Teacher mobility and student learning

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Outline

Motivation

Of particular importance for education policy-makers is the possibility that teacher mobility adversely affects the quality of teaching.

Motivated teachers are typically those who have chosen to be in a given school, while dissatisfied teachers who want to transfer to another school may be poor performers

- because of general motivational factors,
- because they may be simply waiting to move on to a different location, putting low effort into their current work duties and disregarding any longer term plans for their students.

Teachers' motivation is likely to be a relevant factor affecting students' learning.

Results from previous studies ([Jackson, 2010], [Boyd et al., 2010], [Hanushek and Rivkin, 2010]) suggest that

- one reason teachers may desire to move is that they are a poor fit for their present schools,
- teachers who remain in their school tend to outperform those who leave, and
- this gap appears to be larger for schools serving predominantly low income students.

Thus, in principle a better school job matching may potentially increase productivity and student achievement both in the former and new school.

What do we do in this paper

In this paper we look at the dimension of teacher motivation by studying the link between teachers' mobility within the public school system (transfer from one school to another) and students' learning.

We do so by using data of Italian lower-secondary school students.

Italian schools are characterized by a sizable teacher turnover. Such a turnover is not totally random, as tenured teachers sistematically attempt to leave schools where teaching is likely to be more difficult because of the student mix or the social context of the school ([Barbieri, Rossetti and Sestito, 2011]).

Thus, schools serving mainly disadvantaged and minority children often end up having more turnover and teachers less experienced and possibly less motivated.

Specifically, we exploit our previous analysis of the determinants of teacher mobility where two main drivers of teacher mobility were identified, namely

- broad geographical motivation and
- factors related to the school environment.

On the one hand, both the turnover per se and the reduced motivation of teachers are expected to negatively affect students' learning.

On the other hand, teachers who end up in a given school because of their willingness to move there could have a positive impact upon students' achievements.

This paper examines the strength of these possible links, putting them in the wider debate about teachers' effectiveness and job satisfaction.

Our analysis of the relationship between teacher mobility and student learning is not the first in the international literature (see for example [Rockoff, 2004], [Hanushek, Kain and Rivkin, 2005], [Jackson, 2010], [Hanushek and Rivkin, 2010]).

Nonetheless, to our best knowledge our exercise

- is the first for Italy and for its widespread coverage, since we consider all Italian lower-secondary schools and all students enrolled there as well as all teachers working there,
- is unique in that, unlike previous research focusing on actual worker mobility, we focus on desired mobility by using teachers' transfer applications.

The data

The data used in this paper comes from

- the combination of different administrative registries of Italian schools and teachers maintained by the Italian Ministry of Education,
- data from the 2001 Italian population and housing census, and
- data from a national examination of Italian lower-secondary school students.

Administrative registries of Italian schools and teachers

- The first registry is the teachers database that contains
  - gender and date of birth of the teachers
  - the municipality where the teacher is born
  - type of contract (temporary or full tenure)
  - the seniority of tenured teachers
  - a unique anonymized teacher identifier
  - a unique anonimized identifier of the school where the teacher works

- Through the anonimized teacher identifier we were able to link the teachers database to the teachers' mobility applications registry that includes, for each tenured teacher who fills a mobility application
  - preferences given to new destinations

- Through the anonimized school identifier we were able to link the teachers registries with school registries that contain
  - the school type
  - the municipality where the school is located
  - the number of enrolled students
  - the number of foreign students
  - the number of disabled students
  - the number of students enrolled in the first year in a school having had to repeat one or more years' of study in their previous school career

These administrative data

- does not present problems which are typical of survey data, such as unit and item non-response, measurement errors and bias effects due to interaction with interviewers,
- but, relative to normal survey data, they contain very little information on socio-economic characteristics of the teachers and on their family situation.

The 2001 Italian population and housing census

We were able to link the school registries to data from the 2001 Italian population and housing census that contains information about

- gender and age composition of the resident population
- educational attainments
- labour market (such as occupational status and type of occupation)
- housing (such as household composition, characteristics of buildings and houses)

Specifically, we associated each school to

- the closest (in term of geographic distance) census sections
- such as the relevant resident population (accordingly to the school type) living in those sections contains at least k times the number of students enrolled in that particular school

where $k \geq 1$ is a multiplicative factor which guarantees overlapping of sections among different schools.

This method allows us to take into account different factors such as

- geographical distance between schools and sections
- the population density of each census section
- the peculiarity of each school type

National examination

Finally, data on student achievements are from the national examination of Italian lower-secondary school students carried out by INVALSI that contains

- test scores from two parts aimed of assessing reading ("Prova di Italiano") and math ("Prova di Matematica") ability respectively
- gender, age and nationality of the students

This data

- has the advantage that the performance of students attending the same schooling level should exhibit a higher level of comparability across different schools,
- but does not include information about students' socio-economic background and schools characteristics.

Specifically, we focus our analysis on the national examination carried out at the end of the three-year program of the Italian lower-secondary schools in 2007/2008, 2008/2009 and 2009/2010.

- For the school year 2007/2008 results from the test did not affect the grade of the students final exam.
- For the school year 2008/2009 the impact of the results from the test on the students grade was left to the judgment of each examination committee.
- For the school year 2009/2010 the results from the test accounted for one sixth of the final grade.

Our final sample consists of 6,231 different schools.

Variables

Our outcome of interest is the average student achievement in each school. Specifically, we use two alternative measures of student achievement

- the test scores in reading and
- the test scores in math.

These scores have been standardized into a range from 0 to 100, representing the percentage of right answers to the questions of the tests.

Unfortunately, we are not able to link directly data from the national examination and data from the teacher registries at the student level. Thus, since with our data the only possible link between students and teachers is the school (through the school identifier) all our variables are at the school level.

Three sets of covariates related to school characteristics and features are used to model student achievement.

The first set is related to the characteristics of the students enrolled in each school:

- the percentage of students with one year and with two or more years of study delay
- the percentage of female students,
- the percentage of foreign students either from EU or non-EU countries,
- the school's share of disabled students, and
- the share of students enrolled in the first year in a school having had to repeat one or more years of study in their previous school career.

- Because most of the foreign-born students from non-EU countries are immigrants from poor countries, a high proportion of foreign-born students from non-EU countries can be taken as an indicator of low economic background and teaching difficulties.
- The percentage of late students (both on current and previous school career) may be used as proxies for the students' educational ability, which is not directly observable from the data.

The second set is related to the characteristics of teachers working in each school:

- the percentage of teachers applying for a transfer to another school,
- the percentage of teachers who arrived in a school after their mobility application submitted in the previous period was accepted,
- the average seniority and the average age of tenured teachers,
- the percentage of female teachers, and
- the number of teachers (as a proxy for school size).

- As long as a high percentage of teachers applying for a transfer to another school may signal a dissatisfaction of these teachers with the current school, we expect a negative impact of this variable on students achievement.
- On the contrary, if the percentage of teachers who arrived in a school because they requested so may be a signal that their willingness to work there was satisfied, we expect a positive impact of this percentage on students achievement.

Data from the national examination does not include information on the student's socio-economic status. To overcome this limitation, we include a third set of covariates consisting of socio-economic census variables associated to the school catchment area:

- the employment rate,
- the share of illiterate residents, and
- the share of people occupied in agriculture in the school catchment area.

- These variables provide a description of the socio-economic context of the school, possibly reflecting the socio-economic background of the students enrolled in that school. In fact, in Italy enrollment is essentially based on the school catchment area, and mobility of students across different areas is negligible.

Finally, we included

- the student-teacher ratio computed from the teachers and schools registries,
- indicators for the geographic area where the school is located, and
- school year indicators.

Descriptive statistics

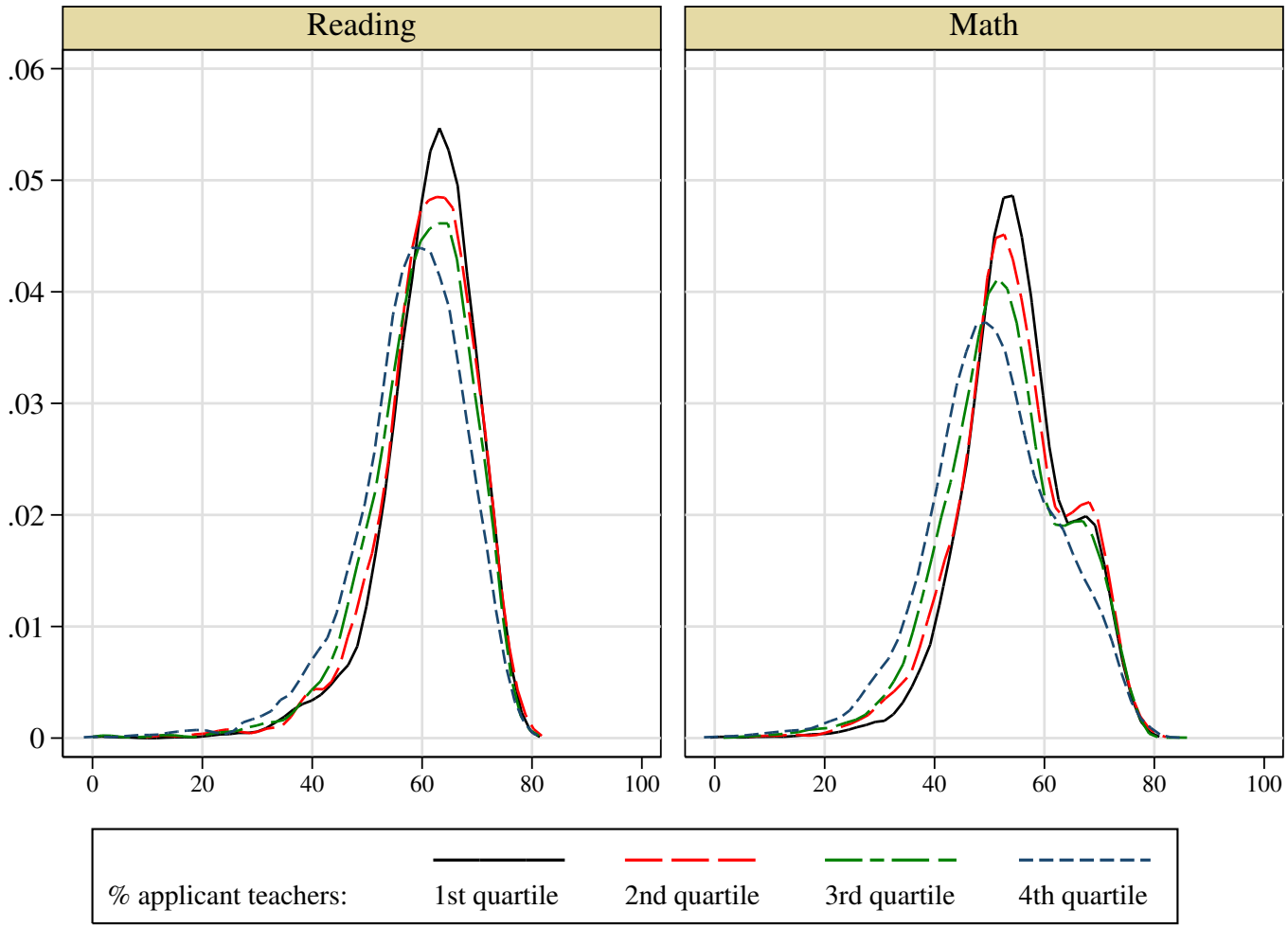
Variable	Mean	SD
Reading test score	60.480	9.656
Math test score	53.705	10.993
% teachers applying for a transfer	19.014	15.826
% teachers arrived	1.217	3.493
% 1-year delay students	7.608	5.928
% 2-year delay students	1.991	3.124
% female student	49.184	8.089
% foreign stud. from EU countries	1.668	2.946
% foreign stud. from non-EU countries	3.606	5.607
% disabled students	3.338	2.577
% previously repeating students	2.906	2.365
Average tenure	16.354	3.897
Average age of tenured teachers	50.695	4.233
% female teachers	77.125	10.196
Teachers	26.959	18.908
Student-teacher ratio	11.065	10.316
Employment rate	41.199	8.359
% illiterate residents	2.489	2.477
% agricultural workers	8.976	7.975
School in the North	0.333	0.471
School in the Centre	0.153	0.360

Schools' characteristics and students' achievements

Our aim is to identify the role of schools' characteristics in explaining students' achievements. We model average students' test scores in reading and math as a function of school characteristics and features.

Specifically, we are especially interested in those characteristics related to the mobility of teachers working in the school. In fact, the possibility that teacher mobility adversely affects the quality of teaching turns out to be of particular importance. This is especially true in the light of previous evidence showing that teachers sistematically attempt to leave schools serving mainly disadvantaged and minority children.

Kernel density of average test scores by percentage of teachers applying for a transfer to another school



In order to deal with the possible reverse channel from students' achievements (as part of the school's teaching conditions) to teachers' mobility we use an instrumental variables approach, exploiting the information on the distance between teachers' place of birth and place of work, which is

- one of the main driving forces for teacher mobility,
- but it is not expected to directly affect student achievements.

Estimated coefficients of the model for average test scores (selected variables)

	Reading		Math	
	OLS	IV	OLS	IV
% teachers applying for a transfer	-0.021 **	-0.106 **	-0.016 *	-0.090 +
% teachers arrived	0.046 *	0.510 **	0.066 **	1.024 **
% 1-year delay students	-0.112 **	-0.103 **	-0.130 **	-0.112 **
% 2-year delay students	-0.150 **	-0.145 **	-0.145 **	-0.136 **
% female student	0.009	0.009	-0.044 **	-0.042 **
% foreign stud. from non-EU countries	-0.068 **	-0.070 **	0.017	0.012
Average tenure	0.037	-0.093	0.093 **	-0.036
Number of teachers / 10	0.027	-0.457 **	0.109 *	-0.624 **
Student-teacher ratio	0.013 +	-0.020	0.011	-0.058
School in the North	3.942 **	4.134 **	5.573 **	6.488 **
School in the Centre	3.670 **	3.901 **	5.067 **	5.868 **
% disabled students	-0.329 **	-0.265 **	-0.382 **	-0.288 **
% previously repeating students	-0.110 **	-0.100 *	-0.207 **	-0.177 **
Employment rate	0.231 **	0.219 **	0.222 **	0.208 **
% illiterate residents	-0.237 **	-0.155 *	-0.207 **	-0.086
Constant	57.421 **	57.388 **	48.155 **	47.772 **
R^2	0.393	0.349	0.501	0.405

Note:+ significant at 10%, * significant at 5%, ** significant at 1%

Conclusions

Our results confirm that

- the percentage of late students (both on current and previous school career) used as proxies for (lower) students' educational ability are negatively related to both reading and math scores,
- student achievements are lower in schools serving mainly disadvantaged and minority children.

Moreover, we find that, after controlling for students' educational ability and socio-economic background,

- the share of teachers applying for a transfer to another school is negatively related to students' achievements,
- while the share of teachers arrived in a school after their request for a transfer was satisfied is positively related to students' achievements.

Of particular concern is the negative effect of teacher mobility and turnover on students' achievements in schools serving mainly disadvantaged children (teachers are typically more likely to move away from these schools).

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