The Impact of a One Laptop per Child Program on Learning Evidence from Uruguay

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Making Impact Evaluation Matter: Better Evidence for Effective Policies and Programs

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Motivation

- In recent years many countries have made substantial investments in One Laptop per Child (OLPC) programs, while others are about to start implementation (e.g. Mexico).

- As Plan Ceibal implemented in Uruguay, these programs have the objective to promote digital inclusion among schoolchildren, as well as improve educational quality through bringing technology into the classroom.

- Although relatively abundant, the literature on the effects of the use of computers on educational outcomes is still mixed.

Main objectives

- Estimate learning impacts of Plan Ceibal on math and reading
- Analyze if there are heterogeneous effects according to socio-economic context


Trópico de Cáncer
Golfo de México
MÉXICO
Mar Caribe
AMÉRICA DEL NORTE
VENEZUELA
COLOMBIA
Ecuador
ÁFRICA
MALÍ
Meridiano cero
BRASIL
AMÉRICA
PERÚ
DEL SUR
BOLIVIA
Trópico de Capricornio
15°
200.000 kms2
ARGENTINA
OCÉANO PACÍFICO
OCÉANO ATLÁNTICO
30°
Círculo Polar Antártico
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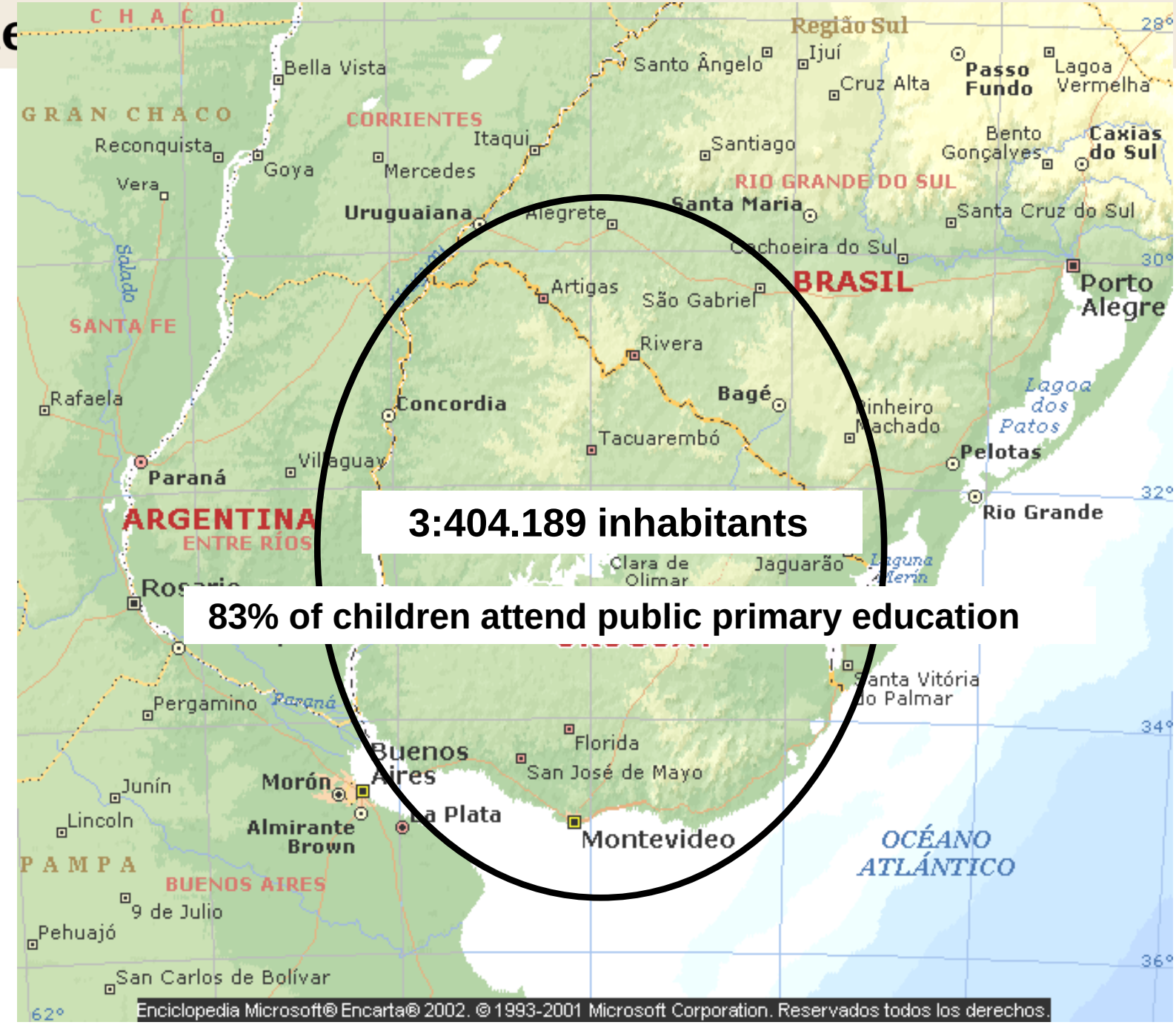

Plan Ceibal

- **Public pupils and teachers are provided with a laptop and internet access** (the first program on a national scale).

- The initiative was launched in a pilot province in 2007. **By October 2013**, Plan Ceibal had distributed **one million laptops to** approximately **625,000 students**, with an estimated **cost of 180 dollars per laptop**.

- Originally this plan was in primary but in recent years it was extended to secondary education. Pupils who where given laptops (XO) while in primary school are encouraged to exchange it for better Ceibal laptops during junior high.

- Students take the **laptops home** and **can often access internet through the school's or through other public places**' signal (such as public squares).

Plan Ceibal

- Right from the start **optional courses** were available for teacher training (in-person and online).

- Training was **only compulsory for school inspectors and teachers who applied as external consultants** to support schools in the incorporation of laptops in the teaching process (Maestros Dinamizadores).

- **Recent progress**:
    - Ceibal support teachers
    - Online assesments
    - Adaptive mathematical platform
    - English using Ceibal laptops

Data

- We employed a **panel of students**.
- The **first wave corresponds to the SERCE evaluation** (Segundo Estudio Regional Comparativo y Explicativo) designed by UNESCO and implemented **in October 2006**. Third grade in primary. The **second wave corresponds to the V Evaluación Nacional de Aprendizajes** carried out in **October 2009** by the National Educational Authorities (ANEP).
- From **6222 students** in public schools that had participated in the SERCE evaluation, **2645 also participated** in National Evaluation of 2009. By that time, the majority was attending the **last year of primary school**, but those who had **repeated a grade were also evaluated in 2009**.

Data

- Student identification numbers and full names were available for schools that participated in the October 2009 evaluation.
- **This enables us to match 92% of students in public schools** who were both evaluated in 2006 and 2009, with the administrative records of Plan Ceibal**, and know the exact date in which each student received his/her laptop.**
- By the end of 2009, all primary school students had received their laptops but while some had been **exposed to the program for almost two years**, others had been treated for **less than a month**.

Data

Percentage of students by date of laptop receipt and geographic area

	Rest of the country			Montevideo		
	2007	2008	2009	2007	2008	2009
January		0.35%				
February						
March			0.04%			
April		3.73%	9.91%		0.04%	
May		7.94%	5.03%			
June		9.03%	0.18%			7.52%
July		2.85%				11.21%
August		0.00%	0.11%		4.29%	13.15%
September		3.20%	0.11%		0.04%	8.05%
October		4.18%	0.04%			0.14%
November		4.89%				
December	3.90%	0.11%				
Total	3.90%	36.27%	15.40%		4.36%	40.07%

Note: The delivery date includes day, month and year. For the purpose of this table observations are aggregated by month and year.

- The government decided to begin distributing laptops in the rest of the provinces and end up in the capital, Montevideo, in order to **shift the focus which has always favored centralism**.

Identification strategy

- We exploit the three facts:

  1. laptops were delivered **between the time of evaluations**

  2. the **distribution criterion was geographic** and not based on the academic performance of schools

  3. we **observe laptop hand-in dates for almost every student in the panel** and **there is some within school variation** in hand-in-dates.

- We **generate a continuous treatment variable** where days of exposure (normalized to years) reflect the **intensity of treatment**.

Methodology and results

- We start by estimating an individual fixed effects model:

$$Y_{ist} = \beta_1 T_{ist} + X_{ist}\gamma + \delta_t + c_i + u_{ist}$$

	Montevideo and rest of the country						Excluding Montevideo
Reading							
Treatment (days of exposure normalized to years)	0.0428	0.0350	0.0320	0.0319	0.0337	0.0313	0.0590
	(0.058)	(0.059)	(0.059)	(0.059)	(0.058)	(0.058)	(0.083)
Observations	4,114	4,114	4,114	4,114	4,114	4,114	2,338
Number of students	2,057	2,057	2,057	2,057	2,057	2,057	1,169
Math							
Treatment (days of exposure normalized to years)	0.1632***	0.1619***	0.1613***	0.1604**	0.1632***	0.1623***	0.1543
	(0.062)	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)	(0.104)
Observations	4,160	4,160	4,160	4,160	4,160	4,160	2,338
Number of students	2,080	2,080	2,080	2,080	2,080	2,080	1,169
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of persons at house (time-varying)	No	Yes	Yes	Yes	Yes	Yes	Yes
Number of rooms at home (time-varying)	No	No	Yes	Yes	Yes	Yes	Yes
Drinkable water at home (time-varying)	No	No	No	Yes	Yes	Yes	Yes
Durable goods at home variables (time-varying)	No	No	No	No	Yes	Yes	Yes
Work (time-varying)	No	No	No	No	No	Yes	Yes

Evidence of regional changes across time:

Seniority (% teachers with less than 5 years of experience)	2005-2006-2007
Montevideo*Year 2006	-1.252**
	(0.470)
Montevideo*Year 2007	-4.999***
	(0.601)
Observations	6,551
Number of schools	2,340
Time dummies	Yes
School fixed effects	Yes

Standard errors are clustered at the province level.

*** p<0.01, ** p<0.05, * p<0.1

Source: own estimates using Monitor Educativo (ANEP).

Methodology and results

- We relax the common trend assumption and allow each school to follow a different learning growth curve over time due to unobservable time-varying heterogeneity:

$$Y_{ist} = \alpha + \beta_1 T_{ist} + X_{ist}\gamma + \delta_t + \pi_s \times \delta_t + c_i + u_{ist}$$

- We run an alternative specification where we allow for different growth curves over schools located in Montevideo and the rest of the country:

$$Y_{ist} = \beta_1 T_{ist} + X_{ist}\gamma + \delta_t + Montevideo \times \delta_t + c_i + u_{ist}$$

Reading							
Treatment (days of exposure normalized to years)	-0.0544	-0.0142	0.0104	0.0029	-0.0008	-0.0027	-0.0664
	(0.413)	(0.410)	(0.398)	(0.398)	(0.406)	(0.398)	(0.101)
Observations	4,114	4,114	4,114	4,114	4,114	4,114	4,114
Number of students	2,057	2,057	2,057	2,057	2,057	2,057	2,057
Math							
Treatment (days of exposure normalized to years)	-0.1658	-0.1561	-0.1582	-0.1620	-0.1513	-0.1601	0.0394
	(0.353)	(0.359)	(0.353)	(0.355)	(0.355)	(0.353)	(0.094)
Observations	4,160	4,160	4,160	4,160	4,160	4,160	4,160
Number of students	2,080	2,080	2,080	2,080	2,080	2,080	2,080
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
School-time dummies	Yes	Yes	Yes	Yes	Yes	Yes	No
Montevideo-time dummy	No	No	No	No	No	No	Yes

Why Plan Ceibal does not seem to have an impact on reading and math?

In 2009 the use of laptops in class was not widespread across all public schools.

	In your reading classes: How often do you use the laptop?	In your math classes: How often do you use the laptop?
Every day or almost every day	37.6%	26.0%
One up to three times per week	38.0%	25.4%
Less than once per week	24.3%	48.6%

Source: V Evaluación Nacional de Aprendizajes, ANEP 2009, weighted.

Students use their laptops in class mostly to search information from internet:

	School	Home
Search information in the internet	67.5%	40.1%
Write a text	13.1%	5.0%
Spreadsheet	0.2%	0.0%
Calculator	0.8%	0.2%
Send emails	1.3%	1.9%
Play	11.5%	38.6%
Chat	2.7%	8.6%
Other	2.9%	5.6%

Source: V Evaluación Nacional de Aprendizajes, ANEP 2009, weighted.

Final remarks

- In the study we used a panel data analysis strategy to evaluate the impact of Plan Ceibal (the only OLPC program implemented at a national scale) on reading and math scores.

- We had the exact date of laptop delivery for more than 90% of pupils. This date varied within schools so it was possible to control for divergent learning growth curves among schools.

- Our results suggest that the plan did not have an impact on reading or math. These results are in line with most of the literature about the impacts of computers on learning, especially programs with no guidance.

Final remarks

- The fact that the use of laptops in classrooms is not generalized and that they are mainly used to search for information on the internet, provides some ideas about why no impact on math or reading is found.

- In the last few years Plan Ceibal has taken on board aims associated with improving learning, incorporating many programs that help teachers use the laptop in class. The students analyzed in this study received their laptops when Plan Ceibal had just started and, thereby, did not benefit from the recent changes in the program while in primary school.

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