"The impact of educational reforms "

How to measure?

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Educational Production Function

"child development is a cumulative process depending on the history of family and school inputs and on innate ability"
Todd and Wolpin, 2003

$$T_{it} = f\left(Student_{it}, Family_{it}, School_{it}, T_{it-1}\right)$$

controls for unobserved input histories and for innate ability

Children of different social origin have different skills and therefore different probabilities of educational success before they even start their school career. B. Becker 2011, Br. J. Soc.
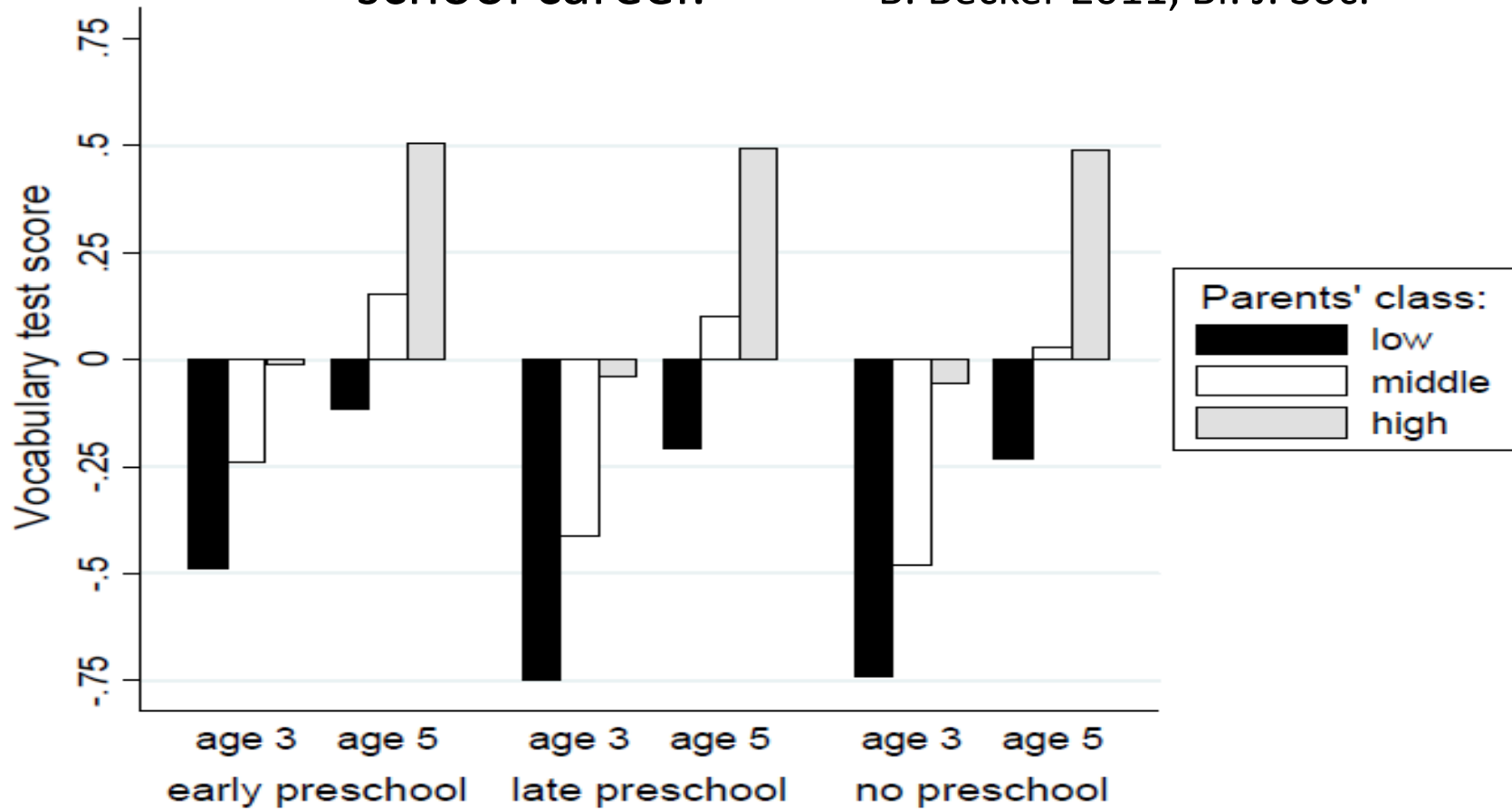
Source: UK Millennium Cohort Study, own calculations
Notes: Arithmetic means of the vocabulary test score.

How to measure the outcome of the educational process?

- Wages, employment
- Non-economic benefits:
  - better health,
  - lower probability of teenager pregnancy,
- Level of education attained (secondary, …)
- Exams scores

We always have to control for initial knowledge/ ability and also for socio-economic conditions.

Impact of education on earnings: T = earnings

More education is associated with higher expected income in the course of life. But what we want to know is:

Do people with more education earn more, on average, than if <u>they</u> had acquired less education?

- To be able to measure the **causal effect** of a given level/type of education on earnings we need data:
  - To follow the individuals until they enter into the labor market
  - To characterize the individuals:
    - Ability, socioeconomic environment, gender,..

Causal impact of education on earnings

Private Returns to higher education,Blundell et al. 2005
(men – aged 31 in 1991, NCDS, UK)

OLS		Matching		
Basic specification	**Full** specification	ATT	ATE	ATNT
39.8	28.7	26.8	31.3	33.1
(37.1; 42,5)	(27.5; 31.8)	(23.5; 31.1)	(28.7; 34.9)	(30.0; 36.7)

OLS-Basic specification: controls for ethniticity and region
OLS-Full specification and Matching: controls for ethniticity, region, parental backgroung information, tests at 7 and 11, school variables

Numbers in parentheses are 95% confidence intervals.

Higher education attainment leads to higher earnings in all the countries where this was measured. What leads to higher education attainment ?

> quantity and **quality**

School inputs or characteristics:

- School resources (books, blackboards,...)
- Class size
- Peer effects
- Teachers
- Autonomy, accountability,
- Retentions (as a strategy to deal with low attainment)

How to evaluate educational policies?

- We should establish the **causal impact** on students achievement of the specific intervention

- Compare final outcomes controlling for all the variables that may condition the policy impact:
  - Initial level of student achievement/knowledge.
  - Characteristcs of school and peers.
  - Characteristcs of class/teacher
  - Characteristcs of family, socio-economic environment

- The availability and quality of students' data are fundamental.

- Having data about the costs of the intervention is also needed to be able to compare the relative efficiency of alternative interventions.

Example: teaching programming language (scratch) to primary public school students in Lisbon.

We wanted to compare final outcomes controlling for:
- Initial level of achievement/knowledge.
- Characteristcs of school and peers.
- Characteristcs of class/teacher selected for the trial

Ideally we could use using a randomized controlled trial, with a linked process evaluation.

We would need: Large number of classes, schools and classes randomly chosen, tests applied at the beginning and the end of the experience.

Other methodologies: matching, difference on difference,…

If we don't take into account the characteristics of schools and peers the results may be totally biased.

% of students per school with mother/father
with higher education, 2012, public schools in Lisbon
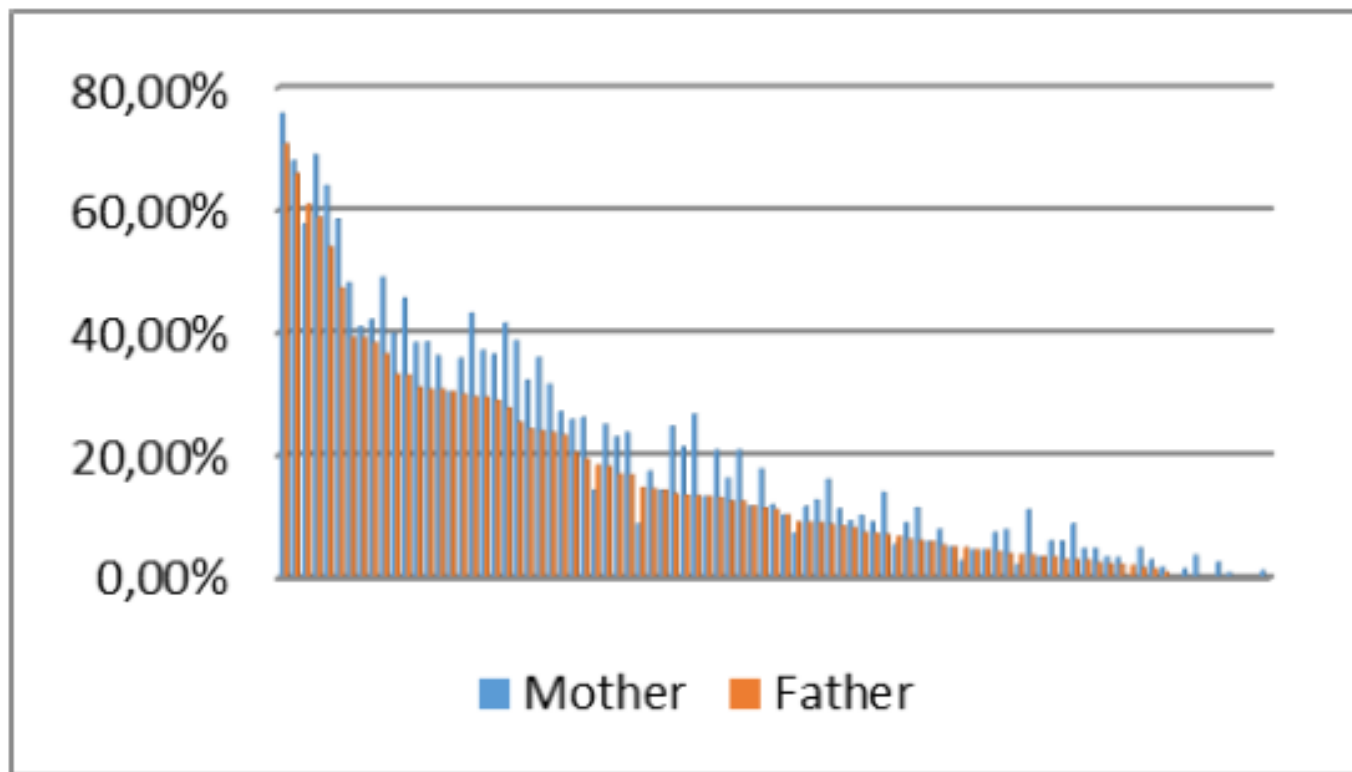
In this work, we obtain that "who are the peers" explains a large part of the difference betwen being in one school or another (school effect).

In **Stratification and peer effects: An analysis of Lisbon public schools,** Ana Rita Azevedo, Luís Catela Nunes, Ana Balcão Reis and Carmo Seabra

Is retention beneficial to low-achieving students? Evidence from Portugal

Luis Catela Nunes, Ana Balcão Reis, Carmo Seabra

Nova SBE

Work in progress, preliminary results

Objective: Compare the Impact of Promotion vs. Retention for low achieving students in the 4th grade

Impact on:
- Students' subsequent achievement:
  - Score in subsequent exams
  - Total number of retentions in a 4-year period;

Previous Empirical results are mixed
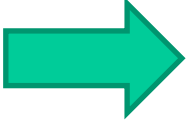
Negative effects
- Jimerson's (2001) summary of 22 empirical results published until 2001. Most studies concluded that retention did not benefit students.

Positive Results
- Allen et al. (2009): meta-analysis of post-1990 studies, found more positive results for studies with more robust designs.
- Roderick and Nagaoka (2005), and Jacob and Legfren (2004, 2009),
- Greene and Winters (2007, 2009) and Schwerdt and West, (2013), and Schwerdt Winters and West (2015)

For Portugal, Pereira and Reis (2014) using data from PISA and IVs concluded that early retention had a negative impact 3 to 5 years later.

Methodological challenge

- Retention typically reflects student´s characteristics, observed (socio-economic background, parents education…) and unobserved (ability, motivation,…)

- These characteristics also affect future achievement

   Endogeneity bias   Causality ?

- **We would like to compare similar students: some promoted, other retained**

  ➢ Randomized Experiment not possible
  ➢ Matching, IV, Regression Discontinuity

Methodology

Proposed solution: matched sample

- Consider only 4$^{\text{th}}$ Grade Students in 2006/2007 with <u>Negative Scores in both the Mathematics and Portuguese National Exams</u>.

Data

MISI (DGEEC-Ministry of Education): 2006/07– 2009/10

4th grade students in public schools in 2006/07-Linked to JNE

Variables:

- Grade
- Retention vs. Promotion
- Year of Birth
- Gender
- Students' and Parents' Nationality
- Parents' Academic Background
- Students' Social Support
- Internet at home
- Computer at home
- National exams' scores (4th and 6th grades)

Descriptive Statistics

Population - Promoted vs. Retained		Promoted	Retained
No. of students		99,817	6,652
Males (%)		52	59
Year of Birth (%)	up to 1995 (aged 12)	8	18
	1996 (aged 11)	17	28
	1997 on (aged 10)	76	54
Students' and Mothers' Nationality (%)	Other Portuguese Speak. Countries	2 and 4	6 and 9
Mother's Academic Background (%)	Primary	43	51
	Higher	10	2
Student's Social Support (%)	Level A	12	22
Computer at home (%)		50	32
Internet at home (%)		31	19

Descriptive Statistics

Sample (2 Negatives) - Promoted vs. Retained		Promoted	Retained
No. of students		4,313	1,726
Males (%)		61	62
Year of Birth (%)	up to 1995 (aged 12)	35	13
	1996 (aged 11)	37	34
	1997 on (aged 10)	28	53
Students' and Mothers' Nationality (%)	Other Portuguese Speak. Countries	4 and 7	8 and 12
Mother's Academic Background (%)	Primary	57	55
	Higher	2	2
Student's Social Support (%)	Level A	24	24
Computer at home (%)		32	33
Internet at home (%)		16	17

Effect of Retention on performance: Scores on 6th grade

Problem: Students take the exams in different years

Distribution of scores in 6th grade exams

Portuguese	E	D	C	B	A	Total
2009	0.9	10.7	52.3	28.2	7.9	100
2010	0.7	10.9	58.2	26.2	4.0	100
2011	0.4	16.6	40.0	37.4	5.6	100

Mathematics	E	D	C	B	A	Total
2009	1.7	19.6	51.3	20.3	7.2	100
2010	1.3	21.7	47.7	20.8	8.5	100
2011	3.3	33.1	30.9	25.7	7.0	100
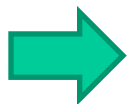
➡ We only consider exam scores in 2009 or 2010

Preliminary results:

Effect of Retention on performance:
Scores on 6th grade - Least Squares Estimation

Dependent Variable: 6th Grade Exam Score	Sample (2 Negatives)				Sub-Sample (2 Negatives and No Previous Retentions)			
	Portuguese		Mathematics		Portuguese		Mathematics	
	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value
Retained in 60/07	0.09	0.00	0.10	0.00	0.06	0.04	0.09	0.01
No previous retention	0.33	0.00	0.24	0.00				
Male	-0.13	0.00	0.01	0.64	-0.09	0.01	-0.01	0.85
Nationality: Port. speak.c.	0.07	0.31	0.08	0.26	-0.03	0.79	0.06	0.66
Mother's nat.: Port. speak.c.	0.01	0.80	-0.13	0.02	0.02	0.81	-0.10	0.21
Mother's education: Primary	-0.10	0.00	-0.03	0.32	-0.10	0.00	-0.04	0.32
Mother's education: Higher	0.11	0.15	0.08	0.35	0.14	0.21	0.15	0.20
Social support	-0.03	0.32	-0.03	0.34	-0.03	0.50	-0.02	0.59
Computer at home	0.00	0.95	0.03	0.34	-0.05	0.16	-0.05	0.19
Internet at home	0.00	0.99	-0.05	0.14	0.04	0.39	-0.01	0.81
Intercept	2.49	0.00	2.06	0.00	2.78	0.00	2.36	0.00
No. of Observations	2,830		2,829		1,246		1,246	
R-squared	0.1198		0.0538		0.0216		0.0104	

95% Confidence Intervals for Impact of Retention:

(0.04 , 0.14)   (0.05 , 0.15)   (0.00 , 0.13)   (0.02 , 0.15)

Conclusions on the evaluation of educational reforms:

Educational outcomes depend very strongly on:

i.   Previous attainment/ability

ii.   Socio-economic conditions and family background

Thus, to estimate the **causal impact** of any educational reform we need to control for these factors. This requires that:

i.   Very complete datasets are available or possible to collect.

ii.   Appropriate methodologies are applied.

This type of evaluation may also allow the identification of the most effective policies.