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IMMIGRANT PUPIL ACHIEVEMENTS IN CENTRALIZED AND DECENTRALIZED SCHOOLSYSTEMS: A COMPARISON BETWEEN PISA SCORES IN ITALY AND SPAIN

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Immigrant pupil achievements in centralized and decentralized school systems: a comparison between PISA scores in Italy and Spain

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Abstract

This paper compares immigrant pupil achievement in the Italian and Spanish school systems. Using 2009 PISA data, a stochastic production function is estimated for the whole school population of the two countries. In this way, the actual and potential scores in both countries are evaluated for sub-samples of students: natives, first-generation, and second-generation immigrants. Our results show that the difference between the potential and the actual scores for the sub-sample of immigrant students is greater in Italy than in Spain, in private schools with respect to public institutions and if the schools are managed nationally.

Keywords: education; immigrant students; Spain; Italy; decentralisation

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1. Introduction

Like most southern European countries, in the last thirty years Spain and Italy have shifted from being primarily emigrant sending to immigrant receiving societies. This phenomenon has radically modified the school populations of the two countries. In 2000 only 1 per cent of students had an immigration background in Italy and less than 2 per cent in Spain, while in 2009 these proportions were 5 per cent and 9 per cent respectively. Disentangling these data at the regional level shows that both countries are characterized by strong regional divides. In Spain, the presence of immigrant students in 2009 was under 5 per cent in Galicia and the Basque Country, but it reached 16 per cent in Madrid. Similarly in Italy, a large group of southern regions – Calabria, Campania, Puglia, Sardinia and Sicily – recorded less than 2 per cent of immigrant pupils, while Emilia Romagna and Piedmont go above 10 per cent[1].

Notwithstanding these similarities in terms of school populations, Spain and Italy have educational systems that are different in many respects. One of these is the degree of decentralization, and in particular the role of regional governments. More precisely, the decentralized model adopted in Spain is such that 96 per cent of public expenditure on education is managed by regional or local governments, while in Italy the proportion managed locally or regionally is only 26 per cent[2] of the total. Of course, this is the result of a process of public finance decentralization that may be considered concluded in Spain but not yet in Italy, and in fact decentralization of the school system is an issue still under debate in Italy[3]. A second differentiation between the two school systems is related to the ways of financing institutes. The 2009 PISA data set used in this work distinguishes between three types of school: public, private government-dependent and private independent. In Spain, public schools represent just under 64 per cent of the total, private government-dependent schools make up 33 per cent and private independents 4 per cent. In Italy, the vast majority of schools are public – 95 per cent – while government-dependent private institutes and independent private institutes are 3 and 2 per cent of the total respectively. Turning to the performance

of students, the above-mentioned PISA 2009 provides evidence for a slight advantage of Italian students in their average scores on the three tests employed: mathematics, reading and sciences (see Table 2 below). Disentangling this indicator, one finds that there is a very small difference between native Spanish and Italian students and between the groups of first-generation immigrants, while there is a big disparity between the two school regimes for second-generation immigrants[4]. We take advantage of these similarities and diversities to estimate a stochastic production function for the schools in these two countries. In this way, we attempt to answer the question of which school system is more efficient as far as immigrant pupil scores are concerned. The rest of the paper is organized as follows. In section 2, the most recent literature on the performances of education systems as regards immigrant pupils is briefly described and the more relevant empirical applications to this issue are reviewed. In Section 3, the data and the empirical strategy are presented. Section 4 discusses the results and Section 5 concludes.

2. Literature on immigrant student gaps in different school regimes.

The study of the achievement of immigrant students in different countries and school systems is quite recent but well-established. The topic has been approached with both studies on a specific country and in a comparative perspective, and also from different points of view, i.e. by focusing on some of the individual student characteristics and/or by considering aspects of school system organization. All these studies exploit a growing set of data collected at the individual level in different surveys, and from empirical methodologies that are becoming ever more sophisticated. The empirical methodology chosen for the present work is illustrated in Section 3, while here we briefly summarize recent results of empirical analyses on this topic in comparative studies and in analysis focusing on Italian and Spanish schools.

Generally speaking, in studies of a specific school system, the weight of individual characteristics of immigrant students (such as family background, the language spoken at home, attitude to study, being a first or second generation immigrant) in their scores is tested together with aspects such as grade retention, public vs.

private financing of schools, the socio-economic profile of classes and schools, the segregation of immigrants, or the level of formal comprehensiveness (or differentiation) of the curricula. In this framework, the analysis has the aim of disentangling the role of individual characteristics from the functioning of the school system in the final outcomes of immigrant students. On the contrary, in comparative works the research question frequently focuses on only one of these aspects, which can be related to the individual characteristics of the students (for example, family background) or to the education system (grade retention), with the aim of discovering in which scheme immigrant students achieve better.

A common result of studies on single countries is that one of the main reasons for lower performances of immigrant students with respect to native students is a less favourable family background. This has recently been demonstrated for Germany (Ammermuller 2005) and Denmark (Rangvid 2007). Notice that 'family background' does not necessarily mean the education level of parents or their economic condition, but could also be a favourable home environment for learning, as indicated by the number of books, the language spoken at home, or the academic expectations of parents for their children, etc. After family background, the role of the school is crucial in explaining gaps in test scores, both in terms of school quality and peer composition (Rangvid 2007).

As underlined by Park and Sandefur (2010) 'even if detailed analyses of educational differences between native and immigrant children in specific countries have contributed to our understanding of educational inequality associated with immigrant status in the corresponding country', the question of 'which countries are more successful in facilitating immigrant children's educational integration is better addressed by comparative research across many countries'. In fact, comparative studies confirm the relevance of the education level of parents in reducing the lag of scores of immigrants, even if this may vary strongly across nations. By comparing Europe and the traditional countries of immigration, Entorf and Minoiu (2005) show that the highest impact of family education on score is found for Germany, the UK and US, whereas intergenerational transmission of educational attainment is less likely in Scandinavian countries and in Canada. At the same time, they show that for students with a migration background a key for

catching up with their schoolfellows is the language spoken at home. By focusing on second-generation immigrants in thirteen European countries, Dronkers and Fleischmann (2010) provide evidence that not only individual student characteristics matter in their academic achievement, but also macro-characteristics of the country of destination, like the average educational level and the naturalisation policy. Again in a comparative framework and looking at the organisation of the education system, Park and Sandefur (2010) study the role of grade retention in reducing the gap between native and immigrant children in ten European countries. They demonstrate that grade retention, where applied, broadens the gap between immigrant children and natives. Alegre and Ferrer-Esteban (2010) compare countries with educational systems controlled publicly, and with more comprehensive curricula, with countries with schools that are more market-oriented and have differentiated curricula. Their conclusion is that segregation is favoured by differentiated curricula and market-oriented systems. From our point of view, an interesting work is that of Perelman et al. (2011) on the Belgian school system. Although their analysis is focused on one country, the aim is to explain the different performances of two communities, the Flemish and the French, by considering the efficiency of the two school regimes.

In recent years, the Spanish school system has been studied from many points of view. While Fuentes (2009) evaluates the broad performance of the regime, more than one work focuses on comparison between the performances of private and public schools for the total population of students. More precisely, Mancebon and Muniz (2007) and Calero and Escardibul (2007) share the conclusion that differences in student scores are not connected to the financing system of the schools. Ferrera et al. (2011) compare the performances of regions, taking into account the role of local autonomy in the Spanish school system and considering the total population. They conclude that lower scores are recorded in those regions that are less efficient overall. In a perspective that is very close to the present work, Perelman and Satin (2008) measure educational efficiency at student level with a parametric stochastic distance function using Spanish PISA 2006 scores. As far as our knowledge goes, Zinovyeva et al. (2008) carry out the only study on immigrant student achievements in Spain. In particular, they confirm the relevance of individual characteristics in explaining more than 50 per cent of the performance

gap between native and immigrant pupils and they provide evidence that school fixed effects explain only 4 to 10 per cent of this gap, capturing mainly differences in the average quality of peers' parental educational levels across schools. Moreover, they are able to demonstrate that immigrants tend to perform relatively worse in those locations where segregation is higher, and they observe that immigrants' performance tends to improve the longer they have stayed in Spain, especially for those who do not speak Spanish at home. They also find that the second generation of immigrant students perform only marginally better than the first generation, with the second generation performing as well as native pupils only in reading tests. In their opinion, this result suggests that the second generation of the immigrants arriving in Spain now will probably only partially close the performance gap with native pupils.

The Italian school system has also been studied in many respects[5]. As for the topic of the present paper, Quintano et al. (2009) adopt the same methodology and data set to measure efficiency in Italian schools in a broad sense, whereas Turati et al. (2011) propose a comparative study between Spain and Italy to evaluate the two school regimes for the total population of students. To the best of our knowledge, there are no comparative studies of the Spanish and Italian school systems that, taking advantage of the similarities of these two countries, compare how efficient they are with respect to the sub-sample of immigrant students by using a stochastic frontier approach (henceforth SFA).

3. Data and empirical strategy

3.1. PISA dataset

The PISA survey carried out in 2009 uses a sample of 25,887 Spanish students and 30,905 Italian students, who represent 6.7 per cent and 6.1 per cent of the two school populations respectively. The sample is restricted here to those records (23,563 Italian and 21,033 Spanish pupils) with no missing data (see Table 1 and Table 2).

[near here Table 1]

[near here Table 2]

The empirical strategy of this paper is a two-stage procedure: in the first we estimate a stochastic frontier to evaluate the potential scores that pupils in Spanish and Italian school systems may achieve, taking into account their characteristics and if the regimes are efficient. In the second step we regress the estimated efficiency, i.e. the difference between potential and real scores, for sub-samples of students with a set of explanatory variables, with the aim of testing the hypothesis that different management frameworks (centralized vs. decentralized, public vs. private) perform differently with regard to the specific group of immigrant students.

3.2. The Stochastic frontier

The stochastic function approach is well known[6], as is the application of the methodology to the education process[7]. In comparison with the alternative frontier approach, i.e. Data Envelopment Analysis (henceforth DEA), SFA allows us to measure how much of the distance between each student's practice and the best practice is attributable to 'unexplained' factors, and how much of this distance can be assigned to inefficiency in the educational production process.

The vast majority of studies of the education production function do not consider the role of the efficiency component, while the SFA allows us to take into account the fact that education is a process in which students use their own and school inputs and transform them into academic results, subject to inefficient behaviours that can be identified at the student level. In a technical efficiency framework, the production function indicates the maximum attainable output, given specific inputs. Any lower performances can be traced back to random noise – beyond the individual's control – as well as inefficiency. In order to tackle the inefficiency issue in education, many empirical studies use the previously-mentioned deterministic non-parametric DEA, in line with the pioneering contribution by Charnes et al. (1981). However, parametric stochastic distance functions allow us to deal simultaneously with multiple outputs, e.g. mathematics and reading test scores, and multiple inputs, including school inputs, student background and peer-group characteristics, in a stochastic framework.

The SFA (Aigner et al. 1977; Meeusen and Van De Broeck 1977) is widely used to estimate individual efficiency scores, while in empirical analyses student results are typically aggregated at school or district level, imposing a considerable limit on the ability to disentangle the effect of a student's own background from his/her peer-group and school inputs on student achievement.

The basic idea of this methodology lies in the introduction of an additive error term to disentangle random noise from an inefficiency term. More precisely, the interpretation we can give to the error terms in the case of student performance is the following: on the one hand, the stochastic term u_i is expected to capture unobserved student characteristics – mainly innate abilities, but also aptitude regarding performance in tests and luck, as well as family-specific circumstances (e.g. parents' workplace status or family problems at home potentially affecting a student's results but not captured by the model). All of these characteristics are assumed to be distributed normally at random in the population. On the other hand, the distance function term v_i is expected to capture students' and teachers' efforts and motivation, as well as school performance and organization, which are not explained by input endowments and the role of educational institutions. These are considered important explanatory factors of international differences observed in student achievement, particularly in the case in which institutions favour homogeneity in classroom composition.

Different distributions have been proposed for the inefficiency term, such as normal mean distribution, exponential distribution, normal truncated distribution and Gamma distribution. There is no a priori reason to prefer any specific type of distribution of errors and most often the assumption of a half-normal distributed inefficiency term is applied. Some studies have considered parametric methodologies, mainly using Cobb-Douglas specifications, but also the translog functional form proposed by Christensen et al. (1971) has been employed. The main advantage of the translog function, which is adopted here, is its highly flexible nature, which allows the study of interactions in the production process.

More precisely, in this paper the translog production function estimated is the following:

$$\begin{aligned}\log score_{ij} = {} & \alpha_0 + \alpha_1 \log ESCS_{ij} + \alpha_2 \log mathweek_j + \alpha_3 \log ESCS_j \\ & + \alpha_4 \log SMATEDU_j + \beta_1 .5 \log ESCS_{ij}^2 + \beta_2 .5 \log mathweek_j^2 \\ & + \beta_3 .5 \log ESCS_j^2 + \beta_4 .5 \log SMATEDU_j^2 \\ & + \gamma_1 \log ESCS_{ij} \log mathweek_j + \gamma_2 \log ESCS_{ij} \log ESCS_j \\ & + \gamma_3 \log ESCS_{ij} \log SMATEDU_j + \gamma_4 \log mathweek_j \log ESCS_j \\ & + \gamma_5 \log mathweek_j \log SMATEDU_j + \gamma_6 \log ESCS_j \log SMATEDU_j \\ & + u_{ij} - v_{ij}\end{aligned}$$

where i=1…n is the number of students and j=1…m is the number of schools. The term u is the normal error term representing pure randomness, and v is the non-negative error term representing inefficiency. The one-sided error in the stochastic frontier efficiency model is assumed to be half-normal.

The dependent variable ($score_{ij}$) is the output, which here is the average of the score obtained in each of the three tests: reading, mathematics and science. All the explanatory variables are expressed as the log of the difference between the distance from the value to the mean of the variable, as the estimation of a translog function requires. The first explanatory variable is the index of the economic, social and cultural condition of the family of each student, ESCS in the PISA dataset ($ESCS_{ij}$). This index is in fact calculated directly from PISA as a weighted average of an index related to home possession by the family, the highest parental level of education and the highest parental occupational status. In the stochastic frontier estimation presented here, the same index is used in two different ways: at the child level ($ESCS_{ij}$) and calculated at the school level ($ESCS_j$) (see Table 1 and Table 3 below).

The second explanatory variable used here is the index of the school's educational resources, calculated from PISA on the basis of seven items related to the principal's perceptions of potential factors hindering instruction at the school, i.e. SMATEDU in the PISA dataset ($SMATEDU_j$). The last variable in the estimation of the stochastic frontier is the number of hours of maths in a week, calculated as an average per school ($mathweek_j$)[8].

[near here Table 3]

3.3. The gap in efficiency

In the second step, the variables employed in explaining the difference between the potential and the actual scores of natives and immigrants are the following: student gender, the language spoken at home, a dummy for students who have repeated one or more years in their school carrier, the highest parental educational level (HISCED), the highest parental occupational status (HISEI), and the generation of immigration, i.e. if the pupil is classified as native or as a first- or second-generation immigrant (see Table 1 for descriptive statistics). In addition, some school features are considered: the size of the school in terms of students enrolled, the student-teacher ratio, a proxy for the level of management decentralisation of the school and the three ways of financing previously mentioned: public, private government-dependent and private independent.

As a proxy for the level of decentralization of the management of schools, the PISA dataset has more than one option. Two indices are directly calculated, RESPRES and RESPCURR. In particular, school principals were asked to report whether "principals", "teachers", the "school governing board", the "regional or local education authority", or the "national education authority" has considerable responsibility for several tasks. School responsibility for resource allocation index (RESPRES) was derived from six items, like selecting teachers for hire or establishing teachers'; starting salaries. The school responsibility for curriculum and assessment index (RESPCURR) was derived from items like choosing which textbooks to use or deciding which courses are offered. Higher values on these indexes should indicate relatively more responsibility for schools than for the local, regional or national education authority[9]. As Table 3 shows, the fact that RESPRES and RESPCURR are the result of a multiple-choice question for which school principals may click more than one answer has the consequence that they seem not to be representative of the real level of school system decentralization. For this reason we decided to use the answer to only one question, which is that on the authority responsible for hiring teachers, to make a dummy, which is 1 if the respondent ticked "national government" for the following question: "*regarding your school, who has considerable responsibility for selecting teachers for hire?*", and zero otherwise. As Table 3 shows, in Italian public schools 47 per cent of

students are enrolled in institutions that we have classified as nationally managed schools, while in Spain this percentage is only 15 per cent.

Finally, notice that in this paper the focus is not on the gap between the scores of natives and those of the immigrant pupils, as in the majority of studies on this topic. What the stochastic frontier allows us to quantify is the score potential of different groups of students and the difference between the potential and the actual scores in each country. On the basis of this estimated difference we study which variables may explain it.

4. Results

As expected, and as illustrated in Table 4, the stochastic frontier of the average score is positively and significantly explained by the index of the economic, social and cultural index of the student's family and that of the school; the coefficient on the quality of resources of the school and the hours of maths are positive but not significant if the log is considered, while both variables are significant and the coefficients are positive if the square of the log is taken into account. Notice that the dummy indicating the country of the pupils is not significant in the estimation illustrated in Table 4, where the whole population of the two countries is considered[10].

[near here Table 4]

The estimation of the frontier enables us to calculate the potential score, the difference between the real score and the potential and an indicator of efficiency for each sub-sample of the school population in the two countries (Table 5).

[near here Table 5]

Starting from this information, one may observe that the two systems are very close in terms of their total efficiency, which approximates to 82 per cent for both countries[11], and also for the group of first-generation immigrant pupils, for whom the total efficiency in both countries is about 76 per cent, while a big disparity exists for second-generation immigrant students. For the latter group, the difference between Italy and Spain in terms of mean score is about 32 points (481-449) in

favour of Italy. This result is confirmed if one looks at the difference between the two potential scores, which is reduced to 25 points (565-540), still in favour of the Italian sub-group, or efficiency, for which the gap is about 3 per cent (80-77).

Other interesting findings regard school financing and management structures. As for the former, the best performances are those of native students enrolled in private schools in Spain, with a slight advantage for independent schools compared to government-dependent schools, followed by Italian native pupils in public schools. As for immigrant students and considering the small group of second-generation immigrants, the best performance is that of private government-dependent schools in Spain, followed by public schools in Italy. The group of first-generation immigrant pupils seems to be favoured in closing the gap if they are in private independent schools in Spain or in public schools in Italy.

Considering management, for native students it seems that decentralized management of schools obtains the best results in both Spain and Italy, while second-generation immigrants seem to reach the best results in centralized schools in Italy and in decentralized institutes in Spain. As for first-generation immigrant students, a centralized regime seems to perform better in Italy, but the contrary is true in Spain.

In more depth, Table 6 shows the results of the OLS estimation of the difference between the real and potential scores for the sub-sample of first- and second-generation immigrants[12].

First of all, notice that the dummy for country in this model is positive and statistically significant. This means that if the sub-sample of immigrant students is considered, the difference between their potential and actual scores is greater in Italy than in Spain. Moreover, even though the OLS estimation verifies that student features (such as the language spoken at home, the education level of the parents and being a first- or second-generation immigrant) are relevant in explaining this difference, there are important school features that also matter. In particular, the difference between potential and actual scores seems to be larger in private schools and if the school is nationally managed, while a greater student-teacher ratio seems to reduce this difference.

[near here Table 6]

5. Conclusions

By exploiting the PISA dataset and by estimating a stochastic frontier, the Spanish and Italian school regimes have been compared with the aim of evaluating their performances with respect to a specific sub-sample of pupils, i.e. immigrant students. At a first look, the data show that the performances of the two countries, both in terms of scores and efficiency, are very close if the whole school population is considered, and also for the sub-samples of native students and first-generation immigrant pupils, while a big disparity exists for second-generation immigrant students. Analysis of actual and potential scores for sub-samples of students and different ways of financing and managing schools does not give clear results. A more precise result comes from analysis of the determinants of the difference between potential and real scores for the sub-sample of first- and second-generation immigrants. In particular, our estimation shows not only that the two countries perform differently, but that this difference is greater in private schools and if the school is nationally managed.

Tables

Table 1. Descriptive statistics - students and parents

	Italy		Spain	
	Obs	Perc.	Obs	Perc.
Girls	11805	50,10	10571	50,26
Boys	11758	49,90	10462	49,74
Native students	22453	95,29	19218	91,37
First-generation immigrant students	862	3,66	1582	7,52
Second-generation immigrant students	248	1,05	233	1,11
Pupils who repeat one or more years	3046	12,93	6260	29,76
Students for whom the language of the test is that spoken at home	19141	81,23	18002	85,59
Students for whom the language of the test is not that spoken at home	4422	18,77	3031	14,41
Highest educational level of the parents (HISCED index)	4,11		4,26	
Highest parental occupational status (HISEI index)	47,61		46,42	
Index of economic, social and cultural status (ESCS index)	-0,05		-0,24	
Total number of students	23563		21033	

Table 2. Descriptive statistics – scores

	Italy	**Spain**
Score for the three tests	502,19	494,63
Score_read	501,26	490,62
Score_math	499,16	496,13
Score_science	506,15	497,15

Table 3. Descriptive statistics – Schools

	Italy	Spain
Hours of maths in the week (average per school)	3,62	3,57
Student-teacher ratio	9,23	11,31
No. of students enrolled in each school (average)	680,76	695,17
Number of student enrolled in public schools	22447	13134
Perc. of student enrolled in public schools	95,26	62,44
No. of students enrolled in private government-dependent schools	701	7104
Perc. of student enrolled in private gov-dependent schools	2,98	33,78
No. of students enrolled in private independent schools	415	795
Perc.of student enrolled in private independent schools	1,76	3,78
Index of economic, social and cultural status at the school level (ESCS)	-0,134	-0,187
Index of the quality of the resources of the school (SMATEDU)	0,002	0,013
Index of responsability for curriculum (RESPCURR) - total	0,140	-0,450
RESPCURR in public schools	0,140	-0,670
RESPCURR in private government-dependent schools	-0,180	-0,080
RESPCURR in private independent schools	0,450	-0,150
Index of resposability for resources (RESPRES)	-0,680	-0,450
RESPRES in public schools	-0,750	-0,740
RESPRES in private government-dependent schools	0,360	0,040
RESPRES in private independent schools	1,140	0,140
Dummy for national responsibility for hiring teachers in public schools (in perc.)	46,666	14,682
Dummy for national responsibility for hiring teachers in private government-dependent schools (in perc.)	0,537	1,147
Dummy for national responsibility for hiring teachers in private independent schools (in perc.)	0,000	0,000

Table 4. Stochastic frontier (whole population)[1]

(dependent variable Log of the score of the three tests)

Index of Economic Social and cultural Status(ESCS)	0.399**
	(-8.429)
ESCS index for the school	0.184**
	(-5.486)
Index of quality of resources of the school	0.045
	(-1.844)
Hours of maths per week(school average)	0.017
	(0.838)
Square of the ESCS index	-0.108**
	(-3.607)
Square of the ESCS index for the school	-0.037
	(-1.385)
Square of the index of the quality of school resources	0.043**
	(-4.301)
Square of the hours of math per week	0.015**
	(-3.641)
Product of the ESCS index	0.030
	(-1.471)
Product of the ESCS and the quality of school resources indices	-0.024
	(-1.686)
Product of the ESCS index and maths hours per week	-0.014
	(-1.086)
Product of the ESCS for the school school and quality of school resources indices	-0.051**
	(-3.694)
Product of the ESCS for the school and maths hours per week	0.006
	(0.549)
Product of quality of school resources and maths hours per week	0.016
	(-1.827)
ITA	0.001
	(0.353)
Constant	5.651**
	(-129.121)
Observations	44596
Absolute value of z statistics in parentheses	
* significant at 5%; ** significant at 1%	

(1) All variables are expressed as the log of the difference between the diffence of the variable and and the mean and the minimum of the same variable

Table 5. Mean score, potential, difference and efficiency for sub-samples of students and type of schools

	Total student population							
	Mean score		Potential score		Difference		Efficiency	
	Italy	Spain	Italy	Spain	Italy	Spain	Italy	Spain
Total Population	502,19	494,63	580,94	572,84	78,75	78,20	0,8277	0,8258
Native	504,76	500,07	582,75	576,59	77,99	76,52	0,8300	0,8319
Second -generation of immigrants	481,04	448,71	565,02	540,04	83,98	91,33	0,8080	0,7762
First -generation of immigrants	441,38	435,42	538,28	532,07	96,90	96,65	0,7584	0,7583
Funding system								
	Mean score		Potential score		Difference		Efficiency	
	Italy	Spain	Italy	Spain	Italy	Spain	Italy	Spain
Public schools								
Native	505,69	489,38	583,10	565,46	77,41	76,08	0,8322	0,8276
Second-generation immigrants	483,96	433,91	567,20	528,39	83,25	94,49	0,8113	0,7626
First-generation immigrants	445,64	431,23	541,32	527,53	95,67	96,30	0,7637	0,7566
Private government-dependent schools								
Native	483,07	515,33	564,91	592,41	81,84	77,08	0,8143	0,8383
Second-generation immigrants	432,38	494,54	523,47	574,20	91,09	79,66	0,7713	0,8219
First-generation immigrants	386,58	447,83	499,16	545,62	112,58	97,79	0,6899	0,7630
Private independent schools								
Native	488,66	530,70	591,57	609,20	102,91	78,50	0.7750	0,8425
Second-generation immigrants	509,68	503,48	624,55	599,08	114,87	95,59	0,7740	0,7952
First-generation immigrants	462,53	460,06	553,42	557,41	90,89	97,35	0,7885	0,7751
Decentralized vs. centralized institutions								
	Mean score		Potential score		Difference		Efficiency	
	Italy	Spain	Italy	Spain	Italy	Spain	Italy	Spain
Schools managed by central authority								
Native	503,64	467,13	582,28	547,86	78,64	80,73	0,8288	0,8040
Second-generation immigrants	485,35	396,48	568,11	499,33	82,75	102,85	0,8131	0,7199
First-generation immigrants	447,16	416,35	542,09	518,02	94,93	101,67	0,7664	0,7307
Schools not managed by central authority								
Native	506,36	503,64	583,42	579,70	77,06	76,07	0,8332	0,8340
Second-generation immigrants	473,86	469,79	559,88	556,48	86,02	86,69	0,8010	0,7980
First-generation immigrants	434,18	437,21	533,53	533,39	99,35	96,18	0,7485	0,7609

Table 6. Determinants of efficiency for First- and Second-Generation Immigrants

(OLS, dep. var. difference between the potential score and the score for this sub-sample)

Dummy for gender of the student (1 girl, 0 boy)	0.657
	(0.569)
Dummy if the language of the test is that spoken at home (1 yes, 0 no)	-2.400*
	(-1.968)
Highest educational level of parents	2.840**
	(-7.953)
Highest parental occupational status	0.063
	(-1.472)
Immigration status	7.527**
	(-4.651)
Dummy for student who repeats one or more years	25.237**
	(-20.375)
Total school enrolment	0.000
	(0.137)
School Type (1=public, 2=private gov. depend, 3=private indep.)	5.845**
	(-3.332)
Student-Teacher ratio	-0.640**
	(-2.885)
Dummy school national management (1 national hiring teachers, 0 otherwise)	3.266*
	(-2.149)
Dummy for the country (1 Italy, 0 Spain)	4.210**
	(-2.838)
Constant	46.770**
	(-8.060)
Observations	2925
R-squared	0.150
Absolute value of t statistics in parentheses	
* significant at 5%; ** significant at 1%	

Notes

[1] PISA 2009
[2] 2011 OECD data.
[3] Regarding this topic, see, among many others Brugnano (2011) and Ferrari and Zanardi (2012).
[4] Native students are those who were born in the country where they were assessed by PISA or who had at least one parent born in the country. Students with an immigration background include students who are first-generation immigrants, i.e. foreign-born students whose parents are also foreign-born, or second-generation immigrants, i.e. students who were born in the country of assessment but whose parents are foreign-born.
[5] Among many others Checchi and Flabbi (2007) and Checchi and Peragine (2005)
[6] See Battese and Corra (1977) and Battese and Coelli (1995)
[7] Barrow (1991) and Cooper et al. (1997)
[8] The choice of variables follows a paper by Perelman et al. (2011) in which the same methodological framework is applied, even though the research question is quite different.
[9] PISA 2009
[10] Two stochastic frontiers, one for each sub-sample of Italian and Spanish pupils, have been estimated. Additional information on these estimations is available upon request.
[11] This is the reason why the dummy for the country is not significant in the stochastic frontier estimation (Table 4).
[12] An analysis of the determinants of the difference in efficiency for the whole population of students is available on request.

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