School Vouchers Italian Style

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Abstract

School vouchers introduced recently in some Italian regions have lowered the cost of private schools. We study the impact of this policy in the largest Italian region, Lombardy, during the first two years since implementation. On one side, we provide evidence that Italian private schools may be selected for different reasons than quality considerations. On the other side, exploiting individual data on voucher applicants, we present evidence that the percentage of voucher applicants is higher the higher the average quality of private schools, which we explain with the fact that better quality schools provide better services to students, including information and consulting on vouchers. We show that enrolment in private schools responds sluggishly to changes in tuition induced by vouchers. Therefore, the estimated short-term impact of the policy is much smaller than the long-term effect. Under stringent assumptions, we are also able to estimate the slopes of demand and supply of private education in an Italian region, providing a quantitative assessment of the potential impact of further voucher extensions.

1. Introduction

In the current debate, the key word for school reform is INCREASING CHOICE OPPORTUNITIES.

By increasing choice, competition among schools can be enhanced.

Alternative ways to increase competition:

⇨ public funding closely tied to the number of pupils

⇨ school vouchers

⇨ develop private sector in education.

Italy is a recent comer in this wave of reform.

2. Are Italian Private Schools on Average of Better Quality than Public Schools?

Theoretical literature assume that private schools provide better quality education.

Empirical evidence on other countries is mixed:

⇨ Neal [2002] shows that Catholic private schools in US have impact on urban minorities.

⇨ Figlio and Stone, [1997] provide evidence of lower achievements in test score in religious private schools in the US.

⇨ Ladd [2002] reviews also non US evidence and shows significant differences between Catholic and non confessional private schools

⇨ Vandenberghe and Robin [2004] use the PISA dataset to examine the effect of private versus public education on pupils' achievement and conclude that private education does not generate systematic benefits.

Empirical evidence on Italy is more uniform in pointing to a lower quality effect of private education:

⇨ Bertola and Checchi [2004] argue that in Italy private schools play a remedial role. They are good at catering to the rich and lazy, possibly offering leisure and a degree for a price.

⇨ Cappellari [2004] uses data on the cohort of 1995 high school graduates from the Italian survey on High School and Beyond and shows that the probability of graduating from a private school rises with the availability of resources in the family of origin but decreases with school performance prior to high school.

⇨ Brunello and Rocco [2004] use data on the 1998 cohort of the same survey and show that enrolment in a private upper secondary school in Italy is higher – ceteris paribus – for students with lower marks in junior high school. Moreover, public school graduates are more likely to enrol in college than private school students.

ADDITIONAL EVIDENCE:

⇨ when we compare the age distribution of students according to school types we have evidence that private schools attract two different type of students: early starters in initial years and students who have been held back by repetitions (*bocciatura*).

Table 1 – Age distribution of students, by class and school types – Italy – 2001-2

	Public school			Private school		
School level	younger	regular	older	younger	regular	older
Primary school						
I	0,00%	98,31%	1,69%	3,64%	94,68%	1,68%
II	2,08%	95,76%	2,16%	15,86%	82,08%	2,06%
III	2,38%	95,03%	2,59%	16,48%	81,20%	2,32%
IV	2,48%	94,61%	2,91%	16,13%	81,47%	2,40%
V	2,82%	93,63%	3,55%	16,73%	80,76%	2,51%
Total	1,98%	95,42%	2,60%	14,09%	83,69%	2,22%
Junior high school						
I	3,65%	88,36%	7,99%	8,54%	87,10%	4,36%
II	3,79%	85,71%	10,50%	8,43%	85,66%	5,91%
III	3,91%	84,11%	11,98%	8,39%	83,76%	7,85%
Total	3,78%	86,08%	10,14%	8,45%	85,53%	6,02%
Upper secondary school						
I	3,67%	74,43%	21,90%	7,40%	67,63%	24,97%
II	4,07%	72,60%	23,33%	8,08%	65,86%	26,06%
III	4,24%	68,70%	27,06%	7,44%	57,08%	35,48%
IV	4,77%	67,60%	27,63%	7,55%	55,42%	37,03%
V	5,25%	68,99%	25,76%	6,21%	41,27%	52,52%
Total	4,32%	70,79%	24,89%	7,19%	55,15%	37,66%
Overall	*3.25%*	*84.59%*	*12.16%*	*10.33%*	*72.45%*	*17.22%*

Source: Ministero dell'Istruzione, dell'Università e della Ricerca, *Scuola non statale: indagine conoscitiva* – a.s. 2001/02, Rome 2003, table 35

⇨ from the PISA 2000 survey we study the characteristics of students enrolled in private schools, we find that they are more likely offspring of educated father, they hold higher aspirations (in terms of socio-economic index associated to the job they hope to get when out of school) and they live in richer and wealthier families. They are more likely enrolled in technical secondary schools or high schools, but they are less involved in cultural activities, and their parents are less interested in their school activity

Table 2 – Private enrolment – PISA 2000 upper secondary schools –
weighed maximum likelihood probit – marginal effects

	coeff	se	coeff	se
female	-0.011	0.01	-0.010	0.01
age	0.000	0.00	0.000	0.00
only child	0.010	0.01	0.007	0.01
father primary school	0.084***	0.02	0.050***	0.02
father lower secondary	0.099***	0.02	0.069***	0.02
father vocational	0.098***	0.06	0.069**	0.05
father upper secondary	0.088***	0.02	0.056***	0.02
father university degree	0.066***	0.01	0.033***	0.01
mother primary school	-0.024	0.01	-0.020	0.01
mother lower secondary	-0.011	0.02	-0.006	0.02
mother vocational	-0.010	0.03	-0.007	0.02
mother upper secondary	0.003	0.02	0.003	0.02
mother university degree	-0.002	0.02	0.000	0.02
socio-economic index family	0.001***	0.00	0.000*	0.00
student aspirations	0.001**	0.00	0.000	0.00
family wealth	0.026***	0.00	0.025***	0.00
family educational support	0.000	0.00	0.001	0.00
home educational resources	-0.006	0.00	-0.006	0.00
parents interested in school	-0.002***	0.00	-0.003***	0.00
student cultural activity	-0.004	0.00	-0.005*	0.00
family possession of books	0.006**	0.00	0.003	0.00
North-East	-0.046***	0.00	-0.042***	0.00
Centre	-0.049***	0.00	-0.045***	0.00
South east	-0.070***	0.01	-0.066***	0.01
technical school			0.037***	0.02
high school			0.063***	0.01
N.obs	3868		3868	
Pseudo R^2	0.23		0.25	

Note: standard error clustered by regions. one, two and three stars
for statistical significance at the 10, 5 and 1 percent level of confidence

⇨ When we compare literacy ability obtained from PISA we find that skill is significantly higher for students of public schools: keeping in mind that literacy score is standardised with mean equal to 500 and standard deviation of 100, and controlling for parental background and school climate, the literacy mean score in public school is 22-25 points higher than in private school.

⇨ Given the potential endogeneity of attending a private school, we have use instrumental variable estimation to deal with the problem. Among potential instruments we considered family wealth and cultural attention, but they do not pass the Hansen J-test for overidentifying restrictions.

⇨ On the contrary, when we introduce information about the attendance of remedial courses, the estimated model passes the test, but all coefficients exhibit some instability. In both cases, the greater magnitude of the IV estimates for the private school effect confirms that private schools tend to attract lower ability students from richer families.

Table 3 – Literacy scores based on average school characteristics –
PISA 2000 upper secondary schools – weighed ols and iv

	school averages		students (ols)		students (iv)		students (iv)	
	coeff	se	coeff	se	coeff	se	coeff	se
high school	94.87***	13.14	97.45***	4.62	121.39***	29.16	307.58	200.68
technical school	36.11***	9.84	36.09***	4.21	59.14***	13.43	172.34**	87.12
parental education (years - school average)	-5.93	4.80	-0.33	0.45	0.52	0.43	4.00*	2.35
parental socio-economic status (school avrg)	1.67	1.07	0.12	0.12	0.34***	0.10	0.96***	0.35
school size (number of students)	0.02*	0.01	0.02***	0.00	-0.05**	0.02	-0.40**	0.17
student/teacher ratio (school average)	2.50*	1.38	2.22***	0.83	3.30	5.25	4.09	34.98
lack of teachers	4.54	3.60	4.25***	1.66	17.16***	5.68	74.98*	39.33
poor quality of educational resources	-5.82*	3.22	-5.58***	1.53	-4.43	4.91	-5.77	29.50
poor quality of the school buildings	-0.08	3.48	-1.06	1.41	-10.91**	5.01	-70.84**	29.78
teacher behaviour	-0.91	3.61	-0.74	1.94	-11.91**	5.84	-62.84*	36.47
student behaviour	9.58**	4.66	9.73***	1.97	-1.56	9.59	-58.26	61.06
teacher moral	-5.23	3.25	-6.08***	2.15	8.52	9.47	68.65	65.55
private school	-25.00***	9.70	-22.04***	6.71	-311.6***	116.51	-1984.3**	851.23
city size	-6.24***	2.14	-5.97***	1.35	1.64	6.11	29.23	43.28
North-West Italy	78.95***	10.43	74.75***	4.91	113.20***	19.39	357.06***	137.31
North-East Italy	67.64***	13.21	63.38***	5.16	75.06***	16.91	132.66	95.24
Central Italy	53.06***	13.63	43.55***	4.81	38.79***	15.44	38.08	82.22
South-East Italy	15.20	10.78	11.39***	4.28	12.26	10.66	30.16	53.33
Constant	369.99***	29.38	380.50***	9.83	370.40***	35.99	412.13*	224.70
N.obs	150		4502		4457		4349	
R^2	0.80		0.36		0.02		--	
Hansen J-statistics					50.56 (0.00)		3.77 (0.43)	

Note: standard error for school estimates are heteroschedastic robust – standard errors for individual estimates are clustered at school level. One, two and three stars for statistical significance at the 10, 5 and 1 percent level of confidence. Instruments for column 3: family wealth, family educational support, home educational resources, parents interested in school, student cultural activity, family possession of books. Instruments for column 4: participation in remedial activities (see footnote 4 for exact description)

⇨ from the 1998 wave of the Multiscopo (Multipurpose) Survey conducted by the National Statistics Institute on a sample of 20153 Italian households.

We exploit a question in the survey asking the reasons why the interviewed household has enrolled one or more children in a private school. The available options include school quality (quality of teachers, quality of services provided), religious and ideological reasons, vicinity, availability of seats and economic reasons.

Parents of students less than 18 years old registered in private schools per type of school and reason of parents' choice – Italy 1998

	Primary	*Lower secondary*	*Upper secondary*	*Total*
No specific reason	11.3	11.6	6.1	9.8
Only school available nearby	7.6	4.8	27.4	12.7
Vicinity	14.8	12.8	11.7	13.5
Services offered	48.9	41.5	26.1	40.8
Cultural (ideological) reasons	14.0	13.4	13.5	13.7
Quality of teaching	36.8	43.4	39.4	38.9
Other reasons	12.5	9.5	5.8	9.9

Next table shows the results of a probit regression which relates the probability of enrolment in private schools to these reasons and additional covariates. We find that the choice of a private school is encouraged by economic and ideological / cultural reasons, by a suitable timetable and by vicinity to the house of residence. School quality indicators are either not statistically significant or are negatively related to enrolment in a private school.

Table 4. Probit model: enrolment in a private school

Variable	Coefficient	St.Err.	Variable	Coefficient	St.Err.
Gender	0.030	0.050	Rented house	-0.080	0.067
Did not think about reasons	-0.893***	0.076	Number siblings	-0.082**	0.036
Quality of teachers	0.555***	0.073	Foreigner	-0.139	0.344
Services provided	0.585***	0.089	Father manager	0.017	0.104
Cultural reasons	0.155	0.102	Father professional	0.329***	0.079
Economic Reasons	-0.908***	0.233	Father self-employed	0.193***	0.066
			Mother manager	0.216	0.164
Father's education	0.015**	0.007	Mother professional	0.059	0.156
Mother's education	0.009	0.007	Mother self-employed	0.119	0.092
Number rooms / house	-0.023	0.016			
Computer	0.036	0.057			
Pseudo R^2	0.308		N.obs	8093	

Source: ISTAT, Indagine Multiscopo 1998. Robust standard errors.
The regression includes type of school, regional and class dummies.
One, two and three stars for statistical significance at the 10, 5 and 1 percent level of confidence

Many Italian students participate to remedial education, either at school or privately, as they try to catch up with the rest of the class. The probability of participating to this type of education is higher among private school students, even after conditioning for family background.

Table 5. Probit model: probability of enrolment in remedial programs.

Variable	Coefficient	St.Err.	Variable	Coefficient	St.Err.
Gender	0.116***	0.042	Mother self-employed	-0.058	0.078
Private school	0.221**	0.102	Attitude to school	-0.234***	0.018
Father's education	0.004	0.005	Absence	0.114***	0.020
Mother's education	0.000	0.005	Rented house	0.078	0.053
Number siblings	-0.045*	0.023	Computer	-0.074*	0.044
Foreigner	0.153	0.307	Number rooms house	0.016	0.011
Father manager	-0.164*	0.087			
Father professional	-0.187**	0.076			
Father self-employed	-0.086	0.054			
Mother manager	-0.053	0.165			
Mother professional	-0.156	0.156			
Pseudo R^2	0.140		Nobs	6783	

Source: ISTAT, Indagine Multiscopo 1998. Robust standard errors. The regression include type of school, regional and class dummies.

3. School Choice and Vouchers

Supporters of school vouchers expect the following effects from the introduction of a program:

⇨ students will shift from public to private schools - increase in the overall productivity of the system

⇨ students of better academic quality are more likely to shift, because private schools are keen to attract pupils who improve their average peer quality.

⇨ competition for students should increase, since public schools fight in order to avoid losing pupils and the associated resources.

Therefore, vouchers are likely to increase stratification, with uncertain effects on efficiency. These effects depend on whether the average gains of pupils in private schools, who enjoy better peers, are superior to the average losses of pupils in public schools, who are stuck with worse peers (linearity of the peer effect ?)

4. Vouchers in Italy

Italy has witnessed a recent wave of expansion in the funds offered to families in support of the educational choices made on behalf of their children.

While national funds have granted to regions in order to cover transports and meals expenditures (national law n.62/2000), some regions have topped up these funds with local funds, coming from general purpose taxation.

More recently, the current government has introduced a national fund aimed to partially subsidise the enrolment in private institutions (financial law for the year 2003, approved as national law n.289/2002).

The core of the debate has centred on the prohibition of public financing of private education existing in the constitutional law.

Between 2001 and 2003, 9 Italia regions out of 20 introduced a voucher scheme for educational expenditures. Only 8 regions have consequently allocated earmarked funds for the purpose.

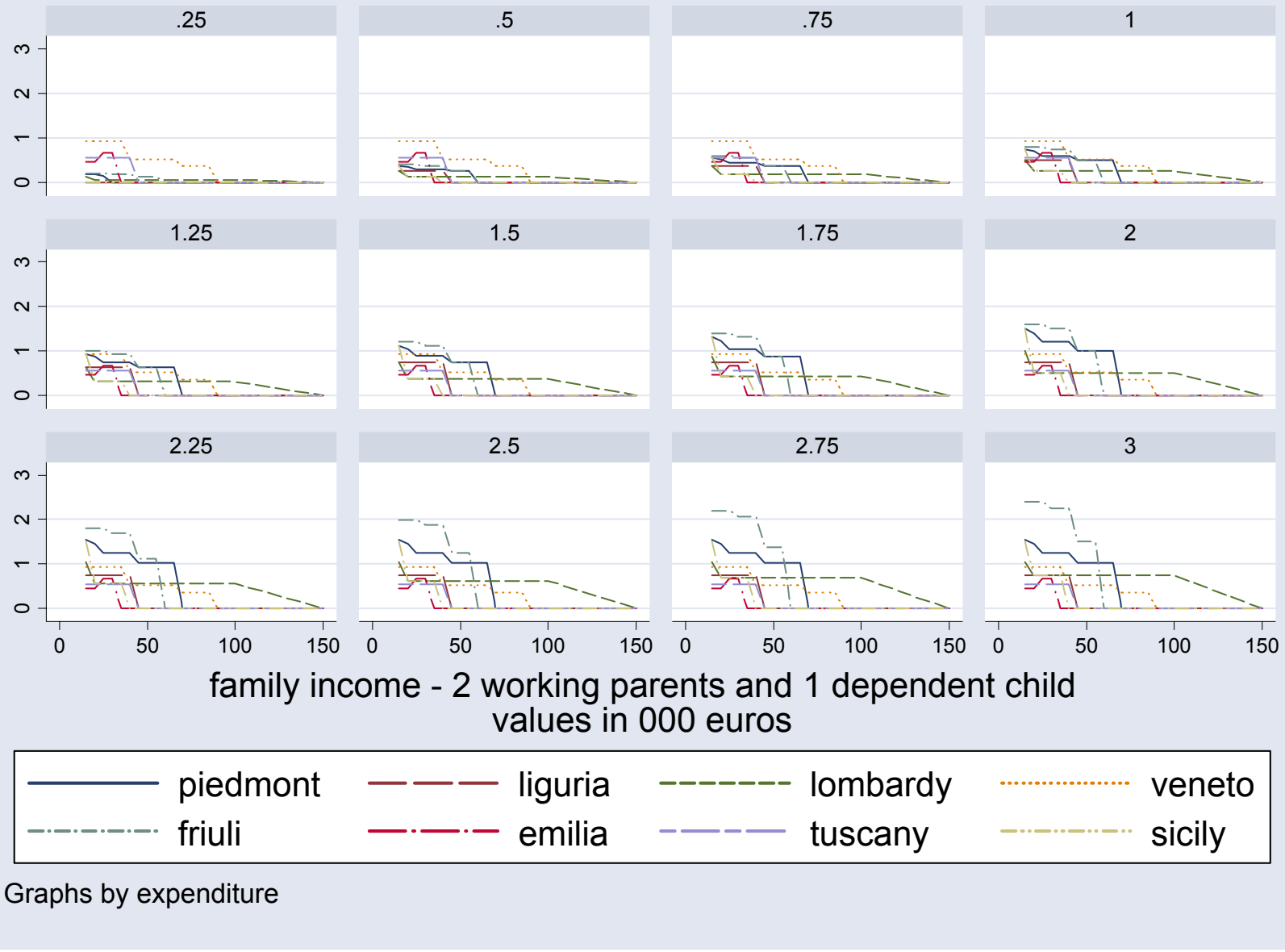
The percentage of reimbursement varies between 80% (Friuli, for a family income below 26.000€) and 25% (Lombardy and Sicily). In 5 regions there is a cap, ranging from 1875€ (upper secondary school in Piedmont for a poor family) to 210€ (primary school in Veneto for a middle income family).

Thus we observe two alternative approaches:

⇨ on one side, there is a partial reimbursement intended to alleviate the tuition afforded by private school users; given the overrepresentation of rich families among them, an income ceiling is introduced in order to mitigate the regressiveness of such measure.

⇨ on the other side, there is a fixed payment, conditional on school performance and family incomes, with a much lower income threshold.

Figure 1 – Simulations of regional systems of school vouchers



Vouchers in Lombardy

Lombardy is the richest and most populous Italian region, and the first to introduce regional legislation on school vouchers.

School vouchers in Lombardy are subsidies to the tuition fee paid by households with pupils attending private schools in primary and secondary education.

The voucher covers 25% of the total cost of private school tuition, with a cap currently running at € 1300 per pupil.

A minimum threshold of reimbursable expenditure (corresponding to € 206 - 400.000 liras) excludes de facto students attending state schools from the voucher.

Only families who were resident in Lombardy and with per capita net income less than € 30.971 (60.000.000 liras) were entitled to obtain the voucher.

Private schools can be divided in two groups, *certified schools (scuole paritarie)*, that are legally recognized by the central government, and *uncertified schools* (*scuole non paritarie)*, which do not have such recognition. Recognition requires that schools receive approval of the curriculum by the Ministry and allow free admission of (solvent) applicants. Only students who attended certified schools could receive the voucher.

The percentage of students enrolled in private schools was significantly higher in Lombardy (9.4 percent) than in Italy (5.9 percent).

Table 6 – School enrolment according to management type – school year 2001-2002

	Students in Italy		Students in Lombardy	
	Public schools	Private schools	Public schools	Private schools
primary	2.534.191	184.253 (6.78%)	364.771	31.602 (7.97%)
lower secondary	1.704.479	61.040 (3.46%)	225.284	20.188 (8.22%)
upper secondary	2.421.303	149.343 (5,81%)	313.009	33.790 (9.74%)
total	*6.659.973*	*394.636 (5.92%)*	*903.064*	*85.580 (9.40%)*

Source: MIUR 2003, Scuola non statale: indagine conoscitiva a.s. 2001/02 –
private schools include students enrolled in both *scuole paritarie* and *scuole non paritarie*.

We obtained from the Lombardy Regional Authority the administrative data on school voucher applicants for two subsequent years: the initial school year 2000-2001, when the voucher programme was introduced, and the subsequent year 2001-2002.

Data on voucher applicants contain information on family income, number of family components, name, address, type and class of the school attended, expenditure for school attended and (possibly) the amount of the voucher obtained.

Table 7 – Enrolment in private schools in Lombardy – school years 2000-01 and 2001-02

	Voucher applicants in private schools – 2000-01	Voucher applicants in public schools – 2000-01	Voucher applicants who could not apply –2000-01	Voucher applicants in private schools – 2001-02	Voucher applicants in state schools – 2001-02	Voucher applicants who could not apply –2001-02	Students in private schools– 2001-02
Unclassified	16.884	12	685	62	6	1	
Primary	14.727	4	68	19.227	4	84	31.590
lower secondary	9.236	72	109	13.372	16	99	20.177
upper secondary	14.713	799	395	18.573	442	429	33.777
Total	*55.560*	*887*	*1.257*	*51.234*	*468*	*613*	*85.544*

Source: our elaboration on administrative data – Regione Lombardia

We infer the tuition charged by private schools from the expenditure born by households who apply for a voucher. The precision of the inference clearly depends on the percentage of applicants in each school.

Aware of the potential distortion in the data - mainly due to unclassified schools in the first year and to missing information in the second year - we compute from the data the percentage change in average tuition from the first to the second available year: on average tuition went up by 5.12% in all schools and by 6.35% in upper secondary schools - 2.42 and 3.65 percent in real terms respectively.

Table 8 – Voucher applicants and school tuition – full sample of private schools – school years 2000-01 and 2001-02

Sample of private schools	Applicants 2000-01	Applicants 2001-02	Family income 2000	Family income 2001	Fee 2000	Fee 2001	Δ fee (mean %)
All private schools							
unclassified	16884	62	90992	48416	4421	2595	**-41.30**
primary	14727	19227	87425	89715	2795	3066	**9.70**
lower secondary	9236	13372	88125	89962	4308	4568	**6.04**
upper secondary	14713	18573	84995	88766	5581	5935	**6.35**
Total	*55560*	*51234*	*87982*	*89385*	*4278*	*4498*	***5.12***
private secondary schools							
confessional schools	2254	5270	99950	100372	5586	5841	**4.57**
non religious schools	2495	3619	97820	98347	5659	6682	**18.08**
confessional technical schools	4886	5606	83851	82034	5245	5171	**-1.39**
non religious technical schools	5078	4078	73144	74498	5863	6443	**9.88**
Total	*14713*	*18573*	*84995*	*88766*	*5581*	*5935*	***6.35***

These changes over time do not take into account the voucher.

If we consider net rather than gross tuition, the former increased over the two years less than the inflation rate, and the relative net price of private schooling declined on average in real terms by close to one percentage point.

Light tiny decline in the incidence of schooling expenditure on the income of families sending their children to private institutions in Lombardy.

Table 9 – Voucher recipients and school tuition fees – full sample of private schools – school years 2000-01 and 2001-02.

Sample of private schools	Successful applicants 2000-01	Successful applicants 2001-02	Fee 2000 net of voucher	Fee 2001 net of voucher	Δ real net fee (%)	Incidence on family income of net fee 2000 (%)	Incidence on family income of net fee 2000 (%)	Δ incidence on family income (%)
All private schools								
unclassified	16849	62	3329	1704	**-51.52**	5.52	3.94	-1.58
primary	14698	19214	2100	2193	**1.75**	3.60	3.59	-0.01
lower secondary	9226	13371	3233	3291	**-0.89**	5.48	5.36	-0.12
upper secondary	14683	18567	4207	4385	**1.55**	7.40	7.20	-0.20
total	*55456*	*51214*	*3219*	*3274*	***-1.00***	*5.50*	*5.36*	*-0.14*
Private secondary schools								
confessional schools	2252	5270	4196	4316	**0.17**	6.32	6.30	-0.02
non religious schools	2494	3619	4267	5000	**14.49**	6.15	7.65	1.50
Confessional technical schools	4876	5606	3947	3767	**-7.26**	6.99	6.39	-0.60
non religious technical schools	5061	4072	4432	4781	**5.17**	8.91	9.10	0.19
Total	*14683*	*18567*	*4207*	*4385*	***1.55***	*7.40*	*7.20*	*-0.20*

The consumer price index inflation was 2.7% between 2002 and 2001.
Source: our elaboration on administrative data – Regione Lombardia

A drawback of the administrative data is that they do not contain the number of pupils in each private schools, but only the number of applicants to the voucher.

We merge these data with the data on private schools provided by the Italian Ministry of Education, which include information on school resources – such as the pupil-teacher ratio, the success rate of enrolled students and some teachers' characteristics).

Unfortunately, private schools are not compelled to provide the Ministry of Education with this information, and therefore there is a significant number of missing cases.

Table 10 – Private schools in the Ministry of Education archives and in the administrative data. Lombardy

	Private schools in Ministry archives	Private schools in Ministry archives and in administrative data		Private schools not in Ministry archives but in administrative data		Private schools in Ministry archives reporting information on students and teachers		Private schools in Ministry archives reporting information on students and teachers in both years
		2000-2001	2001-2002	2000-2001	2001-2002	2000-2001	2001-2002	
Primary	246	216	221	8	7	2	4	2
lower secondary	173	166	168	--	--	160	161	160
upper secondary	317	277	290	24	16	248	266	243
more than one level	--	--	--	9	10	--	--	--
Total	*736*	*659*	*679*	*41*	*33*	*410*	*431*	*405*

Source: our elaboration on administrative data – Regione Lombardia and Ministry of Education

We can use the merged data to study two questions:

⇨ by comparing enrolled students and voucher applicants, we can ask why do we observe different percentages of applicants across schools.

⇨ we can investigate whether there is any correlation between change in enrolment, change in fees and changes in resources.

The percentage of applicants increased significantly from 38.8% to 60.9% in the following year. Potential explanations:

* better classification of data
* change in family income distribution
* increase in fees
* learning process

Table 11 – Enrolment and voucher applicants in the private schools in Lombardy

Sub-sample of private schools with information on school resources in both years and more than five applicants	Number of school with more than five applicants	Students enrolled		Percentage of voucher applicants (student weighed mean)		Tuition (student weighed mean)	
		2000-2001	2001-2002	2000-2001	2001-2002	2000-2001	2001-2002
private schools							
primary	1	215	272	**51%**	**89%**	2600	3012
lower secondary	153	18049	18500	**47%**	**69%**	4477	4660
upper secondary	214	24490	24052	**33%**	**56%**	5866	6078
total	*368*	*42754*	*42824*	***39%***	***62%***	*5263*	*5446*
private secondary schools							
confessional high school	56	8229	8416	**22%**	**52%**	5862	6064
non religious high school	48	5428	5193	**35%**	**52%**	6833	7079
confessional techn.school	52	5418	5308	**37%**	**67%**	5133	5324
non religious techn.school	58	5415	5135	**44%**	**55%**	5634	5866
total	*214*	*24490*	*24052*	***33%***	***56%***	*5866*	*6078*

Source: our elaboration on administrative data – Regione Lombardia and Ministry of Education

When we consider the variations of prices and quantities in the market for upper secondary private education we see that

* the gross real tuition fee has increased,

* the real net tuition fee has declined

* the number of enrolled pupils has also declined over the two available years.

In a traditional demand-supply framework, this outcome requires a negative supply shift.

Table 12 – Change in enrolment and tuition and demand/supply shifters - private schools in Lombardy (weighed mean %)

Sub-sample of private schools with information on school resources in both years and more than five applicants	Δstudent enrolment	Δ real tuition	Δreal tuition net of voucher	Δreal family income	Δcertified teachers
private secondary schools					
confessional high school	2.27	0.58	-0.18	-2.15	0.29
non religious high school	-4.33	1.58	0.77	-5.33	0.02
confessional techn.school	-2.03	1.61	-1.53	2.54	-0.02
non religious techn.school	-5.17	2.33	-0.18	4.04	0.33
total	***-1.79***	***1.41***	***-0.48***	***-0.45***	***0.17***

Source: our elaboration on administrative data – Regione Lombardia and Ministry of Education

5. **Is the application rate for vouchers higher in schools of better quality?**

From a social point of view is certainly easier to justify a voucher if the subsidy is paid out to households who enrol their children in good quality schools.

Since private schools in Lombardy are heterogeneous in standard measures of quality such as the pupil–teacher ratio, it makes sense to ask whether there is any significant correlation between application rates and school quality.

Table 13 – School enrolment in Lombardy by type – upper secondary school - year 2001-2002 – standard deviation in parentheses

	Confessional	Non confessional
Pupils	149.45 (97.84)	107.75 (118.11)
Pass rate	0.74 (0.13)	0.95 (0.71)
Pupil – teacher ratio	14.08 (11.31)	8.03 (7.82)
Proportion of certified (*abilitati*) teachers	0.84 (0.16)	0.71 (0.26)
Proportion of experienced teachers	0.73 (0.20)	0.59 (0.26)
Percentage of voucher applicants	0.57 (0.24)	0.53 (0.25)

5.1. The Model

With perfect information, all eligible individuals should apply for vouchers as long as the marginal revenue is higher than the marginal cost of applying: the application rate should be close to 100 percent.

Letting y^* be the maximum level of individual income for eligibility, with perfect information, the share of applicants in private school s is

$$\left(\frac{N}{T}\right)_s^* = \frac{\sum \delta_s \left(y_i < y^*\right)}{T_s} \qquad (1)$$

where N is the number of applicants, T the number of pupils, and δ an indicator equal to 1 if the term within parentheses holds.

Without perfect information, we posit that the ratio between the observed share of applicants and the optimal share in the absence of information costs is a function of school characteristics X and of the ratio of the average tuition fee F_s over average household income in the school Y_s. Therefore

$$\frac{\left(\frac{N}{T}\right)_s}{\left(\frac{N}{T}\right)_s^*} = \left(\frac{F}{Y}\right)^{\lambda} \exp(\rho X) \qquad (2)$$

Using (2) into (1) and taking logs we obtain

$$\ln\left(\frac{N}{T}\right)_s - \ln\left(\frac{N}{Y}\right)_s^* = \rho X + \lambda \ln F - \lambda \ln Y \qquad (3)$$

Unfortunately, we do not have data on the percentage of eligible households in each school. We deal with this problem by assuming that this percentage depends on lagged average household income in the school

$$\ln\left(\frac{N}{Y}\right)_s^* = a_o - a_1 \ln Y_{s,-1} \qquad (4)$$

which allows us to write

$$\ln\left(\frac{N}{T}\right)_s = a_0 + \rho X_s + \lambda \ln F_s - (\lambda + a_1)\ln Y_{s,-1} \qquad (5)$$

We posit that the average tuition fee in school s is a function of school quality, measured by the vector of variables Q_s: the higher quality the higher the cost and the price asked to households. Therefore

$$\ln F_s = b_0 + \pi_F Q_s \qquad (6)$$

The vector Q includes the pupil - teacher ratio, the percentage of classes with less than 10 students, the percentage of promoted students, the number of pupils and the share of certified teachers.
We can use (6) into (5) to obtain the following reduced form

$$\ln\left(\frac{N}{T}\right)_s = d_o + \rho X_s + \phi Q_s - \theta Y_{s,-1} + u_s + \varepsilon_s \qquad (7)$$

where u_s are unobserved school effects. We capture these effects with dummies for the type of

secondary school (liceo, technical school etc..) and for the degree of integration of upper secondary with primary and lower secondary schools. The vector X contains the dummy C, equal to 1 if the school is confessional and to 0 otherwise.

The results suggest that the percentage of voucher applicants is positively correlated with the pass rate, the percentage of experienced teachers in the school and the confessional school dummy, and negatively correlated with the lyceum dummy, the size of the school and the pupil–teacher ratio.
If we interpret a higher pass rate, a higher share of experienced teachers and a lower pupil–teacher ratio as indicators of school quality, these results point to a positive correlation between quality and the application rate.

Table 14 - Estimates of equation (7). Dependent variable: percentage of pupils applying for vouchers. Secondary school.2001-02

	OLS
Lagged household income	-0.034
	(0.07)
Confessional school	0.375*
	(1.78)
Lyceum	-1.709***
	(3.67)
Pupil teacher ratio	-0.018**
	(2.25)
Pass rate	1.764***
	(2.75)
Size	-0.352**
	(2.01)
Percentage of teachers with at least three years of experience	0.467
	(1.31)
Province	Yes
Type of school	Yes
Integrated school	Yes
Nobs	208
R^2	0.281

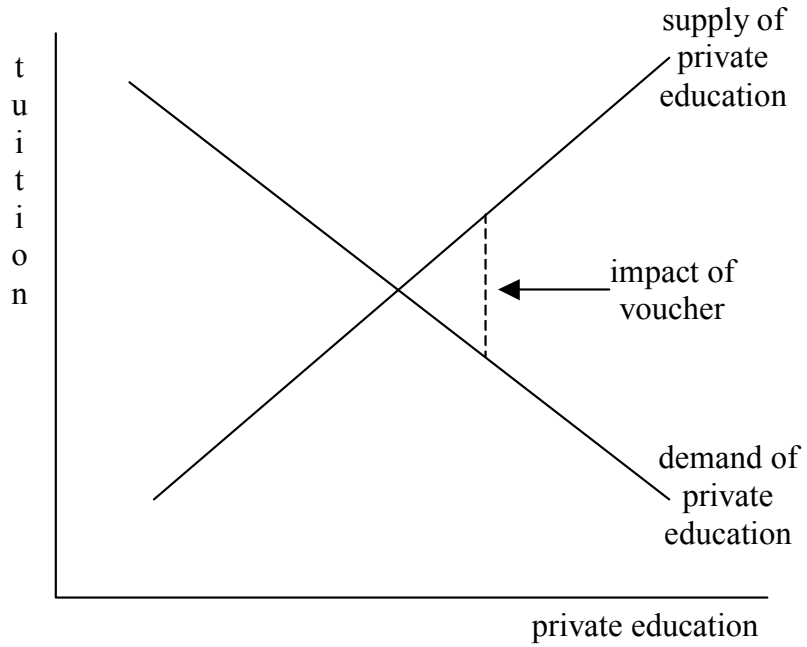
Note: one, two and three stars for statistical significance at the 10, 5 and 1 percent level of confidence; t-values within parentheses.

Our result is consistent with the view that the incentive to apply for vouchers is higher the higher is average private school quality. We explain this with the fact that better quality schools provide better services to students, including information and consulting on vouchers.

6 Do vouchers affect tuition and enrolment rates?

Vouchers are supposed to affect individuals by removing liquidity constraints which restrict school choice to cheap and often low quality (public) schools. If the reallocation is from public to private schools, we would expect enrolment in the latter type of schools to increase. The size of the effect, however, depends both on the elasticity of household demand to prices and on the response of tuition fees to the introduction of vouchers.

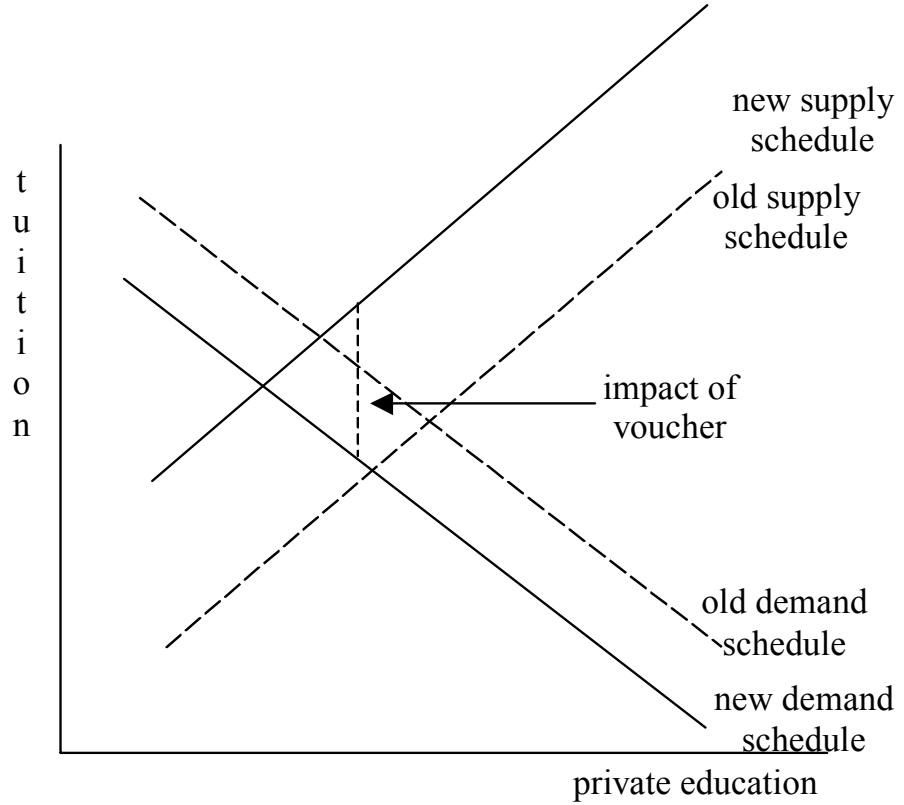
Figure 2. Effect of a generic voucher on tuition and enrolment.



Since data on schools are more numerous, we focus on upper secondary schools.

Computing the average change of tuition and enrolment in the private schools of Lombardy between 2000-01 and 2001-02, it turns out that in the aggregate real tuition and enrolment have increased and decreased respectively in the two-years period by 1.41 and 1.79 percent. These changes are relatively small and are consistent with an upward shift of the supply curve and a downward shift of the demand curve in Figure 2, as depicted in Figure 3.

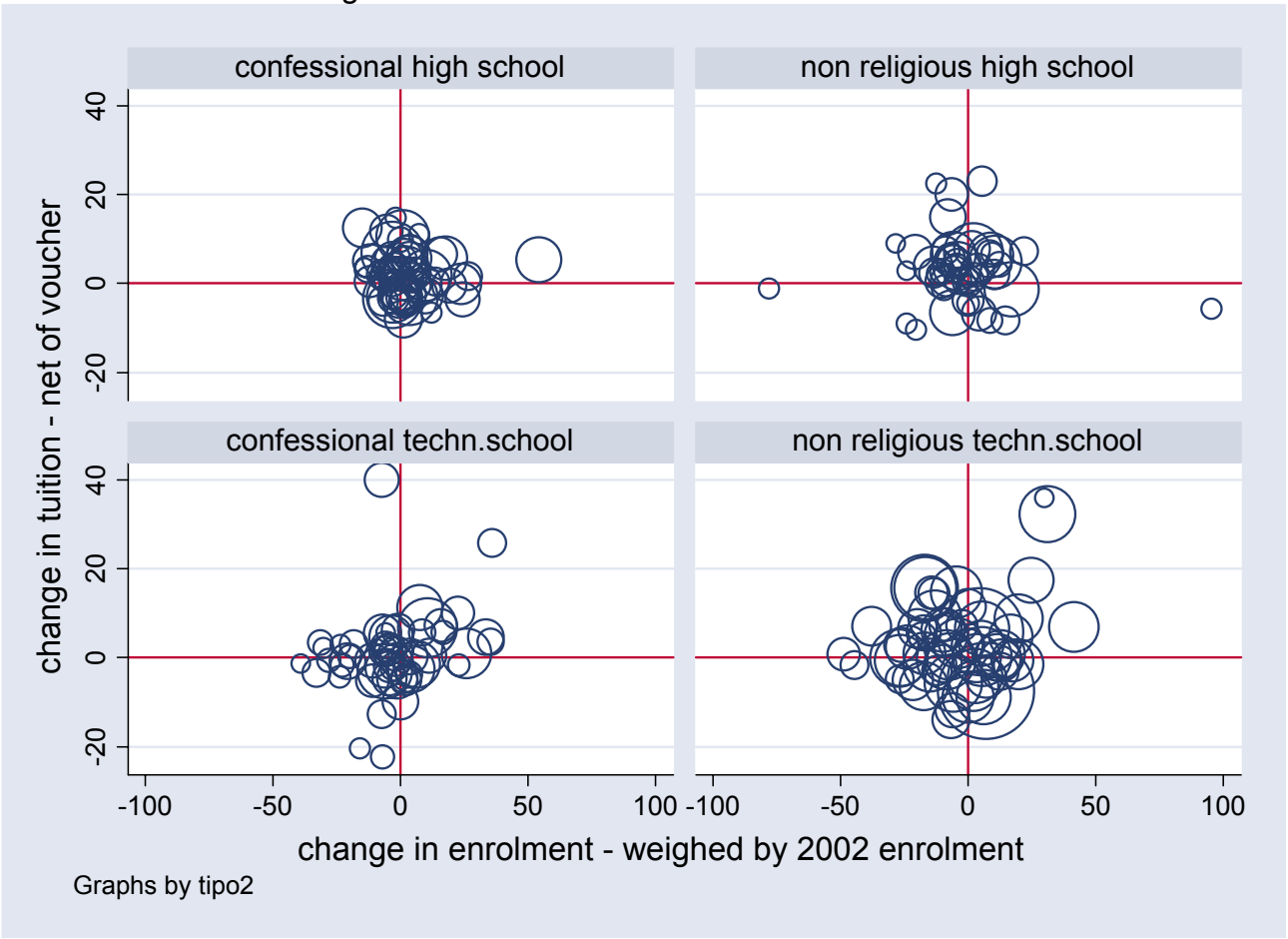
Figure 3. Possible impact of voucher occurrence in our case.



On the one hand, the negative supply shift could be induced by higher costs of supplying private education or by a higher mark up on marginal costs induced by the voucher.

On the other hand, the negative demand shift could be attributed to negative demographic effects or to a switch away from private schools after the introduction of the voucher.

Figure 4. Variation of enrolment and net tuition



In order to gain additional information on the relative elasticity of demand for and supply of private education, we introduce a textbook model were demand for private education depends on (net) tuition fee and family income, and supply depends on (gross) tuition fee and quality

$$\begin{cases} F^d = F^s - \nu \\ N^d = \alpha - \beta F^d + \gamma Y + \delta Q + \rho R \\ N^s = \sigma + \eta F^s + \theta Q + \varphi R + \tau T \end{cases} \quad (8)$$

where F is (log of) tuition, N is the (log of) number of students enrolled in private schools, Y is (log of) family income, Q is a measure of quality (the fraction of certified teachers in our case), R is a measure of ideological orientation of families and schools (the religious orientation of the school), T is a measure of available resources (the number of teachers) and ν is the voucher. Given the logarithmic notation, $\nu = \ln\left(\frac{1}{1-t}\right)$, where t is the subsidy rate (0.25 in our case).

This model is identified and could be estimated using instrumental variables, conditional on two assumptions:

i) the supply of places in private schools does not depend on average household income. Private schools may prefer to attract pupils from high income households, or, alternatively, pupils from wealthier households may self-sort into private schools. It is not clear, however, why this should affect the number of places offered by each school;

ii) the log number of teachers affects supply but has no effect on demand, once we have controlled for school quality and household income. Demand clearly depends on perceived school quality, but should not be affected by the size of the school, captured by the number of teachers.

We have separately estimated demand and supply, for the upper secondary schools, in second year. Caveat: some of our variables (tuition fee and family income) averaged at school level include a measurement error, due to incomplete observation of the entire distribution; given previous remark of low correlation between fee and income, the measurement error is more problematic for the estimate of the income elasticity than for the estimate of the price elasticity.

From a theoretical viewpoint, the demand price is the tuition net of voucher, we and use it as our dependent variable in the first two columns; nevertheless, since we have seen that not all families take advantage of the existence of the voucher, in third and fourth columns we report the corresponding estimates using gross fees.

The demand elasticity is estimated using the fee of the previous year, the proportion of certified teachers of previous year and provincial dummies as instruments.

When significant, the coefficients are always correctly signed. The Hansen test cannot reject the null hypothesis of absence of overidentification for the specifications without lagged value.

Table 15 - Estimates of the demand for private education –
Secondary school – 2001-02 – robust standard errors

dependent variable (log of)	pupils	pupils	pupils	pupils
Net fee (log of)	-0.464***	-0.105***		
	(3.03)	(-2.54)		
Gross fee (log of)			-0.501***	-0.114***
			(3.33)	(2.66)
Family income (log of)	0.977***	0.155*	0.956***	0.151*
	(3.82)	(1.65)	(3.79)	(1.63)
Proportion of certified teachers	0.428**	-0.053	0.427	0.055
	(2.27)	(0.66)	(2.27)	(0.66)
Confessional school	0.116	0.046	0.118	0.046
	(1.43)	(1.49)	(1.47)	(1.50)
Pupils(-1) (log of)	--	0.958***	--	0.957***
		(30.04)		(30.04)
Constant	Yes	Yes	Yes	Yes
Type of school	Yes	Yes	Yes	Yes
Property of school	Yes	Yes	Yes	Yes
Type of recognition	Yes	Yes	Yes	Yes
Observations	203	203	203	205
Hansen J	0.37 [0.54]	6.95 [0.01]	0.29 [0.58]	7.27 [0.01]
R^2	0.33	0.91	0.33	0.91

Note: Instruments: tuition of the previous year, proportion of certified teachers of previous year and provincial dummies. One, two and three stars for statistical significance at the 10, 5 and 1 percent level of confidence; t-values within parentheses

Symmetrically, we estimate the supply side of the model, using average family income at school level as instrument. The supply of private education reacts to price with a very high elasticity, whereas for the other regressors we confirm previous results obtained in previous section: confessional schools offer more admissions (possibly because they face a lower costs), and similarly do schools with better trained teachers (possibly because they have a higher productivity).

Table 16 - Estimates of the supply of private education –
Upper secondary school – 2001-02 – robust standard errors

dependent variable (log of)	pupils	pupils
Gross fee (log of)	2.164***	0.321*
	(2.80)	(1.69)
Proportion of certified teachers	0.371	-0.113
	(1.40)	(1.28)
Confessional school	0.487***	0.120***
	(3.01)	(2.60)
Teachers (log of)	0.464***	0.105***
	(3.78)	(2.97)
Pupils(-1) (log of)	--	0.954***
		(20.84)
Constant	Yes	Yes
Province	Yes	Yes
Type of school	Yes	Yes
Property of school	Yes	Yes
Type of recognition	Yes	Yes
Observations	205	205
Hansen J	exact.ident.	exact.ident.
R^2 (centred)	-0.50	0.90

Both demand and supply elasticities conform to theoretical expectations, with the supply exceeding the demand by four times. By solving the system (8) with respect to the gross fee, we get

$$F^s = \frac{\alpha - \sigma}{\eta + \beta} + \frac{\gamma Y + (\delta - \theta)Q + (\rho - \varphi)R - \tau T}{\eta + \beta} + \frac{\beta}{\beta + \eta}\nu \qquad (9)$$

⇨ Thus a voucher introduced in this market for private education is expected to be appropriated for 17% by the private schools (through the rise of tuition) and for the remaining 83% by families (through the lower net price).

⇨ According to our estimates, gross tuition should have increased by 5%[1] (which is not far from the 4.1% nominal increase recorded in table 12), whereas net tuition should have decreased by 23% (while actually it declined in nominal terms only by 3.2%). Other things constant and given these high elasticities, enrolment should have risen by 10% (equivalent to 2405 students in our sample), while in practice it declined by 1.4%.[2]

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[1] Since the $\Delta F^s = \frac{\beta}{\beta + \eta} \cdot \Delta\nu = \frac{0.464}{0.464 + 2.164} \cdot \ln\left(\frac{1}{1 - 0.25}\right) = 0.17 \cdot 0.28 = 0.047$.

[2] This corresponds to $\Delta N^s = \frac{\eta\beta}{\beta + \eta} \cdot \Delta\nu = \frac{0.464 \cdot 2.164}{0.464 + 2.164} \cdot \ln\left(\frac{1}{1 - 0.25}\right) = 0.38 \cdot 0.28 = 0.10$.

Conclusions

a) we doubt that Italian private schools are on average of better quality than public schools.

b) there is evidence that the percentage of voucher applicants is higher the higher the average quality of private schools.

c) enrolment in private schools responds sluggishly to changes in tuition induced by vouchers. Because of this, the estimated short-term impact of the policy is smaller than the long-term effect. If the current policy is permanent, we expect significant changes in enrolment to occur over time;

d) there is limited impact (both in the short run and in the long run) of vouchers on gross tuition fees, and the subsidy is mainly appropriated by households.

If private schools are not on average more productive than public schools, in terms of the development of cognitive and affective skills, then one important efficiency argument in favour of vouchers does not apply.

In the extreme case of no efficiency gains, vouchers Italian style would produce only redistribution of income away from the taxpayer to the wealthy households who enrol their offspring in private schools.

In this framework, the introduction of the voucher is very unlikely to increase the choice set of families, and even less likely to attract best students from poor families into the private school sector.

Given the absence of an initial impact of enrolment (due to a necessary time span require to learn how to apply for voucher), public schools do not perceive the bite of a growing private sector, and a positive competition among school sectors does not emerge. Thus the benefits of the “school choice” are still far from materialising in Italy.