



# Play to Learn and Learn to Play: Evaluation of One Laptop per Child Program in Costa Rica

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# Motivation

- World Bank Group (2012): “ICT’s have great promise to reduce poverty, increase productivity , boost economic growth, and improve accountability and governance.
- Computers are now entering the classrooms as an effort to instruct students in these skills.

- 2.4 million laptops across 44 countries have been distributed as part as the One Laptop per Child (OLPC) initiative.
- Little empirical evidence of the overall effects of the OLPC program.



# Mission

- The mission of the OLPC program is to “provide means for learning, self-expression, and exploration.”
- Main Objective of OLPC: Provide unprivileged kids with the opportunity to access new information and communication technologies through the provision of a laptop computer.

# The XO Laptop

- SUGAR operative system
- Linux software
- Camera
- Microphone
- USB ports
- Wi-Fi
- Speakers
- Anti-theft system
  
- Cost per unit: \$20



# Logic Model

<b>Inputs</b>	<b>Activities</b>	<b>Outputs</b>	<b>Short-Term Effects</b>	<b>Mid and Long-Term Effects</b>
Laptops	Guided laptop use in school	Use of laptop in class	Increase in laptop usage	Changes in motivation to finish school
Infrastructure			Laptop used for different topics	Changes in occupational aspirations
Teacher Training	Non-guided laptop use outside of school	Use of laptop outside of school	Changes in time allocation	Changes in migration choices
Maintenance			Changes in test scores	Changes in Occupation
Support			Changes in technology skills	Changes in Income

# Evaluation of OLPC Costa Rica

- Short-Term Evaluation: Baseline from 2012 and 1 year post-intervention.
  - 1 Determine the intensity of use and specific uses given to the computers.
  - 2 Study how the laptop affects the intra-household relations and time expenditures.
  - 3 Examine performance through Test Scores.
- Mid-Term Evaluation: On planning stages for a new round of data collection in 2016 or 2017.

# Outline

- The Conectándonos Program in Costa Rica
- Data Collection
- Empirical Strategy
- Results and Conclusion



# Selection of Schools

- 1 The schools that had computer labs were excluded.
- 2 Very small schools and very big schools were excluded.
- 3 The 4 districts that had more than 3 eligible schools were selected.
- 4 Since the NGO prioritized the success of the follow-up visit scheme over the evaluation design, the schools selected for year 1 were chosen to facilitate the weekly logistics, **not randomized.**

A map of Costa Rica showing its geographical outline and internal regional boundaries. The map is colored in light yellow and light blue. Several red dots are scattered across the central and eastern parts of the country, representing the locations of 15 treatment and 19 control schools. The text 'Map of Costa Rica' is overlaid on the lower-left portion of the map.

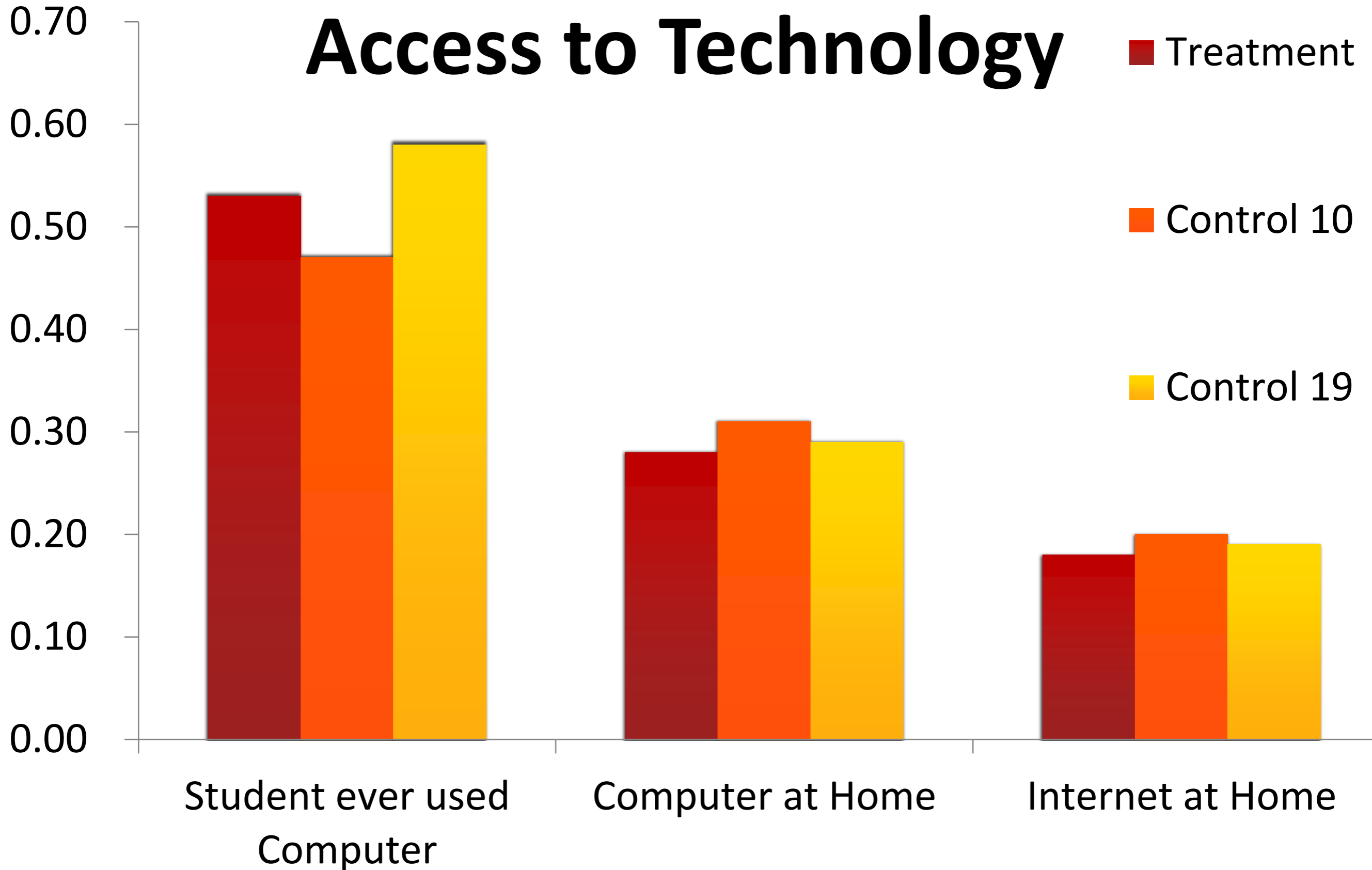
# Map of Costa Rica

- **15 Treatment &**
- **19 Control Schools**

# Baseline Data Collection

- Baseline questionnaires were applied to 15 treatment and 19 control schools, which represent the population of schools.
- Student Questionnaire: Computer usage intensity and specific uses, time allocation.
- Parent Questionnaire: Socio-demographic information, computer usage, time allocation.

# Access to Technology



# Table 1 Baseline Characteristics - Information from Parents

	Treatment	Control
Number of Household Members	4.97 (1.75)	4.93 (1.75)
Number of Kids in the Household	1.99 (1.16)	1.86 (1.22)
Computer usage of the Student	1.89 (0.50)	1.99 (0.49)
Computer usage of other members	4.28 (8.76)	3.90 (8.20)
Hours of Student Outdoors	6.78 (6.77)	5.22 (5.43)
Hours of Student on Homework	6.14 (3.88)	5.55 (5.12)

## Table 2 Baseline Characteristics - Information from Students

	Treatment	Control
Hours of Computer Usage at Home	1.85 (3.88)	2.22 (4.77)
Hours of Computer Usage Outside	0.60 (1.89)	1.41 (3.14)
Observations	1113	1393



# 1 Year Follow-Up Data Collection

- Gathered the first week of school of the 2013 school year. Graduating 6<sup>th</sup> graders were surveyed in November 2012. Tests were added.
- Math Test is an application from the World Bank Math and Reading Student learning achievement documentation for 5<sup>th</sup> graders.
- The Cognition Test is the Wechsler Scale (WISC-R III), it consists of a set of progressive matrices for 6<sup>th</sup> graders.



# Difference in Difference Strategy

- Given that the selection of the treatment schools was not randomized, a single difference estimator between treatment and control schools would lead to biased effects of the program.
- The difference in difference estimator would wipe out any selection bias and lead to consistent estimates assuming:
  1. The time trend is the same for both groups of schools.
  2. The unobservable characteristics of the students are time invariant.

# Regression Model

$$Y_{it} = \alpha + \beta D_i + \delta T + \gamma D_i T + \phi_t X_i + \mu_i + \varepsilon_{it}$$

- $D_i$  denotes treatment status for individual  $i$
- $T$  is equal to 0 in the baseline period and 1 after one year
- $X_i$  is a matrix of baseline control variables
- $\mu_i$  considers any unobservable fixed effects for individual  $i$ .
- $\varepsilon_{it}$  is the error term for individual  $i$  in time  $t$
- $\gamma$  indicates the average treatment effect on the treated

# Findings on Weekly Computer Use

		Baseline Mean
<b>Student Survey</b>		
Weekly hours of use at home	2.705 (0.337) <sup>***</sup>	1.94 (4.20)
Weekly hours of use outside	1.769 (0.333) <sup>***</sup>	1.06 (2.85)
<b>Parent Survey</b>		
Weekly hours of use by the student	2.561 (0.344) <sup>***</sup>	2.12 (3.71)
Weekly hours of use by others	-0.258 (0.735)	4.24 (8.56)
Observations	2590	

# Findings on Specific Computer Uses

## Student Survey

Uses for Internet	0.179 (0.051)***
Uses for Homework	0.044 (0.061)
Uses for Self-Learning	0.085 (0.053)*
Uses for Reading	0.162 (0.058)***
Uses for Playing Games	0.299 (0.064)***
Observations	2590

# Findings on Weekly Time Allocation

		<b>Baseline Mean</b>
<b>Parent Survey</b>		
Hours of student doing homework	-1.059 (0.366) <sup>***</sup>	5.74 (4.48)
Hours helping student with homework	-0.296 (0.305)	5.19 (4.46)
Hours of student doing home duties	0.386 (0.324)	3.06 (4.10)
Hours of student performing outdoor activities	-0.952 (0.558) <sup>*</sup>	5.90 (6.07)
Observations	2590	

# Presence of Heterogeneous Effects

	Treatment	Treatment* Grades 1-4	Treatment	Treatment* Computer
<b>Student Survey</b>				
Weekly hours of use at home	2.927 (0.518) <sup>***</sup>	-0.458 (0.612)	2.712 (0.385) <sup>***</sup>	-0.019 (0.532)
Weekly hours of use outside	2.368 (0.435) <sup>***</sup>	-1.242 (0.445) <sup>***</sup>	1.852 (0.432) <sup>***</sup>	-0.231 (0.521)
<b>Parent Survey</b>				
Weekly hours of use by student	2.272 (0.497) <sup>***</sup>	0.599 (0.593)	2.253 (0.463) <sup>***</sup>	0.866 (0.616)
Weekly hours of use by others	-0.325 (0.793)	0.136 (0.694)	-1.133 (0.739)	2.441 (0.943) <sup>**</sup>
Observations	2590	2590	2590	2590

# School Performance Assessment

$$\text{TestScore}_i = \alpha + \beta D_i + \phi X_i + \varepsilon_i$$

## Math Test

Treatment	-5.303
	(6.636)
Observations	167

## Cognitive Test

Treatment	2.865
	(6.667)
Observations	145

# Conclusions

- This study provides evidence that the students make an intensive use of the computers for very diverse applications, thus learning computer skills.
- Counter-intuitively, no effects are found on laptop usage by other family members. However, parents that already had a computer at home do seem to share the laptop.
- Including training sessions to parents at the beginning of the school year can largely increase the benefited population.



- The program reduces the time performing outdoor activities and doing homework.
- No effects were found on test scores.
- Longer-term evaluations will help understand many effects that do not exist or are impossible to capture after only one year of the program taking place, such as changes in aspirations, education completion and labor market outcomes.

# Future Research Agenda

- The Mid-Term Evaluation will be focused on aspirational changes, motivation to complete formal schooling, and noncognitive skills.
- Technology adoption tests?

**Thank you for your comments!**