Teaching training, extra classes and students' achievement.

The evaluation of a new program in lower secondary schools in Italy

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Introduction

The general aim of this study is to add to the literature studying the determinants of students' achievement. In particular examining the effect of:

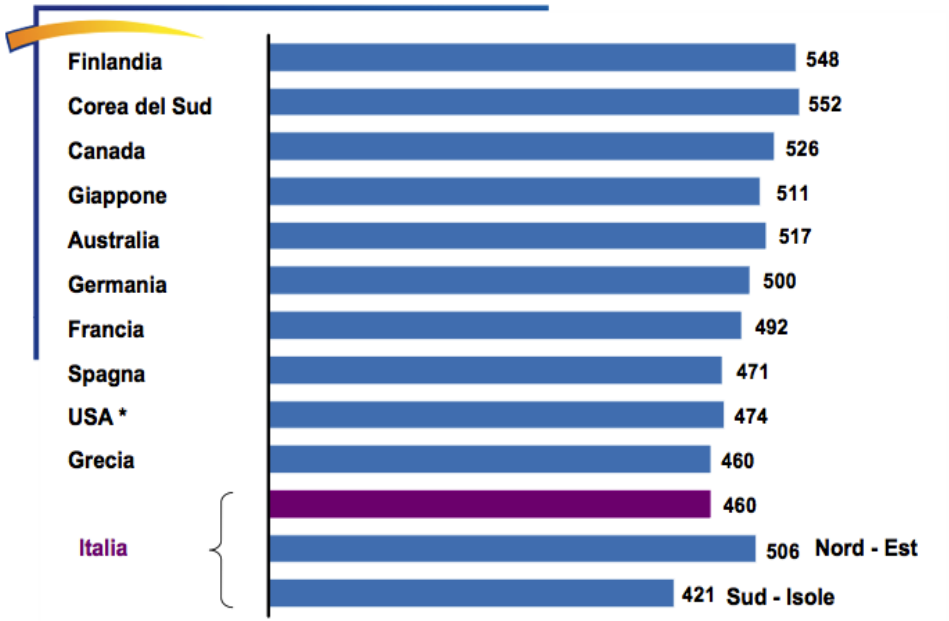
1. Teacher training.
2. Remedial and extra education (providing students with more hours of lectures).

Indeed we are studying the effect on students' achievement of a program, called PQM (Progetto Qualità e Merito), which involves both teacher training and remedial and extra education.

We are analyzing the Italian context exploiting a unique dataset, containing information about schools, teachers and students, which covers the entire population of Italian lower secondary schools.

Motivation for the PQM program

- According to the Program for International Student Assessment (PISA), Italian students perform well below the OECD average in both mathematics and readings (Source: OCSE PISA 2006 Database).
- Moreover there exist differences between the regions in the North and the regions in the South (Source: OCSE PISA 2006 Database).



Aims of the PQM program

The main aim is to raise sixth grade students' test scores in mathematics and language. It targets the 4 PON regions (Apulia, Basilicata, Calabria and Sicily)

1. Teachers.
    - Training on the job.
2. Students
    - Increase school time.

PQM structure

PHASE 1, September-October 2010:

- Students enrolled in PQM classes take a test to asses their level in the involved subject (mathematics, language).

PHASE 2, November - December 2010:

- Teachers analyze the results and identify critical areas, and low achieving students.
- Teachers begin the training, and are helped organize the activities to be held both inside and outside regular school time (*Improvement plan*). Teachers are supported also with innovative material to be used in class.

PHASE 3, January - May 2011:

- Training goes on
- Implementation of the *Improvement plan*, both in regular school time and in the afternoon.

PHASE 4, May 2011

- Final test

Description and aim of the PQM program

- The training is composed by 60 hours (30 meeting, 30 on-line)
- The program is not intended to be a traditional content-focused training program, but a polyvalent training aimed at providing teachers with diagnosis instruments, didactic planning skills and didactic materials.
- The training is held in groups of 10 teachers (i.e. 5 schools), and it is supervised by a mentor who provides support in respect of their decisions about how to organize remedial and extra activities during the school year.
- The aim of the activities was either to help students who were behind to catch up with their colleagues, or to deepen the knowledge of some specific topics.

What we are estimating is the effect of providing teachers with the possibility and the support to organize remedial or extra activities in the class.

Selection of the schools

- Schools could apply to take part in the program during summer 2010. In the application schools had to point out the two teachers that would have been trained and the corresponding two sixth grade classes, taught by these teachers. Teachers were chosen by the schools directors.
- By September 2010, School Regional Offices selected the schools, basing the decision on the following criteria:
  1. Favor lower performing schools:
     - Higher percentage of drop out students.
     - Higher percentage of students that fail.
     - Higher percentage of students legging behind.
  2. Teachers not involved in other training programs.
  3. Schools not involved in the PQM program during the pilot year (2009-2010).

Timing, outcome of interest and definition of the treatment

- Starting from the school year 2009-2010 the program was piloted for mathematics and from the following school year (2010-2011), it was extended also to Italian language.
- The target population of the PQM program are students in sixth grade classes, taught by trained teachers, in selected schools in the targeted regions: South (Puglia, Campania, Sicilia, Calabria).
- Treatment status is being enrolled in a PQM class.
- The outcome of interest are sixth grade students' test scores at the end of school year 2010-2011, after one year of the program.

Data: schools and students

Data are provided by the INVALSI.

1. Schools: Administrative databases (2009-2010), which cover the entire population of Italian lower secondary schools:
   - Number of students, student\teacher ratio, budget (expenses, resources), staff composition.
   - Contextual data: exact location of the schools, population in town, size of the town,...
2. Students: Standardize test taken in all the schools at the end of sixth grade (May 2010 and May 2011).
   - Standardized test scores (mathematics and Italian).
   - Child: gender, date and place of birth, whether attended kindergarten, grades,...
   - Questions about motivation, perception of school, activities done outside school.
   - Parents: place of birth, education, occupation, home environment and household composition.

Short note on the Italian school system

- Primary school from, grade first to fifth.
- Lower secondary school, from grade sixth to eight.
- Higher secondary school, from grade ninth to thirteen. Three main different major tracks: the vocational high school, the technical high school and the academic one (Liceo)

Programs taught in primary and lower secondary schools are the same for all the students are settled by the Italian Ministry of Education.

- At the beginning of each block (primary, lower secondary and higher secondary) students are assigned to a specific class, which is called *sezione*, and they will remain in the same class for all the length of the block (i.e. 5 years in the primary school, 3 years in the lower secondary school, and 5 years in the secondary school).

Identification strategy

Propensity score matching combined with differences-in-differences.

We compare test scores of two contiguous cohorts of children, belonging to the same class (*sezione*) at the end of sixth grade, before and after the program implementation, in PQM and schools chosen as control

PS matching

- Non random selection of schools.
- We chose a control group of schools, among all the non PQM schools, which share similar observable characteristics.
- Variables used (referring to pre-program year): average test scores, student teacher ratio, proportion of permanent teachers, drop out rate, failing rate, proportion of repeating students, proportion of students attending more than 30 hours per week, average class size, number of students, proportion of foreign students, proportion of disable students, school has received other PON funds, (log)population in town,.

	PQM	Control
Number of schools	132	117
Number of treated classes	144	
Number of treated students	2832	
Number of control classes	550	600
Number of control students	11069	12705

Differences-in-differences

- D be a dummy for PQM class,
- S be a dummy for PQM schools,
- T be a dummy for post- treatment period.

We therefore rely on two control groups, one using non treated classes in treated schools, and the other using non treated schools.

$$y_{ijst} = \alpha + \beta_1 D_{ijs} * T_{ijs} + \beta_2 D_{ijs} + \beta_3 T_{ijs} + \beta_4 S_{is} * T_{is} + \gamma_S + \theta X_{ijst} + \epsilon_{ijst},$$

- y_{ijst} is the standardize test score in math or language of student i, in class (*sezione*) j, in school s and time t,
- γ_S is the school fixed effect,
- X_{ijst} is a set of control variable at the student and class level.
- ϵ_{ijst} is a random error.

The coefficient β_1 capture the DID estimates

Main assumptions

1. Common trend assumption
2. We allow teachers and students to be assigned non randomly to a given class (*sezione*) inside a school, but we assume that this non random assignment is constant trough time.

Descriptive at the school level after the matching

	PQM	Control	Difference
Italian, average test score, sixth grade	57.240	57.924	0.683
Mathematics, average test score, sixth grade	48.010	49.112	1.102
Italian, average test score, eight grade	55.012	55.322	0.310
Mathematics, average test score, eight grade	45.960	47.187	1.227
Proportion of permanent teachers	0.893	0.899	0.006
Student-teacher ratio	9.611	9.849	0.238
Number of students in the school	394.280	392.419	-1.861
Proportion of immigrant students	0.028	0.029	0.001
Proportion of disable students	0.033	0.030	-0.004
School drop out rate	0.003	0.002	-0.001
School rate of failing students	0.049	0.045	-0.004
School rate of repeating students	0.048	0.045	-0.004
School received PON funds for students'activities	0.962	0.957	-0.005
Municipality located on montain	0.280	0.256	-0.024
Proportion of female in the school	0.491	0.488	-0.003
(Log) population in town	10.344	10.201	-0.143
Proportion of students doing more than 30 hours	0.334	0.372	0.038
Class size	21.856	21.954	0.098
Number of pqm schools	132		
Number of control schools	117		

T-test for the difference in mean between the two groups. * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Effect of PQM on students' test score

	Language	Mathematics
Sezione pqm mathematics * post		0.151**
		(0.058)
Sezione pqm language * post	0.028	
	(0.050)	
Post-treatment cohort	0.114***	-0.296***
	(0.029)	(0.029)
Sezione pqm mathematics		-0.021
		(0.042)
Sezione pqm language	0.077*	
	(0.032)	
School pqm math * post		0.000
		(0.053)
School pqm language * post	-0.020	
	(0.046)	
Observations	52812	52812

Estimates at the student level, with school fixed effects. Robust standard error clusterd at the school level in parenthesis. Test scores have been standardized using baseline data. * p<0.05, ** p<0.01, *** p<0.001.
Variables included but not reported: female, foreign, ahead, behind student; parents' educational level and occupation; whether student lives with both parents, HOME scale coefficient, class size, class doing more than 30 hours per week.

Effect of PQM on students' test score, in different groups

	(1) Female	(2) Male	(3) Foreign	(4) Native
Sezione pqm mathematics * post	0.183**	0.123^{+}	-0.072	0.161**
	(0.066)	(0.066)	(0.195)	(0.059)
Post-treatment cohort	-0.321***	-0.272***	-0.340***	-0.294***
	(0.034)	(0.030)	(0.069)	(0.029)
Sezione pqm mathematics	-0.032	-0.014	0.035	-0.026
	(0.048)	(0.048)	(0.118)	(0.043)
School pqm math * post	-0.009	0.013	0.096	-0.005
	(0.061)	(0.054)	(0.152)	(0.053)
Observations	25699	27113	1560	51252

Estimates at the student level, with school fixed effects. Robust standard error clustered at the school level in parenthesis
Test scores have been standardized using pre-program data
Each column correspond to a separate regression: using just (1) females, (2) males, (3) foreigns, (4) native.
+ p <0.10, * p<0.05, ** p<0.01, *** p<0.001

Effect of PQM on students' test score, in different groups

	(5) Low edu	(6) Medium edu	(7) High edu
Sezione pqm mathematics * post	0.147*	0.122	0.169+
	(0.071)	(0.074)	(0.089)
Post-treatment cohort	-0.317***	-0.271***	-0.235***
	(0.033)	(0.043)	(0.042)
Sezione pqm mathematics	-0.031	0.005	0.006
	(0.052)	(0.056)	(0.078)
School pqm math * post	0.016	-0.023	-0.075
	(0.059)	(0.069)	(0.083)
Observations	28209	17495	7108

Estimates at the student level, with school fixed effects. Robust standard error clustered at the school level in parenthesis
Test scores have been standardized using pre-program data
Each column correspond to a separate regression: using just students whose parents have (5) low education,(6) medium education,(7) high education.
+ p <0.10, * p<0.05, ** p<0.01, *** p<0.001

Conclusions

- PQM program seems to be effective just for mathematics, not for language.
- Female, native and students's whose parents have low education seem to benefit the most out of it.
- Main limitation is that, given the structure of the program, we cannot identify the effect of spending more time at school, in terms of gain from an additional hours.
- Policy implication: these kind of programs more effective for mathematics?
- Further analysis with the second year results.

THANKS!