Full-Time Teachers, Students, and Curriculum

The Single-Shift Model in Rio de Janeiro

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Abstract

This paper examines the full-time school program in Rio de Janeiro’s municipal schools. The program, called the “Single-Shift” schools (Turno Único), extends the time students spend in municipal schools and seeks to improve the quality of education provision by creating a diverse curriculum for the use of the extra time in school. Unlike the model prevalent in most Brazilian public schools, in which the school day is divided in two shifts of four to five hours each, Single-Shift schools provide education in a format in which students attend a seven-hour daily shift. A subset of Single-Shift schools was certified when they included aspects such as having all teaching staff fully dedicated to a single school. Difference-in-differences estimates, including school and time fixed effects, as well as restrictive school-by-time controls, indicate sizable and robust positive results for the certified Single-Shift program in middle schools. The results indicate that just extending the school day does not grant positive impacts on student performance if it is not also coupled with a more comprehensive and careful consideration on how the additional school hours are used and organized, which requires a well-structured and integrated curriculum, teachers fully dedicated to one school, and focused teacher training.

This paper is a product of the Education Global Practice Group. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at aloureiro@worldbank.org.
Keywords: Extension of the School Day, Full-time School, Impact Evaluation, Student Learning, Dropout Rates.

JEL Classification: I20, J24, C23, D04

1 The authors are extremely grateful to the staff of Rio secretariat of education for providing all necessary data and information for this paper. We also would like to thank Pedro Olinto, Luis Benveniste, David Evans, Juan Manuel Moreno and Ricardo Paes de Barros for very helpful comments. The findings, interpretations, and conclusions expressed in this paper are those of the authors and do not necessarily represent the views of the World Bank.
1. Introduction

This study evaluates the full-time school program in public schools in Rio de Janeiro, Brazil. The full-time school program in Rio de Janeiro – called “Single-Shift Schools” (Escolas em Turno Único) – extends the time that students spend in municipal public schools and seeks to improve the quality of the education provision. Unlike the full-time model prevalent in many Brazilian public schools, in which students spend 4 to 5 hours in school per two shifts, the Turno Único program provides education in a format in which students attend a 7-hour daily shift. Some of the Single-Shift schools were certified when they included aspects such as all teaching staff dedicated 40 hours of their weekly working hours to a single school. Certified elementary schools are called “Carioca Elementary Schools” (CES, in Portuguese, “Primarios Cariocas”) and certified middle schools are called “Carioca Middle Schools” (CMS, in Portuguese, “Ginasios Cariocas”). We analyze the design and implementation of these initiatives and estimate their impact on education outcomes.

This study seeks to not only estimate whether schools that received the Single-Shift program had a greater increase in outcomes but also to analyze what factors could be associated with such outcomes. With these goals, we first present the specificities of the policy and describe the differences of the Single-Shift model to the elementary and middle schools. This framework allows us to understand what are the channels and mechanisms associated to its impact. We finally estimate the impact of the program on student outcomes.

We use a difference-in-differences (DID) model with year and school fixed effects to estimate the change in results for the schools that were converted into the full-time school model in elementary schools (CES and other non-certified Single-Shift elementary schools) and in middle schools (CMS and other non-certified Single-Shift middle schools). The parallel trends assumption tests indicate that the control group is well suited for this analysis.

The results indicate overall positive effects of the Single-Shift program in Rio Municipality. For middle schools, the results are stronger in the CMS model, and not significant – and even negative in some specifications – in Single-Shift middle schools that are not CMS, suggesting that just extending the school day does not generate positive impacts on student performance without a structured organization of what is done in the additional hours. Specifically, we find that CMS have a consistent positive and substantial result of 0.806/0.681 standard deviations on IDEB/IDERio results. For the elementary schools, the Single-Shift schools have a positive effect of around 0.264/0.276 standard deviation on IDEB/IDERio results, but the results in elementary schools seem to be coming from an artificial decrease in age-grade distortion in those schools.

This paper is organized as follows. The next section presents the characteristics of the Single-Shift program, its implementation and a logical framework to achieve its goals. Section 3 describes the data used in the study. Section 4 reviews the related literature. Section 5 presents the identification strategy and results, while section 6 concludes.

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2 For the remainder of this paper we will refer to the Carioca Elementary Schools indistinctly as certified schools, CES, or Primarios Cariocas. Similarly, with Carioca Middle Schools, CMS or Ginasios Cariocas.

3 The IDEB is the national Education Development Index and theIDERio is a similar estimation for Rio de Janeiro Municipality specifically. They are calculated biannually by the Ministry of Education and by Rio’s municipal Secretariat of Education, respectively. IDEB is measured at the school, municipal, state and national levels and is based on two components: student performance in the nationwide standardized test (Prova Brasil/SAEB) and student pass rates. A composite index with those two dimensions mitigates perverse incentives. The index is coupled with targets that allow monitoring whether schools, municipalities, states and the country are on the right track regarding improvements in education quality.
2. The Single-Shift Program

The Single-Shift program in Rio de Janeiro, Brazil, was initially implemented as a pilot in middle schools under the name of “Carioca Experimental Middle School” (Ginasio Experimental Carioca). The Single-Shift program then became an important policy for the Rio Municipal Secretariat of Education (Secretaria Municipal de Educação, MSE), and was expanded to other middle and elementary schools. The full-time school program in Rio de Janeiro, the “Single-Shift Schools” extend the school day to a 7-hour daily shift that goes from 7:30 AM to 2:30 PM – as opposed to part-time schools, in which shifts last 4.5 hours (in both cases the hour sum includes breaks and meals).\(^4\) Extending the school day from 4.5 to 7 hours involves creating a diverse curriculum and promoting innovative and comprehensive ways of using the extra school hours, including additional class time and extracurricular activities of a wide range of fields. Prior to becoming Single-Shift schools, many schools were already full-time, but with a different full-time format, with 9 to 10 hours of classes in double shifts. The goal of Rio MSE is that all municipal schools ultimately follow the Single-Shift School model.

2.A. “Carioca Elementary Schools” (CES) and “Carioca Middle Schools” (CMS)

The Single-Shift program is aligned with a comprehensive restructuring of the school system in the municipality of Rio de Janeiro\(^5\) that also seeks to improve the learning process of students and promote teaching specialization oriented towards each development stage, called “Reorganization of Municipal School Network.” As the restructuring program advances, schools are reorganized into: (1) Children’s Development Space (Espaço de Desenvolvimento Infantil, EDI), which includes Early Childhood Education overall (ECE, crèche and pre-school); (2) Low Fundamental Education (grades 1 to 6, called “Carioca Elementary School” or Primário Carioca); and (3) High Fundamental Education (grades 7 to 9, called “Carioca Middle School” or Ginasio Carioca). This structure of the education system contrasts with the usual organization in the rest of Brazil, with Fundamental Education (FE) divided in low FE (grades 1-5) and high FE (grades 6-9), as well as Secondary Education (SE, grades 10-12).

The first step of the reorganization process – which started in 2012 – concerns segmenting the supply in three cycles, and the second refers to structuring the units so they can become certified Single-Shift Schools. For a school of high fundamental education to meet the criteria established by MSE and be certified as a Carioca Middle School, all classes must be full-time and all the teaching staff must dedicate 40 hours of their weekly working hours to a single school. In low fundamental education, having the complete body of teachers in full-time contracts was set as a goal, rather than as a requirement. That is, some low FE schools were certified even though not all of their teachers were in 40-hour contracts.

The plan to restructure municipal schools and the implementation of the Single-Shift School program are closely related, however, they are not completely intertwined. For that reason, many Single-Shift Schools do not fit into these formats – one-segment school with 6\(^{th}\) grade included in low-fundamental education – and many are in regions where the restructuring has not yet been carried out. Essentially, Single-Shift schools are those with all classes in 7-hour daily shifts.

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\(^4\) As it will be presented below, the full-time school program in Rio was rapidly expanded, but only some of the schools extended the school day following all principles and guidelines of the Ginasio Carioca model.

\(^5\) The restructuring of the school network in Rio consists in the planning of the provision of education in a way that is territorialized in specific segments, according to each stage of development of the student. See Cruz et al (2017) for more details on this program.
Schools with some full-time classes, but not all, are not considered Single-Shift schools. The Single-Shift program does not establish a specific infrastructure model and follows the general guidelines defined by the reorganization program. On the other hand, all certified Single-Shift schools follow the new structure (1st to 6th grades in low-fundamental education and 7th to 9th grades in high-fundamental education).

While elaborating the Carioca Elementary and Middle School projects, MSE also strived to create a school that would engage students, develop abilities related to youth leadership in young people, and adopt the “pedagogy of proximity” as the pedagogic method, which aims to strengthen the bonds between students, teachers, administrators, and the school community as a whole. MSE considers these goals as complementary to the improvement of student achievement. Additionally, a managerial perspective, comprising both the administrative processes and the pedagogical approach, has oriented the production of the content used in the training sessions for the teams of school principals and teachers of the Carioca Elementary and Middle Schools. For MSE, the ideal school size to optimize the teachers’ work hours is of Carioca Elementary and Middle Schools with 24 classes each.

Another middle school model, created in 2012, is the Olympic Experimental Gymnasium (OEG). The OEG is a full-time sports-oriented school, which integrates academic and sports training. In this model, students from grades 6 to 9 with outstanding athletic capabilities are directed to these schools and receive incentives and the proper physical and pedagogical structure to develop skills in Olympic sports. Currently, there are three GEOs. MSE also has other programs that include full-time classes (such as the “Schools of Tomorrow” and the “Bilingual Schools”), but these are not necessarily considered Single-Shift Schools because not all of their classes are full-time. For example, only 56 of 155 Schools of Tomorrow are also Single-Shift Schools.

It is important to note that the municipal schools of Rio de Janeiro contemplated by the federal program called “More Education” – that also extends the school day (“Mais Educação” in Portuguese) – are not necessarily Single-Shift Schools. The “More Education” program supports schools to establish activities after the regular classes. In the case of Single-Shift Schools, their “More Education” activities take place after the 7 hours of classes, after 2:30 PM. Moreover, the activities of the More Education program are extracurricular, with volunteer helpers and the support of different partners (such as SESI and SESC).7 The schools that have adopted the 7-hour single shift use the More Education program and its partners to work on their post-shifts to supplement the activities for children who spend more than 7 hours in school.

2.B. Program Implementation

The preparation for the Single-Shift School program began in the second half of 2010 and initiated its activities in 2011. In 2011, there were 22 Single-Shift Schools, ten of which were Carioca Middle Schools (then called “Experimental Carioca Middle Schools”, “Ginasios Experimentais Cariocas” in Portuguese) and 12 were non-certified Single-Shift schools. Table 1 shows the expansion of the Single-Shift program. Between 2011 and 2013, the teachers and principals of the Carioca Middle Schools received a special salary increase, corresponding to 10% of their paid salaries, but these extras ceased in 2014. During the same period, between 2011 and 2013, school principals and school vice-principals also received a monthly increase of approximately R$ 1,300 and R$ 800, respectively.

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6 Escolas do Amanhã and Escolas Bilingues, in Portuguese.
7 SESI stands for Social Service of Industries (in Portuguese, Serviço Social da Indústria) and SESC stands for Social Service of Commerce (in Portuguese, Serviço Social do Comércio).
In 2012, Rio’s MSE defined an “ideal model” of education supply, which consists of dividing the education supply in three cycles, with the addition of the 6th grade to the early-grades of fundamental education.8 The 2012 school system restructuring added 83 non-certified Single-Shift schools, 2 Carioca Elementary Schools, 8 Carioca Middle Schools and 1 Experimental Olympic Middle School to the program. The single-shift program was then considerably expanded and in 2015 there were 172 Single-Shift schools in total, of which 14 were Carioca Elementary Schools, 25 Carioca Middle Schools, 3 Experimental Olympic Middle Schools, and 130 in different models.

Table 1: Expansion of the Single-Shift Program in Rio de Janeiro: 2011 -2015

| Year | EI + Elementary (except PC) | Elementary (except GC) | Middle (except GC) | Elementary + Middle | ECE + Elementary + Middle | EDI | Primário Carioca (PC) | Ginásio Carioca (GEC/GC) | Ginásio Olímpico (GEO) | Total Single-Shift |
|------|-----------------------------|------------------------|-------------------|-------------------|---------------------------|-----|---------------------|--------------------------|------------------------|----------------------|
| 2011 | 2                           | 0                      | 6                 | 2                 | 2                         | 0   | 0                   | 10                       | 0                      | 22                   |
| 2012 | 77                          | 8                      | 6                 | 2                 | 2                         | 0   | 2                   | 18                       | 1                      | 116                  |
| 2013 | 96                          | 15                     | 6                 | 4                 | 2                         | 2   | 4                   | 25                       | 3                      | 157                  |
| 2014 | 100                         | 18                     | 8                 | 6                 | 2                         | 0   | 9                   | 25                       | 3                      | 171                  |
| 2015 | 94                          | 20                     | 11                | 4                 | 1                         | 0   | 14                  | 25                       | 3                      | 172                  |

Data source: Rio Municipal Secretariat of Education.

The selection of schools to participate in the program did not follow a specific and strict criterion. However, the participation of schools in the Carioca Elementary School and Middle School programs in 2011 was based on three main aspects: (1) schools located in areas with low human development indicators (HDI); (2) high dropout rates; and (3) school management willing to join the program. From the second year of the program (2012, when 94 schools became Single-Shift Schools) on, the selection was aligned with the progression of the Reorganization of Municipal Schools program. Rio’s secretariat of education is divided into 11 regional areas and in each area there is an office (Regional Education Coordination, in Portuguese, Coordenadoria Regional de Educação – CRE) that provides a closer support to schools. To define the required provision of the Single-Shift program, Rio MSE organized a more complete geographic database of the city, and the city was then divided in 232 micro-areas possessing approximately the same school demand – aiming to optimize the physical and human resources of MSE.9

Once these micro-areas were delimited, the regional coordination offices helped to define the future configuration of each existing school: if the school were to be an ECE center, an elementary school, or a middle school. Then several criteria were used to prioritize 30% of the micro-areas to implement the Single-Shift model. Particularly, areas were ranked according to: their classroom deficits (considering the expected demand); their “social infrastructure” (presence or not of “Family Clinics”,10 social assistance reference centers, and mass public transportation); the possibility of 80% of the Single-Shift schools being implemented in properties owned by the municipal governments; and the average household income being less than R$ 900. The choice of an average household income below R$ 900 serves the purpose of benefiting the poorest areas, since it is believed that the program has a greater impact on this population group.

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8 The addition of the 6th grade to the early-FE intended to concentrate the teaching of Math, Portuguese, Sciences, History and Geography lessons in a single 6th grade teacher.
9 Although the borders of the micro-areas are similar to most of the regional coordination borders, they do not perfectly match.
10 Clínicas da Família, in Portuguese.
An implementation plan was elaborated with the help of the regional coordination offices for new schools to open. The plan takes into account the necessary movement of students, teachers, and materials for each area to provide an education organized according to segments and to the particularities of Single-Shift schools. Due to the reorganization of units in different segments (ECE, Carioca Elementary and Middle School), it was necessary sometimes to relocate students, teachers and managers to other school units in the transition between school years. Some municipal schools already had, before the implementation of the Single-Shift program, a full-time model different from the Single-Shift one – 9 to 10 hours-long school days with curriculum courses during the curricular shift and extra activities during the extracurricular part of the school day. This transition is already challenging in itself, but the fact that some schools were leaving behind the 9 to 10-hour full-time – spread between the curricular shift and the extracurricular shift – made the communication and institutional alignment effort more challenging. It was deemed necessary to adapt the guidelines of old full-time schools to the Single-Shift model in order to unify the network’s full-time education model so that it could be escalated more efficiently.

Another challenge to increase Single-Shift provision was to find lots and getting clearance for the construction of new school units. It involved coordinating the activities of various municipal entities (Municipal Secretariat of Education, Municipal Housing Secretariat, Pereira Passos Institute – cartography and data municipal entity, Municipal Urban Planning Secretariat, and Municipal Secretariat of Finance) to operationalize the selection and clearance of areas. The other non-prioritized micro-areas also advanced in restructuring their schools, considering the schools’ practicability to divide in segments and to turn all classes to 7-hours.

The National Education Plan,\(^\text{11}\) which came into effect in June 2014, establishes full-time education as a nationwide target. Specifically, its target number six establishes the provision of full-time education to at least 50% of public schools, which, summed up, must cover at least 25% of students of the basic education cycle in Brazil. Going forward, MSE’s goal regarding the construction of schools was to have 110 new Single-Shift schools in 2016, which would imply 35% of students enrolled in full-time schools (including non-Single-Shift full-time schools).\(^\text{12}\) This share is expected to reach 100% in 2020. In 2014, 18.4% of enrollments were full-time. Of these, 7.39% were in Single-Shift schools.

Furthermore, the next steps in the program provide for an enhancement of the communication strategy. Although this has happened steadily throughout the process – relying on numerous meetings with the regional offices, general meetings with the principals, meetings between the regional offices and their principals, and meetings between the regional offices and the School-Community Councils) – MSE denounced the need to find new ways to engage the school community and to incorporate local specificities in their planning.

\[2.C. \text{ Logical Framework of the Carioca Elementary and Middle School Programs}\]

An important aspect that guided MSE in the design and implementation of the full-day schooling reform is that “more of the same” does not deliver results. Particularly, the difference between the certified Carioca Elementary and Middle Schools versus the non-certified Single-Shift schools implies a major restructuring of the school curriculum. Table 2 presents the specificities of the Carioca Elementary and Middle Schools in contrast with non-certified Single-Shift schools. While

\(^{11}\) In Portuguese, Plano Nacional de Educação (PNE).

\(^{12}\) Non-Single-Shift full-time schools are those where students stay in total for 9 hours in the school, in the morning and afternoon shifts.
non-certified Single-Shift schools applied the first characteristic (7-hour shift for all classes), the certified model transformed several other school components (teachers’ working hours, curricular guidelines, etc.).

Table 2: Characteristics of Certified Single-Shift Schools

| Characteristics          | Carioca Elementary School (CES)                                                                 | Carioca Middle School (CMS)                                                                 |
|--------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| School time              | 7-hour shift (7:30 AM to 2:30 PM) for all classes;                                              | 100% of the teachers working 40 hours per week in a single Carioca Middle School;         |
| Teachers                 | Teachers working 40 hours per week in a single Carioca Elementary School (but it is not required that all teachers work in a regime of at least 40 hours, like in the Carioca Middle Schools); | Teachers teach for 7 hours per day and collectively take 1 hour per day to plan their next day’s lessons, that is, some periods of time are reserved so that all the teachers can be together while planning their lessons; |
| Pedagogic planning       | In the cases in which elementary education have teachers on 40-hour contracts, teachers are in the classrooms during 7 hours per day and collectively take 1 hour per day to plan their next day’s lessons, that is, some periods of time are reserved so that all the teachers can be together while planning their lessons; | Teachers teach for 7 hours per day and collectively take 1 hour per day to plan their next day’s lessons, that is, some periods of time are reserved so that all the teachers can be together while planning their lessons; |
| Plan of Action           | A document elaborated by each CES and CMS in the beginning of the school year in which each school set goals and define strategies for the school year to attain them, based on the guidelines established by the central level of MSE. These Plans of Action unfold into Programs of Action for the teachers; |                                                                                          |
| Teacher training         | In-service training for teachers and school administrators throughout the year (1st semester = training of CES/CMS old-timers; 2nd semester = training of the teams of the schools that will become CES/CMS the following year); |                                                                                          |
| Curricular guidelines    | Common curricular matrix and diversified part for primary school students. Diversified part includes: English language, reading room, directed study, and religious studies; | Common curricular matrix and diversified part for middle school students. Diversified part includes: English language, directed study, “life project, and elective courses; |
| Youth Leadership | The CES works with the concept of leadership by using discussions and practices related to socioemotional skills through the curriculum material. | Leadership (previously called “youth leadership”) is the foundation of the pedagogic proposal of the CMS; |
| Thematic instruction | None | Thematic instruction – a pedagogic strategy that focuses on teaching through thematic associations instead of subjects. Mandatory between 2011 and 2013. It became optional in 2014; |
| Class Journal | Activities related to the journal about the school routines of 4th, 5th, and 6th graders (this activity started in 2014); | None |
| Monitoring | Monitoring is done by a Regional Coordination employee, responsible for monitoring all the Single-Shift Schools (except the CMS) from a given region; | Monitoring is done by the central level of MSE; |
| Engagement with the school community | Assembly with the school community (families of the students) to prepare for entering the elementary school, in addition to regular parent-teacher conferences; | Assembly with the school community (parents and families) to inform them about and engage them with the Single-Shift School proposal, in addition to regular parent-teacher conferences; |

Notes: Authors’ organization according to information provided by the Rio Municipal Secretariat of Education.

An important difference between the Carioca Elementary School and the Carioca Middle School programs lies in the teachers’ work regime. While in CMS all the teachers necessarily undertake a 40-hour per week workload in their schools, in CES there are teachers on 40-hour contracts as well as teachers with other types of contract. Thus, the necessary budgets for implementing each of these programs differ. In Carioca Middle Schools, all teachers who work less than 40 hours per week will have their workload – and therefore their salaries – complemented to the 40-hour level. In contrast, the Carioca Elementary Schools will prioritize the assignment of teachers on 40-hour contracts, but that is not a necessary condition.
The totality of teachers on 40-hour contracts in the Carioca Middle Schools also influences their planning meetings. The extension of the shift to 7 hours (7:30AM to 2:30PM) allows teachers to dedicate an hour a day to plan lessons, in a collective effort. That is, all teachers with 40 hours meet at the same time in the school, facilitating the interaction among them and the discussion about the class and the students’ issues.

Another distinction of Carioca Elementary and Middle schools to other types of schools refers to the teacher training. Structuring a specific training module for teachers and managers assigned for the 7-hour school day differs both from the non-full-time model, and from the 9 to 10-hour school day model previously used. The continuous training of teachers and the establishment of plans of action, and therefore of targets, was thought to encourage specialization of teachers in a particular age group. Among the pedagogical approaches covered by the training are the youth leadership, the students’ life project; the amount of time dedicated daily to lesson planning, etc. The main challenge reported by Rio SME was the fact that the program has escalated quickly, especially in the elementary level, such that it was necessary to transform the knowledge accumulated during the first years on training material for the new schools entering the program.

In addition to their workload, between 2011 and 2013, the “thematic instruction” approach was mandatory for all teachers of the Carioca Middle Schools. Thematic instruction\(^{13}\) is a pedagogical strategy that focuses on teaching through thematic associations instead of subjects/courses. In 2014, each Carioca Middle School was allowed to assess whether the thematic instruction method should subsist.\(^{14}\) The underlying idea of a thematic set of courses is that the contents taught in the classroom must appeal to the students’ interests and be connected to the way with which the youth comes across information and challenges outside of the school, which are not compartmentalized in courses. It aims to enhance the students’ abilities to solve problems as they arise in their practical lives. This way, a lesson about the Amazon Rainforest, for example, can convey content related to other subjects, such as Sciences, Mathematics, Portuguese, etc.

Other important curriculum guidelines of the certified Single-Shift Schools refer to the “life project” classes in Carioca Middle Schools and the class journal in Carioca Elementary Schools. The “life project” classes aim to encourage children to develop ideas related to their own dreams and future prospects. Activities related to the writing of a journal (which were implemented starting in 2014 in 4th, 5th, and 6th grades) aimed at engaging students in the contents taught in the classroom by relating it to their day-to-day lives. Particularly, students are prompted to relate the contents covered in the classroom to extra-school experiences and to reflect upon this process. In effect, it requires students to write a daily account of their previous day, with emphasis on what was taught in class and the intersection of that with their own lives.

Both the Carioca Elementary and the Carioca Middle schools have specific monitoring arrangements. In addition to the supervision carried out at the central level, there are officials assigned to monitoring the CES within each of the 11 regional coordination areas, the “Single-Shift supervisors,” which check the curriculum adequacy, teachers’ activities schedule, as well as organize, and provide training for the management team of those schools, which occur at least bimonthly. The CMS, in turn, are supervised only by the central level of MSE.

The activities established as distinctive features of the programs are intended to impact student learning and management of human and non-human resources, considering that a better managed school is more likely to provide an enhanced learning environment. However, education programs’

\(^{13}\) In Portuguese, thematic instruction is called polivalência.

\(^{14}\) According to information supplied by the MSE, around 90% of the Carioca Middle Schools chose to keep the thematic instruction approach.
impact evaluations usually ignore the process by which the program may influence the final results and only analyze whether the associated effect is positive or negative. In general, it is assumed that the program’s final result is to improve students’ performance, and researchers often estimate if the program as a whole impacted or not a given indicator without questioning what in the program could actually have affected the results. The design of the logical frameworks presented in Figure 1 and Figure 2 seek to qualify this type of analysis by introducing indicators that could and should be affected until the desired final result is reached.

The frameworks presented in Figure 1 and Figure 2 were designed by the authors, in partnership with Rio MSE’s program managers, considering the steps necessary to achieve the final results. The CES and CMS program managers sought to establish parameters that would result in fostering the formation of bonds between teachers, students, and the school community, thus improving the day-to-day experience of the student (school climate), the engagement in the classroom and, ultimately, performance. Dividing schools between different physical spaces dedicated to ECE, elementary, and middle-school; and maximizing the number of teachers who spend at least 40 hours in a school were considered important features to encourage the strengthening of bonds. In addition, Rio MSE sought management efficiency gains due to the monitoring carried out by both the regional offices and its central level, as well as training of the management team.
FIGURE 1: Logical Framework of the Carioca Elementary School

**Inputs:**
1) Budget: same as the budget of the other municipal schools.
2) Human resources: Addition of work hours needed to bring every teacher to the 40-hour category,
3) Up to 2013: Special salary increase
4) Official in charge of managing the GC program at the central level

**Activities:**
1) Integrated 7-hour curricular guidelines
2) 100% of the teachers with a 40-hour a week workload
3) Continuous and permanent training of teachers and managers
4) Planning meetings with compulsory participation of all teachers of a given school
5) Calling of assembly with the school community prior to the beginning of the Single-Shift Program
6) Designing of schools’ Action Plans, which unfold into the teachers’ Action Programs
7) Journal-related activities for 4th, 5th and 6th graders (from 2014 on)

**Products:**
1) % of enrolments in Single-Shift Schools
   - 2016 target: 35% of enrolment in full-time schools

**Intermediate Results:**
1) Student attendance.
   - Target: increase of the student attendance
2) Teacher absence (licenses)
   - Target: reduction in teacher absenteeism and medical licenses
3) Parents’ participation in the schools
   - Target: increase in the parental attendance to school meetings
4) Literacy
   - Target: 100% of students literate by the end of 1st grade

**Final Results:**
1) New school format attractive to students, focused on student leadership
   - Target: students’ interest and engagement increase
2) School dropout
   - 2020 Target: 25% reduction in dropout rate towards 0.97% for the initial years and 2.32% for the final years
FIGURE 2: Logical Framework of the Carioca Middle School

Inputs:
1) Budget: same as the budget of the other municipal schools.
2) Human resources: Addition of work hours needed to bring every teacher to the 40-hour category,
3) Up to 2013: Special salary increase
4) Official in charge of managing the GC program at the central level

Activities:
1) Integrated 7-hour curricular guidelines
2) 100% of the teachers with a 40-hour week workload
3) Continuous and permanent training of teachers and managers
4) Planning meetings with compulsory participation of all teachers of a given school
5) Calling of assembly with the school community prior to the beginning of the Single-Shift Program
6) Designing of schools’ Action Plans, which unfold into the teachers’ Action Programs
7) Multi-tasking approach (polivalência) – optional from 2014 on

Products:
1) % of enrolments in Single-Shift Schools
   2016 target: 35% of enrolment in full-time schools

Intermediate Results:
1) Student attendance.
   Target: increase of the student attendance
2) Teacher absence (licenses).
   Target: reduction in teacher absenteeism and medical licenses
3) Parents’ participation in the schools
   Target: increase in the parental attendance to school meetings
4) 9th grade to high-school transition
   Target: 100% of 9th graders enrolling in upper secondary education

Final Results:
1) New school format attractive to students, focused on student leadership
   Target: students’ interest and engagement increase
2) School dropout.
   2020 Target: 25% reduction in dropout rate towards 0.97% for the initial years and 2.32% for the final years
3. Data

An important factor in this analysis is that not all elementary schools that are Single-Shift are certified as CES, neither all the Single-Shift middle schools are certified as CMS. However, only the certified “Carioca” styles have the defined organization as presented above. Moreover, not all treated schools became Single-Shift at the same time. Starting in 2011, a number of new schools became Single-Shift every year after, and a number of schools also left the program. The sample used in the regression estimations is schools that have complete information for all years. That is, we restrict the sample to schools that have information on all variables used so we can have a balanced panel.

Table 3 and Figure 3 show the number of schools and number of students, respectively, in the sample for the estimations using IDEB as the outcome. As shown in Table 3, of the 22 schools that became Single-Shift in 2011, 21 are part of the sample. In 2012, 60 schools with complete information were added to the program, summing to 81 schools in total. In 2013, there were 38 new schools with complete information, however, 4 schools that were Single-Shift left the program (1 elementary and 3 middle schools). In 2014, 24 new schools were added, and 5 schools left the program. Finally, in 2015, five new school became CES.

Table 3: Sample Size

| Year when the school became Single-Shift | Total Sample | Elementary Schools | Middle Schools | Total |
|-----------------------------------------|--------------|--------------------|----------------|------|
| Total treatment                         | 866          | 539                | 327            |      |
| Control                                 | 448          | 288                | 736            |      |
| Single-Shift (non-CES)                  |              |                    |                |      |
| CES                                    |              |                    |                |      |
| Total Entered                           | 10           | 10                 | 20             |      |
| Left                                   | 0            | 0                  | 0              |      |
| Single-Shift (non-CMS)                 |              |                    |                |      |
| CES                                    |              |                    |                |      |
| Total Entered                           | 10           | 10                 | 20             |      |
| Left                                   | 0            | 0                  | 0              |      |
| CMS                                    |              |                    |                |      |
| Total Entered                           | 10           | 10                 | 20             |      |
| Left                                   | 0            | 0                  | 0              |      |

Notes: CES refers to Carioca Elementary Schools. CMS refers to Carioca Middle Schools. Ginásios Olímpicos are included in CMS schools. This is the sample with complete information from 2007 to 2015, including the control variables used in the regression models.

Data Source: Rio de Janeiro Municipal Secretariat of Education.
Rio has experienced substantial improvements in education quality, as measured by IDEB and IDERío. They are both indexes calculated by a standardized test (the Prova Brasil, from the Ministry of Education, in the 5th or 9th grade, and the Prova Rio, from MSE, in the 3rd and 7th grades), and the passing rate for the cycle (from 1st through 5th grade or from 6th through 9th grades). To estimate the impact of the CES, we analyze the IDEB and IDERío for the first cycle of fundamental education (1st through 5th grade), and to estimate the impact of the CMS, we analyze the indexes for the second cycle. The years analyzed are every other year from 2007 to 2015 when the IDEB is the outcome and yearly from 2009 to 2014 when the outcome is IDERío. Since the policy started in 2011, the years prior to the reform are 2009 and 2007 (and 2005, in the models without control variables) when the outcome variable is IDEB and 2009 and 2010 when the outcome is IDERío.

In the latest round of the national education quality index (IDEB) used in this study, Rio showed continued progress. As shown in Figure 4(a), IDEB for the early grades of FE was 5.3, up from 5.1 in 2009 and 4.2 in 2005. This increase occurred despite a teacher strike that lasted for 80 days in 2013. Figure 4(b) depicts the fact that IDEB results for the final grades of FE were more volatile, especially in 2009, when MSE abolished automatic grade promotion and repetition rates spiked.15

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15 Until 2009, all students would automatically pass to the next grade, within 3 years cycles, i.e., there was automatic promotion into the next grade, except in grades 3, 6 and 9.
FIGURE 4: IDEB – Fundamental Education – Municipal Schools, Rio de Janeiro, 2005-2015

Improvements on standardized test scores have driven the increase on IDEB observed since 2009. Figure 5 shows the trends of Prova Brasil (the bi-annual student assessment used in the calculation of IDEB) and Prova Rio (the annual municipal student assessment used in the calculation of IDERio). There was a significant increase in learning in 2009, as measured by Prova Brasil. IDEB and IDERio scores are highly correlated.

FIGURE 5: Prova Brasil & Prova Rio – Fundamental Education Municipal Schools, Rio de Janeiro, 2005-2015

Table 4 shows the characteristics of the schools that became Single-Shift in 2011 and of those that became between 2012 and 2013. Particularly, Table 4 presents the difference between the treatment and control schools in the first year that they were treated and the difference of the same
first year of the program to the characteristics in the years prior to the treatment. Table 4 poses that – except in a few cases – treated schools are not very different from the control schools. The exceptions are low FE schools that became Single-Shift in 2011, which contain poorer students (students with significantly fewer items in the house); low FE schools that became Single-Shift in 2012-13, which have lower proportion of mothers with higher education; and high FE schools, which have lower proportion of students with age-grade distortion (in all Single-Shift schools).

More worrisome is the fact that the characteristics of the treated schools may have artificially changed in the first year of treatment. Particularly, Table 4 suggests that the proportion of students with mothers with higher education increases and the proportion of students with age-grade distortion decreases in both elementary and middle schools. In order to check if these changes in school characteristics happened with the Single-Shift program, rather than being a movement of all Rio municipality, Tables 5 and 6 analyze the relationship between being a Single-Shift school and the school characteristics.

Table 5, column (1), shows that the age-grade distortion decreased in the years when the Single-Shift program was put in practice for the elementary schools. For middle schools, the decrease in age-grade distortion is even stronger in CMS schools, and not statistically significant for non-certified Single-Shift schools, as presented in Table 5 column (2). The proportion of items in the house and of mothers with higher education have also increased in Carioca middle schools, indicating a change in the student population of these schools. The participation rate in Prova Brasil increased in elementary and non-certified middle Single-Shift schools. The only significant change that happened with the non-certified Single-Shift middle schools is the proportion of mothers with higher education, which surprisingly decreased.

The changes in participation rates may be an effect of the Single-Shift program, as the schools became more attentive to standardized testing. However, the changes in age-grade distortion in elementary and middle Single-Shift schools are unlikely an effect of the program but rather a movement in student population. While a decrease in age-grade distortion could be a medium to long-term effect of full-time schools, this would not be observed in the first year of treatment. In fact, Rio MSE officials have indicated an active effort to move children with high age-grade distortion out of Carioca Elementary and Middle schools.
Table 4: Characteristics of Single-Shift Schools

|                      | Early Grades - FE | Final Grades - FE |
|----------------------|-------------------|-------------------|
|                      | Control | Treatment | Diff | Control | Treatment | Diff |
| **Items in the house** |         |           |      |         |           |      |
| Became Single-Shift in 2011 | 6.70    | 5.97      | 0.73** | 6.73    | 6.86      | -0.13 |
| Became Single-Shift in 2012/2013 | 6.72    | 6.60      | 0.12 | 6.41    | 6.30      | 0.11  |
| **Mother Education** |         |           |      |         |           |      |
| Became Single-Shift in 2011 | 0.33    | 0.41      | -0.09 | 0.39    | 0.39      | -0.01 |
| Became Single-Shift in 2012/2013 | 0.38    | 0.32      | 0.05*** | 0.45    | 0.43      | 0.02  |
| **Age-grade distortion** |         |           |      |         |           |      |
| Became Single-Shift in 2011 | 19.79   | 24.97     | -5.18 | 37.31   | 24.88     | 12.43*** |
| Became Single-Shift in 2012/2013 | 17.73   | 16.52     | 1.21 | 35.73   | 26.38     | 9.35*** |
| **Notes:** Items in the house refers to the sum of major household goods in the house of 5th and 9th grade students. The household goods considered are: TV, stereo, DVD, refrigerator, freezer, car, washing machine and the total number of bathrooms and bedrooms. Mother education refers to % of 5th/9th grade students of which their mother has Tertiary Education. The age-grade distortion is the proportion of students with more than 2 years of school delay.

T-test: * significant at 10%; ** significant at 5%; *** significant at 1%

Data sources: Brazilian Ministry of Education.
### Table 5: Single-Shift Characteristics - Elementary Schools

|                           | (1)       | (2)       | (3)       | (4)       |
|---------------------------|-----------|-----------|-----------|-----------|
|                           | Age-grade distortion | Mean items in the house | % Mothers w/ HE | Participation rate-Prova Brasil Elem |
| **Single-Shift * Post**   | -4.592    | 0.108     | -0.007    | 0.267     |
|                           | [0.617]**  | [0.088]   | [0.015]   | [0.038]**  |
| **School of Tomorrow**    | -1.467    | -0.097    | -0.041    | -0.174    |
|                           | [0.644]**  | [0.079]   | [0.012]**  | [0.083]**  |
| **More Education**        | -0.658    | 0.036     | -0.014    | -0.102    |
|                           | [0.384]*   | [0.043]   | [0.006]**  | [0.041]**  |
| **Constant**              | 19.338    | 7.317     | 0.176     | 2.408     |
|                           | [0.209]**  | [0.020]**  | [0.003]**  | [0.039]**  |
| **Observations**          | 2690      | 2690      | 2690      | 2690      |
| **Number of schools**     | 538       | 538       | 538       | 538       |
| **R-squared**             | 0.12      | 0.40      | 0.56      | 0.64      |
| **School FE**             | Yes       | Yes       | Yes       | Yes       |
| **Year FE**               | Yes       | Yes       | Yes       | Yes       |

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%
Notes: Elementary schools 2007, 2009, 2011, 2013 and 2015. Clustered standard errors in school level.

### Table 6: Single-Shift Characteristics - Middle Schools

|                           | (1)       | (2)       | (3)       | (4)       |
|---------------------------|-----------|-----------|-----------|-----------|
|                           | Age-grade distortion | Mean items in the house | % Mothers w/ HE | Participation rate-Prova Brasil Mid |
| **Carioca Middle School * Post** | -20.334   | 0.286     | 0.047     | 0.02      |
|                           | [1.368]**  | [0.144]**  | [0.021]**  | [0.105]   |
| **Single-Shift * Post**   | -3.139    | 0.089     | -0.035    | 0.121     |
|                           | [2.608]   | [0.189]   | [0.019]*   | [0.065]*   |
| **School of Tomorrow**    | -4.037    | 0.18      | -0.061    | 0.211     |
|                           | [1.354]**  | [0.093]*  | [0.014]**  | [0.088]**  |
| **More Education**        | -0.755    | -0.128    | -0.009    | 0.173     |
|                           | [0.490]   | [0.053]**  | [0.007]   | [0.035]**  |
| **Constant**              | 38.196    | 7.775     | 0.066     | 2.398     |
|                           | [0.280]**  | [0.026]**  | [0.003]**  | [0.045]**  |
| **Observations**          | 1635      | 1635      | 1635      | 1635      |
| **Number of schools**     | 327       | 327       | 327       | 327       |
| **R-squared**             | 0.29      | 0.65      | 0.90      | 0.70      |
| **School FE**             | Yes       | Yes       | Yes       | Yes       |
| **Year FE**               | Yes       | Yes       | Yes       | Yes       |

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%
Notes: Middle Schools 2007, 2009, 2011, 2013 and 2015. Clustered standard errors in school level.
4. Literature Review

The literature that assesses the impact of full-time schools is not conclusive. It generally indicates positive results when it comes to educational outcomes, but differs on the magnitude and the statistical significance of this impact. While the results regarding pass and dropout rates as outcome variables are mostly positive, many studies find no significant effects for variables related to school performance measured by student test results. A meta-analysis of 19 studies in Latin America provided by Alfaro, Evans & Holland (2015) finds positive, but heterogeneous impacts in terms of magnitude across a range of outcome variables, including learning outcomes, adult labor force participation, and crime and teenage pregnancy reduction. In addition, the authors perform a cost-effectiveness exercise and conclude that even using the most optimistic impact estimates, there are several other more cost-effective reforms to achieve similar learning effects.

Pires and Urza (2010) analyze a Chilean program that turned part-time into full-time schools. Using the methodology of difference-in-differences (DID) with propensity score matching, the authors found that full-time schools had positive and significant impact on academic outcomes (student performance in standardized test and dropout rates), as well as cognitive and socio-emotional outcomes. They also find negative effects on teenage pregnancy and on the likelihood of being arrested before the age of 25. However, there are no significant impacts on students’ future employment and salaries.

Bellei (2009) also analyzes the impact of the full-time program in Chile with the methodology of DID, finding a significant impact on the performance of students in Spanish language and Mathematics. In addition, the study finds evidence that the program has a greater effect on students of schools in rural areas, on students of public schools, and on students who are at the top of the performance distribution before the program implementation. Berthelon and Kruger (2011) explore the temporal and spatial heterogeneity in the implementation of the Chilean program to establish a causal relation between full-time schools and outcomes such as teen pregnancy and crime rates. The authors conclude that access to full-time schools reduces the likelihood of teenage pregnancy in poor urban areas, as well as crime rates in the young population.

Analyzing data from Uruguay, Cerdan-Infantes and Vermeersch (2007) investigate the impact of a full-time school program in poor urban areas on the performance of 6th graders. Using propensity score matching, the authors find a positive and significant impact of the program on standardized Portuguese and Mathematics tests. Garcia, Fernández, and Weiss (2013) investigate the impact of a full-time school program in Colombia between 2007 and 2008 on the likelihood of grade repetition and on the risk of dropping out of school before graduation. The authors restrict the analysis to families who had at least one child in a full-time school and another in a part-time school, and control the regression estimations for fixed effects on the family level. They find significant impact of the program on reducing student failure rate and dropout rate.

However, the evidence of full-time schooling in Brazil is not so encouraging. Aquino and Kassouf (2011) analyze the impact of a program that implemented full-time public schools in the state of São Paulo, starting in 2006. Using the methodologies of propensity score matching, panel data analysis, and DID, the authors find that 9th graders in full-time schools showed no significant differences in proficiency (using the state system of external evaluation, SARESP) and pass rates in comparison to those who attended traditional schools.16

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16 An important issue in the analysis is the fact that 24% of the full-time schools in 2007 went back to being part-time in 2008. In addition to making the definition of the treatment group ambiguous, the factors that led to this reversal are unclear – these factors may be correlated with outcome variables, which would distort the findings of the study.
Pereira (2011), Mendes (2011) and Almeida et al. (2016) have evaluated the federal program “More Education”, responsible for supporting states and cities in their intent to increase the number of school hours to at least 7 hours a day in public elementary, middle, and high schools in the capitals, in other cities of the nine Brazilian metropolitan areas, as well as in other cities with more than 90,000 inhabitants. Pereira (2011) uses DID methodology, designating the elementary and middle schools that had participated in the program in 2009 as the treatment group and the elementary and middle schools that only joined the program in 2010 as the control group. The author finds a significant impact of the program on the reduction of dropout rates, but no impact on performance and pass rates. Mendes (2011) reaches similar conclusions about the impact on performance and pass rates using propensity score matching methodology. Almeida et al. (2016) also use DID methodology with propensity score matching and find that the “More Education” program has on average no impacts on school dropout rates. Interestingly, they observe average negative impacts on mathematics test scores, which are stronger in the short term, and lower test scores in Portuguese and mathematics in schools choosing the fields of Portuguese and/or sports in the added hours. It is important to note that the “More Education” program is substantially different from the usual full-time school model, as it supports the schools to extend the school day for only 3 days during the week, but without providing any support for infrastructure improvement or logistics, apart from additional resources for school meals and hiring assistants for developing extra activities.

5. Effects of Single-Shift on Education Results

5.A. Identification Strategy
This paper aims to measure the impact of the Single-Shift policy on student learning outcomes. We are interested in finding whether students who have attended Single-Shift schools had greater increases in their learning outcomes compared to how much they would have learned had they not attended such schools. Since we cannot observe what would have happened to these students, we need econometric strategies to estimate what happened to a control group that we will argue – after we consider their observed differences – is similar enough to the group of students who went to the treated schools.

Our identification strategy is a difference-in-differences (DID) model, with school and year fixed effects. In order to reliably estimate the effect of the Single-Shift policy, we need to evince that the estimated difference in the results between the treated and the control groups is not coming from any other intrinsic unobservable characteristic that affects their results. That is, we need to demonstrate that, after we control for the observable characteristics, our identification strategy allows us to estimate the impact coming from the experience of the students that attend Single-Shift schools.

The DID strategy compares the results of the schools that became Single-Shift in the years after that school became Single-Shift, with the results of such schools prior to becoming Single-Shift. The DID then takes the difference between the increase in this treated group and the increase of the control group. We analyze the results using three control groups: The first control group is formed by schools that never became Single-Shift until 2015. The second control group is formed only by schools that became Single-Shift in 2014 or 2015. Since we are restricting the sample to schools that eventually became Single-Shift, this second analysis goes only from 2005 to 2013 (instead of 2005 through 2015), so the treatment is compared to schools that are not yet Single-Shift. The reason for restricting the control group to schools that eventually became Single-Shift...
is that these schools that were chosen to become Single-Shift may have intrinsic characteristics that could affect their results. If this is true, the results may reflect the effect of these intrinsic characteristics, rather than the impact of the Single-Shift policy. The third control group is formed by schools with a low proportion of students with more than two years of school delay. We showed, in Table 5, that there was a change in the student population in the treated schools, decreasing the age-grade distortion. If schools with a lower proportion of students with school-delay have on average higher increases, the increase in results of treated schools may be upwardly biased when compared to schools with a higher proportion of students with school delay.

The main model is presented in equation (1) below:

\[
\text{Outcome}_{it} = \beta_0 + \beta_1 \text{School}_i + \beta_2 \text{Year}_t + \beta_3 \text{Single-Shift*Post}_{it} + \\
\beta_4 \text{Schools of Tomorrow}_{it} + \beta_5 \text{More Education}_{it} + \\
\beta_6 \text{Mean # of items in the house}_{it} + \beta_7 \% \text{Mothers with higher ed}_{it} + \\
\beta_8 \text{Age-grade distortion}_{it} + \beta_9 \text{Participation rate in standardized test}_{it} + \epsilon
\]

Where \(i\) refers to school and \(t\) refers to year, from 2005 through 2015 (except for the analysis of schools that eventually became Single-Shift, when \(t\) goes from 2005 through 2013). We use two outcomes in our models: the IDEB and the IDERio results. The more common DID model includes dummy variables for treated versus control groups, and for before and after the treatment was implemented. The model we are presenting is more restrictive than that. Instead of grouping the schools into four groups (treatment and control and before and after the intervention), when we include school fixed-effects (School) we control for all the individual characteristics that are fixed, not only whether they are in the treatment or control group. The same for the year fixed effect (Year); instead of grouping the years in before and after the intervention, we are controlling for the average trend of the outcome.

As with the regular DID model, we are interested in analyzing the interaction of being a treated variable after the intervention. The variable \(\text{Single-Shift*Post}_{it}\) represents this interaction in equation (1). It is a dummy variable that varies by school \(i\) over time \(t\). It equals one for the years after the intervention (after the school became Single-Shift), for the schools that became Single-Shift, and is zero before or when the school never becomes Single-Shift. Therefore, coefficient \(\beta_3\) in equation (1) refers to the effect of being Single-Shift, measured by the outcome results. It represents the change in the outcome of the treated schools that is above the average trend of the outcome results, and above the level of the outcome for that school, compared to the trend when schools were not exposed to the treatment.

Not all Single-Shift elementary schools are CES and not all middle schools are CMS (but all CES and all CMS are Single-Shift). Therefore, we also estimate model (1) by including a specific variable for the Ginasios (CMS*Post_{it}). The coefficients of the variables \(\text{Single-Shift*Post}_{it}\) and CMS*Post_{it} represent the change in outcome due specifically to the Single-Shift (non-Ginasio) and for the Ginasio (certified Single-Shift middle school) treatments, respectively.\(^{17}\) We do not do the same analysis for the CES because, by 2013, there were only 4 schools that were CES (and only 2 schools with complete information), and this sample only increases to 7 schools with complete information in 2014.

The model presented in equation (1) also includes controls that vary by school over time. The objective of including these variables is to control for school characteristics that are not fixed in

\(^{17}\) The triple-interaction (Ginasio Carioca*Post*Single-Shift_{it}) means exactly the same as the interaction Ginasio Carioca*Post_{it}, since all Ginasios Cariocas are Single-Shift schools.
time (and, therefore, are not controlled by the school fixed effects) and could be related with the treatment. For example, schools in poor neighborhoods (measured here by the students’ mean number of items in the house) were prioritized to participate in the program. If the number of items in the house is negatively related with the students’ achievement, a school in a neighborhood that becomes poorer could bias the results, as the effect of becoming poorer would be reflected in the Single-Shift effect. Moreover, any change in student population – as Table 5 indicates to be happening – would influence the results in treated schools. Therefore, the inclusion of the variables $\text{Mean # of items in the house}_i$, $\% \text{Mothers w/ higher ed}_i$ and $\text{Age-grade distortion}_i$ also control for these movements in student population.

We also control for other programs that include full-time classes (particularly, the “Schools of Tomorrow” and the “More Education”), since these programs may influence the results of the Single-Shift schools. The inclusion of the variable $\text{Participation rate in standardized test}$ aims to control for increases in the participation rate in treated schools, as Tables 5 and 6 show to have happened. If Single-Shift schools encourage students to participate in standardized tests, and the increase in student participation negatively influences the results, the non-inclusion of such control would downwardly bias the Single-Shift effect. On the other hand, the change in participation rate over time can be part of the full-time school effect when, for example, the Single-Shift model increases school awareness to the test. In this case, the participation may be part of the effect rather than a confounding variable. In order to deal with this possibility, we show all models with and without the controls that vary by school-over-time. Results indicate that the effects are robust to the inclusion of these variables in the model.

Another difference of this analysis to a regular DID model is that the number of observations (schools) in the treatment and control groups is different every year. In 2011, the treatment results are estimated by the number of variables that are treated in 2011 (only 3 elementary schools and 18 middle schools). In 2013, the treatment average is then estimated by the new number of treated schools – 79 elementary schools and 34 middle schools. Therefore, the coefficient $\beta_3$ represents the increase in the outcome due to the treatment in the years when the treatment is active. The schools that left the program become zero in the years after they left the treatment.

One may worry that the small number of treated schools in some years may bias the results. When we control for the year fixed-effects, we deal with any issue associated with the proportion of schools that become Single-Shift every year. However, there could be a situation that becoming a treated school earlier is associated with certain characteristics that influence the outcome. For example, if the schools that were first chosen to participate in the Single-Shift program were those that had better conditions (unobserved by the controlling variables), then the results estimated using the 2011 treatment might overestimate the effect of the Single-Shift program. In order to deal with this issue, we also estimate equation (2) below. The schools that left the treatment are not included in this second analysis. In the analysis of model (2), we do not distinguish the Single-Shift schools that are in the “Carioca” models or not – CES and CMS versus other non-certified Single-Shift schools – given the small sample sizes of each of these subgroups.

\[
\begin{align*}
\text{(2) Outcome}_i = & \beta_0 + \beta_1 \text{School}_i + \beta_2 \text{Year}_i + \beta_3 \text{Single-Shift in 2011}*\text{Post 2011}_i + \\
& \beta_4 \text{Single-Shift in 2012/3}*\text{Post 2012/3}_i + \\
& \beta_5 \text{Schools of Tomorrow}_i + \beta_6 \text{More Education}_i + \\
& \beta_7 \text{Mean # of items in the house}_i + \beta_8 \% \text{Mothers w/ higher ed}_i +
\end{align*}
\]

18 The standardized tests are Prova Brasil when the outcome is the IDEB and Prova Rio when the outcome is the IDERiô.
\[ \beta_9 \text{Age-grade distortion} + \beta_{10} \text{Participation rate in standardized tests} + \epsilon \]

Figures 6 and 7 show the trends in IDEB results for the early (first through 5th) and later (6th through 9th) grades of fundamental education, respectively. The figures present the IDEB results for the three groups used in the analyses. The schools that became Single-Shift in 2011 and the schools that became Single-Shift in 2012 or 2013 are both treatment groups. In the model presented in equation (1), their effect is estimated together, and in the model presented in equation (2) they are estimated separately.

These figures allow us to analyze the common trend assumption, a necessary condition for the estimation of the DID model. The common trend assumption posits that the average change in the comparison group represents the counterfactual change for the treatment group in absence of the treatment. In order to verify if our control group represents a reliable counterfactual, we need to observe whether the trend prior the treatment took effect was similar to the control, indicating that the observed change in fact comes from the Single-Shift policy.

**FIGURE 6**

Notes: The Single-Shift program started in 2011. In 2013, there were 95 elementary Single-Shift schools, but 16 did not have complete information over time. Of the 79 left, five left the program. Source: INEP & MSE. Control group refers to schools that did not become Single-Shift until 2015 or that left the Single-Shift program.
FIGURE 7

Notes: The Single-Shift program started in 2011. In 2011, there were 18 Single-Shift middle schools, 8 Single-Shift non-CMS and 10 CMS. Of these, 16 had complete information. In 2012-2013, 20 new schools became Single-Shift: 6 non-CMS and 14 CMS. Of these, 3 left the Single-Shift program. Source: INEP & MSE. Control group in this figure refers to schools that did not become Single-Shift until 2015 or that left the Single-Shift program.

Table 7 shows a regression analysis for the common trend assumption. Specifically, it estimates the difference between the Single-Shift schools and the control schools over time. In column (1), we estimate the difference between the schools that became Single-Shift in 2011 and the control schools (that did not become Single-Shift neither in 2011 nor in 2012/2013) over time. That is, we check whether we observe any difference between the treatment and control prior to the introduction of the policy, in 2007 and 2009, and after the introduction of the policy, in 2011. Column (2) estimates a similar model for the schools that became Single-Shift in 2012/2013. In addition, column (3) estimates the difference over time between those schools that became Single-Shift in 2011 and those that became Single-Shift in 2012/2013 (it compares the treatment groups). In column (1), we only observe a difference between the treatment and the control in 2011, the first year of the policy. This is an important finding, suggesting that the control is a good one to estimate the impact of the policy. Moreover, it is interesting to note that in 2013, the difference between treatment and control becomes insignificant, indicating that the main effect of the policy happened in the first year of its implementation.

Column (2) also provides evidence that our control fulfills our assumption of common trends. We only observe a significant result in 2013, the year when the policy comes into action for this group. Column (3) then shows that schools that joined the program in 2011 do not have unobserved characteristics that significantly change their results compared to schools that entered afterwards.
Moreover, we only observe a significant difference in 2011, the year when the policy took effect for the first group.

Table 7: Testing Common Trend Assumption - IDEB Elementary Schools

|                                | (1) IDEB Elem (SD) | (2) IDEB Elem (SD) | (3) IDEB Elem (SD) |
|--------------------------------|--------------------|--------------------|--------------------|
| Single-Shift 2011*Post 2007    | 0.099              |                    | 0.022              |
|                                | [0.421]            | [0.379]            |                    |
| Single-Shift 2011*Post 2009    | -0.591             |                    | -0.553             |
|                                | [0.425]            | [0.387]            |                    |
| Single-Shift 2011*Post 2011    | 1.355              |                    | 1.133              |
|                                | [0.233]***         |                    | [0.219]***         |
| Single-Shift 2011*Post 2013    | -0.031             |                    | -0.291             |
|                                | [0.292]            |                    | [0.269]            |
| Single-Shift 2012/13*Post 2007 |                    | 0.074              |                    |
|                                |                    | [0.073]            |                    |
| Single-Shift 2012/13*Post 2009 |                    | 0.039              |                    |
|                                |                    | [0.103]            |                    |
| Single-Shift 2012/13*Post 2011 |                    | 0.066              |                    |
|                                |                    | [0.090]            |                    |
| Single-Shift 2012/13*Post 2013 |                    | 0.301              |                    |
|                                |                    | [0.084]***         |                    |
| Constant                       | -0.851             | -0.894             | -0.962             |
|                                | [0.023]***         | [0.021]***         | [0.051]***         |
| Observations                   | 2670               | 3096               | 462                |
| Number of schools              | 445                | 516                | 77                 |
| R-squared                      | 0.6                | 0.6                | 0.66               |
| School FE                      | Yes                | Yes                | Yes                |
| Year FE                        | Yes                | Yes                | Yes                |

* significant at 10%; ** significant at 5%; *** significant at 1%. Notes: IDEB Low Fundamental Education 2005, 2007, 2009, 2011, 2013 and 2015. Single-Shift schools include CES in this model. Standard errors clustered in school level.

Table 8 is similar to Table 7, but analyzes middle school outcomes. Column (1) shows that schools that became Single-Shift in 2011 had slightly higher results in 2007, compared to control schools. The difference is not statistically significant in 2009 and then we see the jump associated with the policy in 2011 and 2013. Differently from the elementary school comparison, we continue to observe a significant difference between the treatment and control in 2013 and 2015, 2 to 4 years after the policy was first implemented, suggesting that the effect did not fade out over time.

Column (2) of Table 8 shows the differences between the schools that received the treatment in 2012 and 2013 and the control group (those that were not Single-Shift in any of the analyzed years). The coefficients do not indicate any significant difference between the treatment and control groups prior to the treatment implementation, only after. Finally, column (3) of Table 8 shows the difference between those schools that started to be Single-Shift in 2011 and those that...
started in 2012 or 2013. The differences between the schools that started in different years are not significant in any of the years, suggesting that there was no significant difference (after controlling for observed differences) in trends between the schools that received the Single-Shift policy in the first year of the policy compared to those that received it later. This result is particularly interesting considering the fact that the first year of the policy received extra attention for being an “experimental” program.

|                          | (1) IDEB Mid (SD) | (2) IDEB Mid (SD) | (3) IDEB Mid (SD) |
|--------------------------|-------------------|-------------------|-------------------|
| Single-Shift 2011*Post 2007 | 0.408 [0.209]*    | 0.149 [0.193]     |
| Single-Shift 2011*Post 2009 | 0.075 [0.221]     | 0.211 [0.262]     |
| Single-Shift 2011*Post 2011 | 0.664 [0.248]*** | 0.270 [0.266]     |
| Single-Shift 2011*Post 2013 | 0.534 [0.194]*** | -0.241 [0.168]    |
| Single-Shift 2012/13*Post 2007 | 0.204 [0.158]     |
| Single-Shift 2012/13*Post 2009 | -0.214 [0.276]    |
| Single-Shift 2012/13*Post 2011 | 0.295 [0.260]     |
| Single-Shift 2012/13*Post 2013 | 0.865 [0.127]**   |
| Constant                 | -0.528 [0.032]***| -0.537 [0.032]***| -0.838 [0.095]***|
| Observations             | 1854              | 1860              | 198               |
| Number of schools        | 309               | 310               | 33                |
| R-squared                | 0.44              | 0.42              | 0.67              |
| School FE                | Yes               | Yes               | Yes               |
| Year FE                  | Yes               | Yes               | Yes               |

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%
Notes: IDEB High Fundamental Education 2005, 2007, 2009, 2011, 2013 and 2015.
Single-Shift schools include CMS in this model. Standard errors clustered in school level.

5.B. Results
Tables 9 and 10 present the results of model (1) for the IDEB and IDERio early years, respectively. Column (1) of these tables shows the results controlling only for whether the schools are part of the programs “Schools of Tomorrow” and “More Education”, in addition to the school and time fixed effects. They compare the Single-Shift schools (including those in the model of CES) with
the control schools. Column (2) includes controls for items in the house, mothers’ education, participation rate in *Prova Brasil/Prova Rio* and age-grade distortion. Column (3) restricts the sample to only schools that eventually became Single-Shift schools, in years 2007 through 2013. Finally, column (4) restricts the sample to only schools with low age-grade distortion in 2010 (the year prior to the start of the Single-Shift program). We consider schools with less than 18 percent of age-grade distortion in 2010 as having low distortion in early grades. Eighteen percent is the median of the age-grade distribution in 2010.

The results presented in Tables 9 and 10 show overall positive effects for the Single-Shift policy in early grades. However, these results lose significance when we restrict the sample to schools that already had low age-grade distortion prior to 2011. The coefficient presented in Table 9, column (2), for example, indicates that schools that became Single-Shift increased their results by 0.264 standard deviation in years when the policy was active compared to the schools that did not receive this policy. Using IDERio as the outcome, Table 10 column (2) indicates an increase of 0.276 standard deviation. This increase is above the average trend in IDEB/IDERio results, and after controlling for other policies that happened simultaneously and for students’ characteristics. In Table 9, the positive impact of the Single-Shift policy on IDEB increases when we compare the treatment only to other elementary schools that eventually became Single-Shift, as shown in Column (3). In Table 10, however, the result of column (3) is not statistically different from zero, suggesting that, when we look only to schools that eventually became Single-Shift, the relevant increase in the treated schools happened mostly in comparison to their result in 2007 (and the IDERio started to be measured in 2009). Moreover, the results presented in column (4) of Tables 9 and 10 are not statistically significant, suggesting that a great part of the effect in the Single-Shift elementary schools comes from the change in student population and the decrease in age-grade distortion.

Table 11 shows the results of model (1) on the components of IDEB; Prova Brasil Portuguese (columns 1 and 2), Mathematics (columns 3 and 4) and approval rate in elementary education (columns 5 and 6). Columns (1), (3) and (5) show the regression results with only municipal and time fixed effects and controlling for whether the schools are also part of the programs “Schools of Tomorrow” and “More Education.” Columns (2), (4) and (6) show the results after including the school-by-year control variables. Table 11 indicates that the positive results of the elementary Single-Shift schools come both from an improvement in Portuguese and Math test results as from an improvement in approval rates.

Tables 12 and 16 show the results for the model presented in equation (2) in elementary and middle schools, respectively. That is, we estimate the effect of the Single-Shift schools separately for those that became Single-Shift in 2011 (the first year of the program) and for those that entered the program afterwards. Interestingly, Table 12 shows that not only all elementary Single-Shift schools observed a positive increase in IDEB results, but also those schools that entered the program earlier had a higher increase. The last column (column (3) of Table 12) presents the results for the restricted sample of schools that eventually entered the program. There is only one school with low age-grade distortion in 2010 (prior to the program) that became Single-Shift in 2011, so we could not estimate the model restricting the sample to low distortion schools.

The model presented in column (2) of Table 12 – which controls for the programs “Schools of Tomorrow” and “More Education” and for school-by-time variables – indicates that elementary schools that entered the program in 2012 or 2013 observed a positive increase of 0.219 standard deviation in relation to those schools that did not participate in the program until 2013. This result is very close to the ones we find in Tables 9 and 10. In addition, Table 12 indicates that those
schools that became Single-Shift in 2011 observed a positive increase in the order of 0.784 standard deviation compared to the control group.

The greater effects in the first group of elementary Single-Shift schools can have three possible interpretations. First, schools that were initially selected into the program had particular unobserved characteristics that were important for the effect, which we show in Table 7 that this does not seem to be the case. Second, the program was better implemented in the first group of schools. Third, the program loses impact when it is expanded. However, if we can say that the policy had an effect in elementary school students, the fact that we observe positive and significant results for those schools that entered in 2012 and 2013 indicates that this impact also happened in its “expanded version.”

|                      | (1) IDEB Elem (SD) | (2) IDEB Elem (SD) | (3) IDEB Elem (SD) | (4) IDEB Elem (SD) |
|----------------------|-------------------|-------------------|-------------------|-------------------|
| Single-Shift * Post  | 0.432             | 0.264             | 0.333             | 0.127             |
|                      | [0.064]**         | [0.062]**         | [0.131]**         | [0.104]**         |
| School of Tomorrow   | -0.006            | -0.043            | 0.096             | 0.021             |
|                      | [0.072]           | [0.067]           | [0.151]           | [0.137]           |
| More Education       | 0.025             | 0.003             | 0.002             | 0.011             |
|                      | [0.037]           | [0.035]           | [0.093]           | [0.056]           |
| Mean items in the house | 0.074          | 0.112             | 0.037             |                   |
|                      | [0.019]**         | [0.048]**         | [0.029]           |                   |
| % Mothers w/ HE      | 0.341             | 0.621             | 0.416             |                   |
|                      | [0.139]**         | [0.333]**         | [0.201]**         |                   |
| Participation rate-Prova Brasil Elem | 0.045 | -0.011 | 0.055 |
|                      | [0.020]**         | [0.071]           | [0.035]           |                   |
| Age-grade distortion | -0.027            | -0.016            | -0.032            |                   |
|                      | [0.003]**         | [0.007]**         | [0.006]**         |                   |
| Constant             | -0.903            | -0.802            | -1.175            | -0.736            |
|                      | [0.021]**         | [0.154]**         | [0.387]**         | [0.239]**         |
| Observations         | 3114              | 2690              | 368               | 1430              |
| Number of schools    | 519               | 538               | 92                | 286               |
| R-squared            | 0.61              | 0.53              | 0.54              | 0.55              |
| School FE            | Yes               | Yes               | Yes               |                   |
| Year FE              | Yes               | Yes               | Yes               |                   |
| Restricted Sample    | No                | No                | Yes               | Yes               |

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: IDEB Elementary Schools 2005, 2007, 2009, 2011, 2013 and 2015. Columns (2) and (4) refer to years 2007 through 2015. Column (3) refers to only schools that eventually become Single-Shift until 2015, in years 2007 through 2013. Column (4) refers to only schools with low age-grade distortion in 2010 (prior to the program). Single-Shift includes CES in this model. By 2013, there were 77 non-certified Single-Shift schools and 2 CES (with complete information). Clustered standard errors in school level.
### Table 10: Single-Shift & IDERio Elementary

|                         | (1) IDERio Elem | (2) IDERio Elem | (3) IDERio Elem | (4) IDERio Elem |
|-------------------------|-----------------|-----------------|-----------------|-----------------|
|                         | (SD)            | (SD)            | (SD)            | (SD)            |
| Single-Shift * Post     | 0.436           | 0.276           | 0.033           | 0.180           |
|                         | [0.063]***      | [0.069]***      | [0.100]         | [0.136]         |
| School of Tomorrow      | 0.189           | 0.25            | 0.323           | 0.349           |
|                         | [0.065]***      | [0.067]***      | [0.121]***      | [0.137]***      |
| More Education          | 0.001           | 0.009           | 0.161           | -0.108          |
|                         | [0.034]         | [0.035]         | [0.090]*        | [0.048]**       |
| Mean items in the house |                 |                 |                 |                 |
|                         | 0.026           | -0.035          | 0.023           |                 |
|                         | [0.023]         | [0.036]         | [0.037]         |                 |
| % Mothers w/ HE         | -0.067          | 0.113           | 0.062           |                 |
|                         | [0.138]         | [0.252]         | [0.199]         |                 |
| Participation rate-Prova Rio 3rd grade | -0.433 | -0.333 | -0.593 |           |
|                         | [0.118]***      | [0.245]         | [0.206]***      |                 |
| Age-grade distortion    | -0.029          | -0.018          | -0.038          |                 |
|                         | [0.003]***      | [0.009]**       | [0.007]***      |                 |
| Constant                | -0.582          | 0.091           | -0.046          | 0.257           |
|                         | [0.023]***      | [0.184]         | [0.345]         | [0.298]         |
| Observations            | 4557            | 3605            | 455             | 1974            |
| Number of schools       | 651             | 515             | 91              | 282             |
| R-squared               | 0.46            | 0.49            | 0.38            | 0.45            |
| School FE               | Yes             | Yes             | Yes             | Yes             |
| Year FE                 | Yes             | Yes             | Yes             | Yes             |
| Restricted Sample       | No              | No              | Yes             | Yes             |

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: IDERio in Elementary Schools from 2009 to 2015. Column (3) refers to only schools that eventually become Single-Shift until 2015, in years 2009 through 2013. Column (4) refers to only schools with low age-grade distortion in 2010 (prior to the program). The info on number of goods in the house and mother education is from Prova Brasil (and imputed in other years). Single-Shift includes CES in this model. By 2013, there were 77 non-certified Single-Shift schools and 2 CES with complete information. Standard errors clustered in school level.
# Table 11: Components of IDEB Elementary schools

|                                | (1)     | (2)     | (3)     | (4)     | (5)     | (6)     |
|--------------------------------|---------|---------|---------|---------|---------|---------|
|                                | Prova Brasil-Port Elem (SD) | Prova Brasil-Port Elem (SD) | Prova Brasil-Mat Elem (SD) | Prova Brasil-Mat Elem (SD) | Approval rate-Elem | Approval rate-Elem |
| Single-Shift * Post            | 0.227   | 0.134   | 0.237   | 0.153   | 0.038   | 0.023   |
|                                | [0.058]** | [0.062]** | [0.060]*** | [0.065]*** | [0.006]** | [0.005]*** |
| School of Tomorrow             | -0.077  | -0.073  | -0.019  | -0.027  | 0.01     | 0.003   |
|                                | [0.057]  | [0.058]  | [0.068]  | [0.069]  | [0.006]  | [0.005]  |
| More Education                 | 0.014   | 0.029   | 0.029   | 0.041   | 0.006    | -0.002  |
|                                | [0.035]  | [0.036]  | [0.035]  | [0.036]  | [0.003]** | [0.003]  |
| Mean items in the house        | 0.032   | 0.051   | 0.051   | 0.005   | 0.005    | 0.005   |
|                                | [0.020]  | [0.019]*** | [0.002]*** |         |          |         |
| % Mothers w/ HE                | 0.376   | 0.36    | 0.36    | 0.004   | 0.004    | 0.004   |
|                                | [0.138]*** | [0.139]*** | [0.139]*** | [0.010]  |          |         |
| Participation rate-Prova Brasil Elem | 0.000   | 0.021   | 0.021   | 0.005   | 0.005    | 0.005   |
|                                | [0.019]  | [0.019]  | [0.019]  | [0.002]** |          |         |
| Age-grade distortion           | -0.014  | -0.012  | -0.012  | -0.002  | -0.002   | -0.002  |
|                                | [0.003]*** | [0.003]*** | [0.003]*** | [0.000]*** |          |         |
| Constant                       | -0.685  | -1.006  | -1.039  | -1.155  | 0.877    | 0.932   |
|                                | [0.020]*** | [0.154]*** | [0.019]*** | [0.150]*** | [0.002]*** | [0.013]*** |
| Observations                   | 3114    | 2690    | 3114    | 2690    | 3114     | 2690    |
| Number of schools              | 519     | 538     | 519     | 538     | 519      | 538     |
| R-squared                      | 0.67    | 0.67    | 0.72    | 0.65    | 0.18     | 0.21    |
| School FE                      | Yes     | Yes     | Yes     | Yes     | Yes      | Yes     |
| Year FE                        | Yes     | Yes     | Yes     | Yes     | Yes      | Yes     |
| Restricted Sample              | No      | No      | No      | No      | No       | No      |

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: Prova Brasil Portuguese & Math 5th Grade. Approval rate index from 1st through 5th grades. Years analyzed: 2007, 2009, 2011, 2013 and 2015. Single-Shift includes CES in this model. Standard errors clustered in school level.
### Table 12: Model 2 - Single-Shift & IDEB Elementary

|                          | (1) IDEB Elem (SD) | (2) IDEB Elem (SD) | (3) IDEB Elem (SD) |
|--------------------------|--------------------|--------------------|--------------------|
| **Single-Shift in 2011*Post 2011** | 0.98               | 0.784              | 0.719              |
|                          | [0.404]**          | [0.431]*           | [0.379]*           |
| **Single-Shift in 2012/13*Post 2012** | 0.392              | 0.219              | 0.282              |
|                          | [0.065]***         | [0.064]***         | [0.130]***         |
| **School of Tomorrow**   | -0.021             | -0.058             | 0.057              |
|                          | [0.073]            | [0.068]            | [0.153]            |
| **More Education**       | 0.029              | 0.006              | 0.004              |
|                          | [0.038]            | [0.036]            | [0.094]            |
| **Mean items in the house** | 0.078             | 0.114              |
|                          | [0.020]***         | [0.047]**          |
| **% Mothers w/ HE**      | 0.35               | 0.566              |
|                          | [0.139]**          | [0.329]*           |
| **Participation rate-Prova Brasil Elem** | 0.042             | -0.021             |
|                          | [0.020]**          | [0.072]            |
| **Age-grade distortion** | -0.027             | -0.015             |
|                          | [0.003]***         | [0.007]**          |
| **Constant**             | -0.89              | -0.825             | -1.191             |
|                          | [0.021]***         | [0.158]***         | [0.388]***         |

| Observations | 3036 | 2625 | 368 |
| Number of schools | 506 | 525 | 92 |
| R-squared | 0.61 | 0.53 | 0.54 |
| School FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| Restricted Sample | No | No | Yes |

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: IDEB Elementary Schools 2005, 2007, 2009, 2011, 2013 and 2015. Column (2) refers to years 2007 through 2015. Column (3) refers to only schools that eventually become Single-Shift until 2015, in years 2007 through 2013. There is only one school with low age-grade distortion in 2010 (prior to the program) that became Single-Shift in 2011, so we could not analyze restricting the sample to low-distortion schools. Single-Shift includes CES in this model. By 2013, there were 77 non-certified Single-Shift schools and 2 CES (with complete information). Clustered standard errors in school level.

Tables 13 and 14 present results of model (1) on IDEB and IDERio for middle schools. Columns (1) of these tables present results for certified and non-certified Single-Shift schools as separate variables, controlling for school and time fixed-effect, and for “Schools of Tomorrow” and “More Education” programs. Columns (2) control for student characteristics and participation rate in Prova Brasil. Columns (3) restrict the sample to schools that eventually became Single-Shift until 2015, on the results until 2013. Finally, columns (4) restrict the sample to schools with low age-grade distortion in 2010. We consider schools with less than 37 percent of students with school 2-year delay as having low distortion in high fundamental education level. Thirty-seven percent is
the median value of the 2010 age-grade distortion in high FE in Rio de Janeiro, which means that we cut our sample in half to consider only the schools that had low distortion prior to 2011.\textsuperscript{19} The results presented in Tables 13 and 14 indicate very positive effects for the certified CMS schools on IDEB and IDERio results, respectively. Even after including all controls, Carioca Middle Schools had an increase of 0.806 standard deviations in IDEB results (column (2) of Table 13) and of 0.681 standard deviations on IDERio results (column (2) of Table 14). Columns (3) show a smaller but still significant and positive results for the CMS when we restrict our sample to schools that eventually became Single-Shift. Columns (4) also show positive and significant when we restrict our sample to low age-grade distortion schools. Single-Shift non-CMS schools, on the other hand, have a non-significant impact on IDEB results. Columns (3) and (4) of Tables 13 and 14 show even negative results for these non-certified Single-Shift middle schools.\textsuperscript{20} Table 15 then analyzes the components of IDEB middle school results. Columns (1), (3) and (5) show the results with school and year fixed-effects, and controlling for whether the schools participated in “Schools of Tomorrow” and “More Education” programs in the years when they were part of these programs. Columns (2), (4) and (6) show the results including all controls. The results for Carioca Middle Schools indicate that the observed increase in IDEB comes from an increase in both student performance and approval rates. No results in Table 15 were statistically significant for the Single-Shift non-certified middle schools.

Table 16 presents the results for model (2) in Single-Shift middle schools (including CMS and non-CMS Single-Shift middle schools), with IDEB as the outcome variable. Columns (1) and (2) of Table 16 show the results of Single-Shift middle schools that entered the program in 2011 and that entered the program in 2012 and 2013 controlling for school and year fixed effects and other controls that vary over time. The coefficients of Table 16 indicate that not only the schools that entered the program earlier but also those schools that entered the program in 2012 and 2013 had positive increases in IDEB. As shown in column (2), in the model including all controls, the schools that entered the program in the first year had an increase of 0.566 standard deviation in IDEB results. The schools that entered the program later had a similar increase in standard deviations.

Columns (3) and (4) show the results considering the restricted samples. The results of column (3) – which restricts the sample to only schools that eventually entered the program until 2015 – are not statistically significant, which is probably due to the fact that only 7 new middle schools entered the Single-Shift program in 2014 or 2015 and they were all non-certified middle schools. Note that the schools that entered the program in 2014/2015 are the control group in column (3). When we restrict the sample to schools with low age-grade distortion, as presented in column (4) of Table 16, the results are positive and significant, either for those that entered the program in 2011 as for those that entered in 2012 or 2013. These results are interesting in telling us that not only the pilot CMS (Carioca “Experimental” Middle Schools) observed positive results, the expansion of the policy was also very successful in increasing IDEB results.

\textsuperscript{19} We also estimated – as an additional robustness check – a model considering as treatment only the Single-Shift middle schools (certified and non-certified) with a low decrease in age-grade distortion. The Single-Shift schools with an increase higher than 10 percentage points in age-grade distortion were considered as control group. Ten percentage points represents the median decrease of age-grade distortion in the treatment schools. We find similar results, with positive and significant (slightly smaller) coefficients for CMSs and non-significant results for non-certified Single-Shift middle schools.

\textsuperscript{20} Column (3) of Table 13 presents the estimated effect of -0.300 standard deviation (statistically significant at 1%) and column (4) presents the estimated effect of -0.340 standard deviation (statistically significant at 10%). The other coefficients for the non-certified Single-Shift middle schools are not significantly different from zero.
Table 13: Ginasio Carioca & IDEB Middle Schools

|                           | (1) IDEB Mid (SD) | (2) IDEB Mid (SD) | (3) IDEB Mid (SD) | (4) IDEB Mid (SD) |
|---------------------------|-------------------|-------------------|-------------------|-------------------|
| Carioca Middle School * Post | 1.454 [0.125]*** | 0.806 [0.110]*** | 0.410 [0.130]*** | 0.958 [0.149]*** |
| Single-Shift * Post       | 0.153 [0.157]     | 0.011 [0.133]     | -0.300 [0.109]***| -0.318 [0.244]    |
| School of Tomorrow        | 0.138 [0.088]     | 0.026 [0.090]     | -0.505 [0.109]***| 0.092 [0.126]     |
| More Education            | 0.101 [0.053]*    | 0.090 [0.090]***  | 0.262 [0.074]    | 0.1 [0.074]       |
| Mean items in the house   | 0.184 [0.033]***  | 0.296 [0.058]***  | 0.104 [0.050]**  |                   |
| % Mothers w/ HE           | 0.087 [0.243]     | -1.199 [0.438]*** |                   | -0.106 [0.379]    |
| Participation rate-Prova Brasil Mid | 0.009 [0.034] | -0.037 [0.062] | 0.012 [0.051]    |                   |
| Age-grade distortion      | -0.023 [0.003]***| -0.018 [0.004]*** | -0.023 [0.004]***|                   |
| Constant                  | -0.543 [0.032]*** | -0.412 [0.293]    | -1.482 [0.531]***| -0.063 [0.469]    |
| Observations              | 1956              | 1635              | 164               | 820               |
| Number of schools         | 326               | 327               | 41                | 164               |
| R-squared                 | 0.46              | 0.49              | 0.79              | 0.43              |
| School FE                 | Yes               | Yes               | Yes               | Yes               |
| Year FE                   | Yes               | Yes               | Yes               | Yes               |
| Restricted Sample         | No                | No                | Yes               | Yes               |

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Notas: IDEB Middle Schools 2005, 2007, 2009, 2011, 2013 and 2015. Columns (2) to (4) refer to years 2007 through 2015. Column (3) refers to only schools that eventually become Single-Shift until 2015, in years 2007 through 2013. Column (4) refers to only schools with low age-grade distortion in 2010 (prior to the program). Clustered standard error in school level.
Table 14: Ginasio Carioca & IDERío Middle Schools

|                          | (1) IDERío Mid (SD) | (2) IDERío Mid (SD) | (3) IDERío Mid (SD) | (4) IDERío Mid (SD) |
|--------------------------|---------------------|---------------------|---------------------|---------------------|
| Carioca Middle School * Post | 1.044 [0.092]***    | 0.681 [0.100]***    | 0.376 [0.120]***    | 0.861 [0.174]***    |
| Single-Shift * Post      | 0.022 [0.129]       | -0.096 [0.114]      | -0.042 [0.105]      | -0.340 [0.187]*     |
| School of Tomorrow       | 0.151 [0.079]*      | 0.108 [0.081]       | -0.066 [0.119]      | 0.202 [0.129]       |
| More Education           | 0.074 [0.035]**     | 0.063 [0.034]*      | 0.067 [0.068]       | 0.111 [0.049]**     |
| Mean items in the house  |                     |                     |                     |                     |
|                          | 0.093               | 0.105               | 0.088               |                     |
| % Mothers w/ HE          | 0.017 [0.021]***    | -0.551 [0.035]***   | -0.042 [0.033]***   |                     |
| Participation rate-Prova Rio 7th year | 0.861 [0.183]***    | 0.801 [0.379]**     | 0.744 [0.280]***    |                     |
| Age-grade distortion     | -0.014 [0.003]***   | -0.004 [0.005]      | -0.014 [0.004]***   |                     |
| Constant                 | -1.088 [0.026]***   | -1.784 [0.214]***   | -2.165 [0.409]***   | -1.721 [0.321]***   |
| Observations             | 2345                | 2204                | 190                 | 1113                |
| Number of schools        | 335                 | 315                 | 38                  | 159                 |
| R-squared                | 0.73                | 0.74                | 0.83                | 0.75                |
| School FE                | Yes                 | Yes                 | Yes                 | Yes                 |
| Year FE                  | Yes                 | Yes                 | Yes                 | Yes                 |
| Restricted Sample        | No                  | No                  | Yes                 | Yes                 |

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Notas: IDERío in Middle Schools from 2009 to 2014. Column (3) refers to only schools that eventually become Single-Shift until 2015, in years 2009 through 2013. Column (4) refers to only schools with low age-grade distortion in 2010 (prior to the program). The info on number of goods in the house and mother education is from Prova Brasil (and imputed in the years without Prova Brasil, starting in 2009). Standard errors clustered in school level.
## Table 15: Components of IDEB Middle schools

|                              | (1)  | (2)  | (3)  | (4)  | (5)  | (6)  |
|------------------------------|------|------|------|------|------|------|
|                              | Prova Brasil-Port Mid (SD) | Prova Brasil-Port Mid (SD) | Prova Brasil-Mat Mid (SD) | Prova Brasil-Mat Mid (SD) | Approval rate-Mid | Approval rate-Mid |
| Carioca Middle School * Post | 1.023 | 0.757 | 1.193 | 0.768 | 0.087 | 0.031 |
|                              | [0.124]*** | [0.138]*** | [0.163]*** | [0.161]*** | [0.011]*** | [0.010]*** |
| Single-Shift * Post          | 0.172 | 0.099 | -0.011 | -0.087 | 0.014 | 0.000 |
|                              | [0.158] | [0.157] | [0.171] | [0.160] | [0.017] | [0.014] |
| School of Tomorrow           | 0.095 | -0.007 | 0.103 | 0.004 | 0.017 | 0.01 |
|                              | [0.113] | [0.114] | [0.106] | [0.111] | [0.011] | [0.011] |
| More Education               | -0.025 | -0.014 | 0.018 | 0.026 | 0.017 | 0.014 |
|                              | [0.057] | [0.059] | [0.055] | [0.055] | [0.006]*** | [0.006]*** |
| Mean items in the house      | 0.137 | 0.122 | 0.122 | 0.015 | 0.015 | 0.015 |
|                              | [0.033]*** | [0.032]*** | [0.004]*** | [0.004]*** | [0.004]*** | [0.004]*** |
| % Mothers w/ HE              | -0.112 | 0.202 | -0.019 | 0.003 | 0.002 | 0.002 |
|                              | [0.267] | [0.260] | [0.032] | [0.032] | [0.032] | [0.032] |
| Participation rate-Prova Brasil Mid | -0.015 | -0.019 | 0.003 | 0.003 | 0.003 | 0.003 |
|                              | [0.030] | [0.032] | [0.032] | [0.032] | [0.032] | [0.032] |
| Age-grade distortion         | -0.008 | -0.012 | -0.002 | -0.002 | -0.002 | -0.002 |
|                              | [0.004]** | [0.004]*** | [0.000]*** | [0.000]*** | [0.000]*** | [0.000]*** |
| Constant                     | -0.679 | -1.305 | -0.098 | -0.995 | 0.792 | 0.879 |
|                              | [0.029]*** | [0.281]*** | [0.031]*** | [0.296]*** | [0.004]*** | [0.032]*** |
| Observations                 | 1956  | 1635  | 1956  | 1635  | 1956  | 1635  |
| Number of schools            | 326   | 327   | 326   | 327   | 326   | 327   |
| R-squared                    | 0.41  | 0.34  | 0.34  | 0.4   | 0.52  | 0.59  |
| School FE                    | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |
| Year FE                      | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |
| Restricted Sample            | No    | No    | No    | No    | No    | No    |

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: Prova Brasil Portuguese & Math 9th Grade. Approval rate index from 6th through 9th grades. Years analyzed: 2005, 2007, 2009, 2011, 2013 and 2015. Columns (2), (4) and (6) refer to years 2007 through 2015. Standard errors clustered in school level.
Table 16: Model 2 - Single-Shift & IDEB Middle Schools

|                                | (1) IDEB Mid (SD) | (2) IDEB Mid (SD) | (3) IDEB Mid (SD) | (4) IDEB Mid (SD) |
|--------------------------------|-------------------|-------------------|-------------------|-------------------|
| Single-Shift 2011*Post 2011    | 1.204             | 0.566             | 0.004             | 0.834             |
|                                | [0.186]**         | [0.130]**         | [0.147]**         | [0.156]**         |
| Single-Shift 2012/13*Post 2012 | 1.011             | 0.566             | 0.009             | 0.656             |
|                                | [0.182]**         | [0.114]**         | [0.154]**         | [0.335]*          |
| School of Tomorrow             | 0.064             | -0.017            | -0.599            | 0.081             |
|                                | [0.099]           | [0.095]           | [0.123]**         | [0.137]           |
| More Education                 | 0.095             | 0.088             | 0.169             | 0.12              |
|                                | [0.055]*          | [0.054]           | [0.082]**         | [0.074]           |
| Mean items in the house        | 0.18              | 0.296             | 0.113             |                  |
|                                | [0.032]**         | [0.060]**         | [0.052]**         |                  |
| % Mothers w/ HE                | 0.243             | -0.401            | 0.036             |                  |
|                                | [0.240]           | [0.493]           | [0.383]           |                  |
| Participation rate-Prova Brasil Mid | 0.004  | -0.053            | -0.02             |                  |
|                                | [0.034]           | [0.052]           | [0.051]           |                  |
| Age-grade distortion           | -0.025            | -0.03             | -0.025            |                  |
|                                | [0.003]**         | [0.005]**         | [0.004]**         |                  |
| Constant                       | -0.544            | -0.287            | -1.051            | -0.053            |
|                                | [0.032]**         | [0.285]           | [0.517]**         | [0.482]**         |
| Observations                   | 1926              | 1610              | 164               | 800               |
| Number of schools              | 321               | 322               | 41                | 160               |
| R-squared                      | 0.46              | 0.49              | 0.77              | 0.43              |
| School FE                      | Yes               | Yes               | Yes               | Yes               |
| Year FE                        | Yes               | Yes               | Yes               | Yes               |
| Restricted Sample              | No                | No                | Yes               | Yes               |

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: IDEB Middle Schools 2005, 2007, 2009, 2011, 2013 and 2015. Columns (2) and (4) refer to years 2007 through 2015. Column (3) refers to only schools that eventually become Single-Shift until 2015, in years 2007 through 2013. Column (4) refers to only schools with low age-grade distortion in 2010 (prior to the program). Single-Shift includes CMS in this model. Clustered standard error in school level.

Finally, Table 17 summarizes all results. It specifically shows the results presented in columns (2) of Tables 9 through 16, with the complete sample including all controls. As presented in Table 17, the results for elementary and middle Single-Shift schools are overall positive and statistically significant across different specifications. They are consistent across different grades (IDEB uses Prova Brasil that tests 5th and 9th grades, and IDERio uses Prova Rio that tests 3rd and 7th grades), and come not only from the first cohort that participated in the program, but also from the program expansion. Moreover, the increases seem to be coming not only from better pass rates, but also from improvements in student performance.
## Table 17: Summary of Results

|                      | IDEB | Prova Brasil Port | Prova Brasil Math | Approval rate | IDERio |
|----------------------|------|-------------------|-------------------|---------------|--------|
| **Elementary Schools** |      |                   |                   |               |        |
| Single-Shift (CES & non-certified) | 0.26*** | 0.13*** | 0.15*** | 0.02*** | 0.28*** |
| Became Single-Shift in 2011 | 0.78*  | 0.13*** | 0.15*** | 0.02*** | 0.28*** |
| Became Single-Shift in 2012-13 | 0.22*** | 0.13*** | 0.15*** | 0.02*** | 0.28*** |
| **Middle Schools**     |      |                   |                   |               |        |
| Carioca Middle Schools | 0.81*** | 0.76*** | 0.77*** | 0.03*** | 0.70*** |
| Single-Shift (non-certified) | 0.01  | 0.10  | -0.09  | 0.00  | -0.08  |
| Became Single-Shift in 2011 | 0.57*** | 0.10  | -0.09  | 0.00  | -0.08  |
| Became Single-Shift in 2012-13 | 0.57*** | 0.10  | -0.09  | 0.00  | -0.08  |

Notes: Results from Tables 9 through 16. DID models including fixed-effects and municipal-by-time controls. Non-restricted sample.

However, the effect of the elementary Single-Shift schools is not robust to the restricted sample of schools with low age-grade distortion. This finding suggests that most of the increase we find in Single-Shift elementary schools come from the change in the student population, which artificially decreases the age-grade distortion and, therefore, artificially increases its results. Moreover, in contrast to the Carioca middle schools, which showed very positive results independently of when they entered the program, Single-Shift middle schools that do not follow the CMS model do not seem to have any impact on IDEB and IDERio results.

These analyses suggest that the Single-Shift model is successful in influencing student performance. However, just having 7 hours for the students does not seem to have the same positive impact on student performance without the organization of what is done in these 7 hours, such as teachers with 40 hours of dedication to the school, teacher training, and curriculum. While we cannot contrast the certified versus non-certified Single-Shift elementary schools, our results make clear that for middle schools, the structured model is notably relevant.

### 6. Conclusion

This study adds to the literature on the impact of full-time schools in developing countries. The results found in the existing literature do not indicate conclusive effects for the full-time school model; more time in school does not necessarily translate into student learning and performance. In Brazil particularly, more time in school with the federal program “More Education” is associated with negative effects in mathematics and Portuguese, as presented in Almeida et al. (2016). Aquino and Kassouf (2011) also find that 9th graders in full-time schools in São Paulo showed no significant differences in proficiency and pass rates in comparison to those who attended traditional schools.

In contrast, this study finds that when this extra time is organized with a structured curriculum, full-time teachers and a focused teacher training, it may have a significant impact on student achievement. The main difference between Rio’s certified Single-Shift schools and other full-time schools is the requirement that all teachers in the participating schools are fully dedicated to a single school. Other programs, such as the São Paulo full-time school model, extended the school...
day by adding new curricular activities in the second-shift (“counter-shift”) of the school day. The “More Education” program also added new activities to extend the school day, but in a less structured way than the São Paulo state and Rio de Janeiro municipal full-time programs. The Single-Shift model of Rio Municipality exemplifies the difference between a non-structured full-time school program and a structured one. Using similar methodologies as other studies — specifically, difference-in-differences estimates with municipal and time fixed effects and restrictive municipal-over-time controls — our results indicate that just extending the school day does not grant positive impacts on student performance if that is not also coupled with the pedagogical possibilities allowed by having full-time teachers. We find strong and robust positive results for the certified Single-Shift program in high fundamental education (FE) levels, but non-significant results for the Single-Shift high FE non-certified schools.

We could not differentiate the effect of certified versus non-certified low FE schools, given the small sample of certified elementary Single-Shift schools. In contrast to the CMS, the CES did not require all teachers to be full-time in a single school. We find that the positive results of the overall Single-Shift program in the early grades become statistically insignificant when we restrict our sample to schools with low age-grade distortion, suggesting that the Single-Shift program in elementary schools was not as successful as in the certified middle schools.

Finally, the activities established as distinctive features of the CES and CMS programs were intended to impact student learning and management of human and non-human resources, considering that a better-managed school is more likely to provide an enhanced learning environment. Rio’s Single-Shift schools were certified when all the teaching staff dedicated 40 hours of their weekly working hours to a single school (in CES this characteristic was set as a goal, rather than a requirement). This characteristic of the certified model transformed several other school components (teachers’ working hours, curricular guidelines, etc.), leading to a successful improvement in student learning, particularly in the middle school model.
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