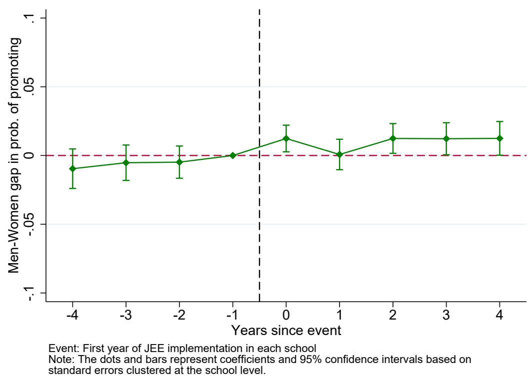
(d) Natural sciences



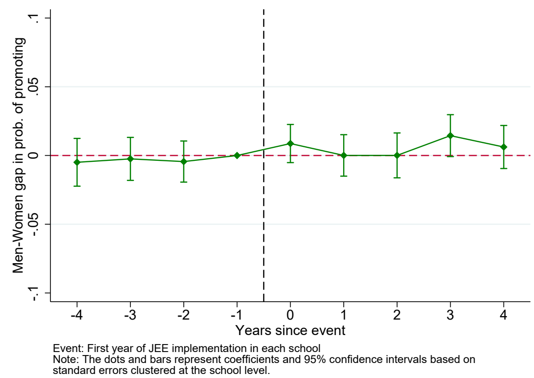
Source: authors' elaboration based on test scores data and JEE data (MINERD).
Note: The score corresponds to the standardized test score obtained in the PG test for the corresponding subject. The gender gap in test scores is calculated as the difference in average scores between boys and girls.

Figure 10: Effect of the JEE on the gender gap in the probability of promotion

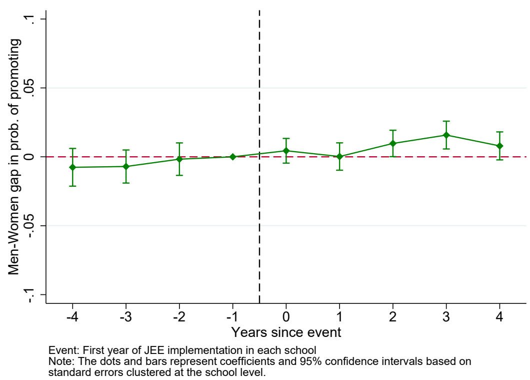
(a) Language



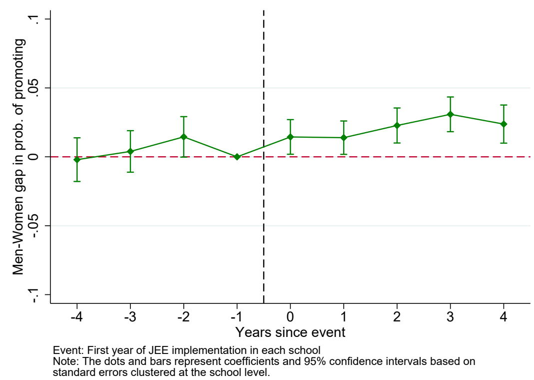
(b) Math



(c) Social sciences



(d) Natural sciences



Source: authors' elaboration based on test scores data and JEE data (MINERD).
Note: The gender gap is calculated as the difference in the probability of promotion between boys and girls.

coincidence that in recent years several countries in the region have implemented policies that extend the school day, with the main objective of enhancing students' academic skills. In this regard, the Dominican government introduced in 2013 the *Jornada Escolar Extendida* (JEE), a flagship educational program that doubled the length of the school day in the public schools of the country from 4 to 8 hours. The JEE has been the main educational policy in the Dominican Republic for more than a decade now, and it is likely to remain so for years to come. Given its national relevance, it is important to know in depth the overall consequences of its introduction and to study its potential socioeconomic effects, particularly on educational quality.

Therefore, in this paper we assess the impact of the JEE on students' learning, exploiting the gradual implementation of the policy over time and by geographical area. We match students' test scores data for the period 2010-2019 with school-level administrative information about the program implementation, and analyze the changes in student learning after the JEE in each school following an event study approach.

Our results suggest that the JEE does not seem to have had a strong impact on student learning, at least in the short term. On the one hand, the program increased the scores in the high-stakes exam for students in the last year of secondary education, although the effects found are low and heterogeneous across subjects. When looking at the PG scores (the low-stakes evaluation), we find positive effects in most of the subjects, but with large confidence intervals, resulting in a non-significant average impact over time. Consequently, the estimated effects of the JEE on the probability of promoting each subject are close to zero.

Despite these initial results, we do find a relevant impact of the JEE on the learning gender gaps, with the expected heterogeneity according to the previous literature. In particular, the program seems to have favored girls' learning in the low-stakes evaluation and improved boys' relative scores in the high-stakes exams. However, we do not find such a clear heterogeneous effect between subjects where girls or boys have a typical relative learning advantage.

In this regard, the evidence of this paper highlights the need to seriously consider the relative importance of both the subject itself and the type of assessment for better educational development. This could lead to more cost-effective policy designs that can more accurately distinguish the possible changes of an extended school day on the academic performance of women and men.

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