

Foreign Students and Achievement in Mathematics: Evidence from the Italian Case

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Gli alunni stranieri e l'apprendimento delle matematica: alcune riflessioni sul caso italiano

The growing presence of foreign students in the Italian school continually interrogate teachers, policy makers and all those who are daily faced with issues related to this more and more structural reality. This work presents an analysis of the educational achievements in Mathematics of foreign students who have just completed the first cycle of education (5th grade) in Italy. To this end, we use INVALSI data that have the advantage to measure learning outcomes through standardized tests. Studying the frequency of responding correctly to any individual item and controlling for students' background, we find substantially different and more encouraging reading of the learning gaps between Italian and foreign students.

Keywords: foreign students' educational achievement, INVALSI, mathematics, socio-economic-cultural background, equity, linguistic competence.

La crescente presenza di allievi stranieri nella scuola italiana interroga continuamente gli insegnanti, i decisori politici e tutti coloro che si trovano quotidianamente a fronteggiare le problematiche legate a questa realtà sempre più strutturale. Il presente contributo propone un'analisi sugli esiti in Matematica alle Rilevazioni INVALSI 2014 degli studenti con cittadinanza non italiana che hanno appena terminato il primo ciclo di istruzione (classe V della scuola primaria). Considerando la probabilità di rispondere correttamente ai singoli item e tenendo sotto controllo alcune condizioni di contesto, si può avere una lettura diversa e più incoraggiante dei divari nell'apprendimento tra alunni italiani e stranieri.

Parole chiave: apprendimento degli alunni stranieri, INVALSI, matematica, background socio-economico-culturale, equità, competenza linguistica.

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This article is the output of a joint work of the two authors. Nonetheless, Veronica Riccardi contributes substantially to Section 1 (Introduction) and Section 3 (The research: some results). Section 2 (Research methodology) and Section 4 (Discussion) have been mostly developed by Giuseppina Le Rose. The opinions expressed in this article are the authors' own and do not reflect anyhow the view of INVALSI.

Foreign Students and Achievement in Mathematics: Evidence from the Italian Case

1. Introduction

Historically marked by high rates of emigration, over the past 30 years, Italy – as well as Portugal, Greece and Spain – has become one of the major destinations for international migrants (Colombo and Sciortino, 2004).

At the end of 2014, census data count more than 5 million foreign residents in Italy, about the 8.2% of the total resident population, with a small increase (92.000 people) over the previous year. More than 190 countries of origin are represented, but the top five nationalities are Romania (1.131.839 persons), Albania (490.483 persons), Morocco (449.058 persons), China (265.820 persons) and Ukraine (226.060 persons) (IDOS, Confronti, 2015).

The presence of immigrant students attending the Italian education system¹, in the last years, has become a structural phenomenon so as to induce the Ministry of Education, in compliance to the principle of non-Italian citizenship, to manage the composition of classes comprising both Italian and non Italian students. It is worth to remark here that “immigrant students” is a very broad expression because it includes children with different biographical experiences and various situations (new arrived children, migrant children, children with an immigrant background of second or third generation). At least since the early 2000s, in Italian schools, there has been a steady increase of students with foreign citizenship, along with an opposite downward trend in the Italian students because of a demographic downturn (low birth rate).

Overall, in the school year 2013/2014 802,785 migrant pupils attended Italian schools, the 9.0% of the total – 16,155 more than in the school year 2012/2013 (incidence of 8.8%). Of these 167,591 were enrolled in nursery school (20.9%), 283,233 in primary school (35.3%), 169,780 in lower secondary school (21.1%), 182,181 in upper secondary school (22.7%).

The immigrant population in the age 3-19 is the 9% of the total. However, it is especially the share of those who are born in Italy (second generation - G2)² that experience a dramatic upturn: in the school year 2013/2014 foreign students, as a whole, grew to a pace of 2.1% over the previous year; those born in Italy increased of about 11.8%. Second generation pupils weight therefore the 51.7% of the total migrant pupils (MIUR-ISMU, 2015).

- 1 The Italian education system is divided into four levels: nursery school (from 3 from 6 years), primary education (from 6 to 11 years), lower secondary education (from 11 to 14), upper secondary education (from 15 up to 19 years), and tertiary education. For a detailed description of the Italian education system, see: <https://webgate.ec.europa.eu/fpfis/mwikis/eurydice/index.php/Italy:Overview>.
- 2 “First Generation” (G1) meant the people who were born elsewhere and immigrated to this country, “Second Generation” (G2) in this sense means those who were born in Italy from these “First Generation” parents.



Level	Foreign students	%	Of which born in Italy	Of which enrolled for the first time	%	% foreign of all students	% born in Italy of all foreign students
Nursery school	167.591	20,9	140.739	-	0,0	10,1	84,0
Primary education	283.233	35,3	182.315	14.421	46,8	10,0	64,4
Lower secondary education	169.780	21,1	64.338	7.889	25,6	9,6	37,9
Upper secondary education	182.181	22,7	27.790	8.515	27,6	6,8	15,3
Total	802.785	100,0	415.182	30.825	100,0	9,0	51,7

Tab. 1: Foreign students in Italy - school year 2013/14

Education accounts for much of the young immigrants social integration. An education system able to assure equal opportunities to all students, regardless of their social or cultural background, and to develop intercultural awareness and skills available for the entire school population, will be a fundamental testing ground for an increasingly multicultural society. Its achievement is however challenging as it requires a strong capacity of ensuring high-quality education for all its members, minimizing disparities and avoiding polarization in outcomes (Catarci, 2015).

Italy traditionally has an inclusive school system (comprehensive schools, special education integrated in regular schools) and a well developed system of early childhood education; diversity is a central concept in policy documents and in pedagogy, a concept that encompasses cultural, linguistic, religious, and individual features like ability or disability (Allemann-Ghionda, 2008). In this framework, the presence of migrant pupils in daily school life is not only recognized as reality, but it is also seen as an opportunity for changes for the whole school (MIUR, 2007).

In European context, immigrant students still appear to be disadvantaged in terms of enrolment in type of school, duration of attending school, achievement, dropout rates and type of school diploma attained (Park and Sandefur, 2010). Also in Italy, they systematically achieve less in the INVALSI test score than their native Italian peers. Nevertheless, the Italian school system is generally thought to comply with the principle of inclusion (Allemann-Ghionda, 2008).

Research in Education can offer interesting insights on the issue of assessment of students without Italian citizenship because it allows to speculate on the degree of maturity of the process of integration of foreign students in Italian schools. Such research could highlight inequalities generated from differences in the social background, origin, or gender that could potentially broaden because of the lack of interactions among groups of different students. It has been documented, for instance, that schools attended by natives and migrants students are substantially different in terms of period of attendance, opportunities for learning and socialization, or support from their parents. The so-called inequality of educational opportunities are thus, in migration processes, one of the factors that can amplify inequalities between immigrants and the local population, even over successive generations (Ricucci Fieri, 2008).



This research in Italy is still in its infancy. Our “theoretical starting point” for explaining achievement is then motivated on gaps derived from the amount abundant literature on traditional European immigration countries (Germany, United Kingdom, Netherlands, etc.). This strand of literature points to one major conclusion: the biggest disadvantage of immigrant students in educational achievement is the lower parental resources (Heath & Brinbaum 2007; Schnepf 2008). Once socio-economic family background has been taken into account, the “documented” educational inequality between the two groups significantly decreases and often disappears. In fact, recent immigrant parents in Italy countries have relatively high education levels but they encounter severe undervaluation of their educational credentials in the labour market (Eurostat, 2011, pp. 51-56) and are found to be disadvantaged with respect to the majority of the populations (OECD, 2008; 2010; Reyneri & Fullin, 2011). What makes Italy interesting from an international perspective is that recent studies indicate weaker effects of socio-economic family background in accounting for achievement differences in these new destination country than in most other European countries (Marks, Cresswell & Ainley, 2006; OECD, 2012a, pp. 89-93).

Researches conducted in Italy show that, in addition to the socio-economic status of the family, variables related to the use of language (Folgheraiter & Tressoldi, 2003; Murineddu, Duca & Cornoldi, 2006; Azzolini, 2011) account of much of the educational attainment across foreign students. Other correlates discussed in literature to date are the motivation to learn, the discontinuous frequency in attending school discontinuous due to repeated return to the country of origin, the knowledge of more than one language, and the level of education of the pupil in the foreign country of origin. A closer mother tongue to the Italian language is also acknowledge to facilitate their learning process.

Overall, these scholars show that the major factors affecting outcomes are not those related to ability and commitment in studying but rather those related to a direct knowledge of Italian, the socio-economic and cultural development of families, the number of years of stay in Italy, the country of origin.

Interesting information on foreign students’ (first and second generation) achievement can be obtained from the results of INVALSI³ surveys. Figure 1 shows the average test score achieved in Italian among our three groups of interest: native, first and second generation foreign students, across the four grades. The group average comparison reveals significant differences (at 95% of confidence) in favor of native students in all grades considered in the 2013/14. Nonetheless, differences between Italian and second generation foreign students are lower than those of first generation students (INVALSI, 2014, p. 79)⁴.

3 INVALSI is the Italian national institute for the evaluation of the school system which regularly carries out standardized tests to assess the learning levels of the pupils at various grades. INVALSI is responsible for administering an annual test of Italian and Mathematics to all students of the following classes: second and fifth class of primary school, third class of lower secondary school and second class of upper secondary school. Within the entire school population, it is identified each year a sample of schools, classes and students with survey procedures subsidiaries.

4 The data presented in the two figures refer to the sample INVALSI and are based on scores (or ability) estimated using the Rasch model and using an average of 200 and a standard deviation of 40.

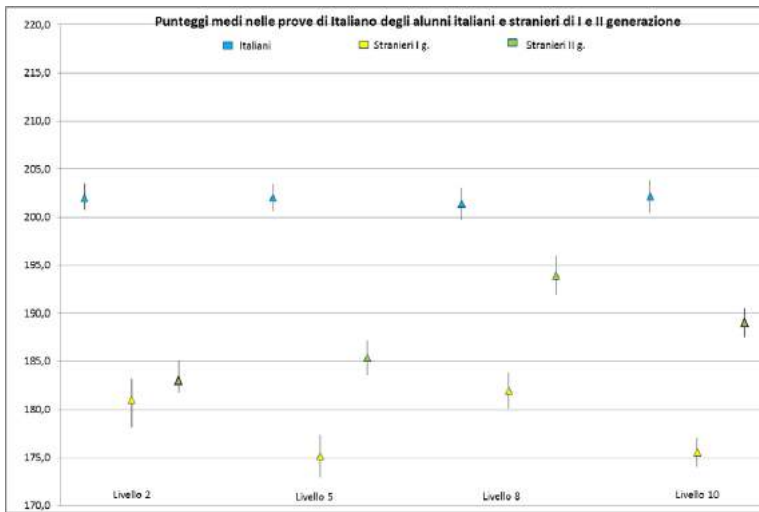


Fig. 1: Results of Italian and foreign (first and second generation) students in Italian INVALSI test for school level - Italy



Differences among such groups, however, are smaller in Mathematics if compared to Italian and this could prove that when different skills come into play, besides the linguistic competence, foreign students are able to get more positive results.

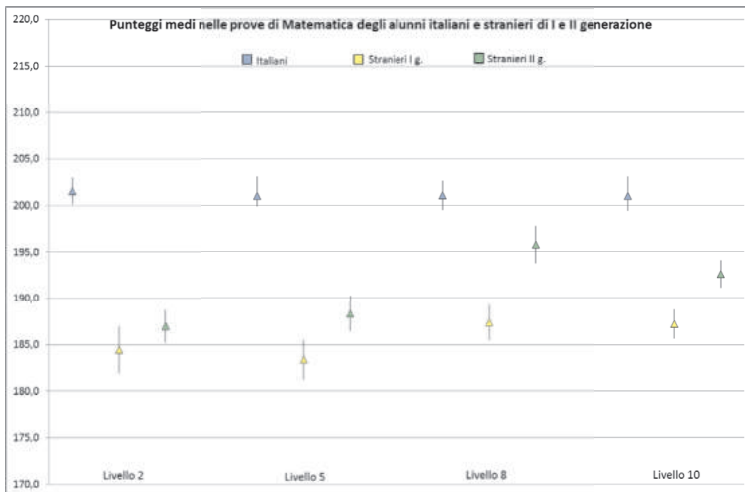


Fig. 2: Results of Italian and foreign (first and second generation) students in Math INVALSI test for school level - Italy

These two figures however only report raw correlation between students' achievements and country origin. No additional informations about socio-cultural and linguistic variables are taken into account and controlled for.

Despite school policies have been designed to favor the inclusion and adoption of an intercultural model, scholastic failure, dropouts, delays and poor performance are a pressing and unresolved problem of Italian school. It is essentially a matter of social equity, not only of educational approach: all forms of intercultural dialogue should guarantee everyone a full even opportunity for successful education and the free choice to develop their talents. Otherwise, only the dominant group controls and benefits from the educational opportunities and school placement of foreign students is a mere formality that may end up in perpetuating social injustice (Tarozzi, 2015, pp. 51-52).

2. Research methodology

To investigate differences between first-generation immigrants and second-generation immigrants educational achievements, we use INVALSI data that have the advantage to measure learning outcomes through standardized tests. We consider the mathematics test administered to fifth-grade pupils at the end of 2013/2014 year, along with a pupil's questionnaire for measuring socio-economic factors⁵. The choice of analyzing the results of outgoing students from the first cycle of education is linked to the importance of the skills acquired in this period for future education and future life. In fact, one of the main goals of a public education system, especially in primary school, is to offer equal educational opportunities to all students.

The aim of this work is to examine the magnitude of a standardized test score differences between immigrant (first and second generation) and native students *after controlling for socioeconomic background*. Specifically, we test whether citizenship is really, *net of other factors*, a major predictor of students good or bad success in mathematics – as literature to date has hypothesized. To pursue this research question, we use a model of conditional logistic regression. Logistic regression, also called logit model, is used to model dichotomous outcome variables. In this study, the dependent variable is the item correct answer (that is, it is equal to 1 if the student responds correctly to the item, 0 otherwise). The logit estimates the frequency that the dependent variable is equal to one, given a certain value taken by the control variables, that is the conditional frequency that the student, Italian, first generation immigrant, second generation immigrant, with a particular family background, correctly answers to the item of interest⁶.

5 The test includes 58 items: 43 multiple-choice items and 15 Open-response items. To view the full text of Math INVALSI test, see http://www.invalsi.it/areaprove/documenti/strumenti/05_Matematica_Fasc_1_STAMPA.pdf. For a detailed description of the INVALSI math test, see: http://www.invalsi.it/areaprove/rapporti/Rapporto_Rilevazioni_Nazionali_2014.pdf.

The pupils also filled a questionnaire for collecting variables which are proxies of the social, economic and cultural conditions of their families. Other data were collected through the school secretaries. For a detailed description of the pupil's questionnaire see: http://www.invalsi.it/areaprove/documenti/strumenti/Questionario_studente_classe_V_primaria.pdf

6 The logit regression model, as well as the probit, is preferred over the linear probability model because “forces” the values of the binary dependent variable to assume values between zero and one. The two models, logit and probit model the response



Some controls have been inserted both at individual-level and class-level. The individual controls are:

- gender;
- nursery school frequency;
- parents level of education;
- age of entry to school;
- geographical area where the school is located;
- parents' occupation;
- age of entry in Italy (only for first generation students);
- math oral mark⁷.

The geographical area is controlled for in two different ways. Our benchmark results exploit the within-macroarea variations in the likelihood of answering correctly to each item. In such a way, we compare students' achievements within the given area—specifically, North, Center, and South—and this strategy allows us to seize attitudes towards education that potentially affect their employment perspectives, aspirations, and ambitions, that might differ across those areas. These within-area estimations are those presented in the main body of this paper. On top of that, we have also computed more robust estimations that rather exploit within-Region variation. This strategy allows us to compare the achievement of native and foreign students within a certain small area, the Region. These second results are not different from the first ones, and are available upon request.



function as a function of distribution, logistics and normal, respectively. The logistic function gives greater weight to the tails of the distribution, that is, to cases where it is expected that a student with certain characteristics, with high probability to respond correctly or incorrectly to the item. For details, see, among others Stock & Watson (2005).

- 7 We considered a variable for the highest degree obtained from the father and one for the highest degree obtained from the mother and the possible responses are primary school graduation, lower secondary school graduation, vocational training qualification, upper secondary school qualification, another secondary school qualification (for example I.S.E.F), University graduation and post-university qualification.

Parents work are two variables with the following alternative response: unemployed, housewife, manager, university professor, functionary or military officer, entrepreneur/farmer entrepreneur, professional employee, military officer, freelance (doctor, lawyer, psychologist, researcher), employed worker (chandler, farmer, wright, etc.), clerk, graduated military, worker, addetto ai servizi/socio di cooperativa, old age. To age of entry to Italy (only for first generation students) the mode of response ranging from “a year or before” to “10 or more years”.

Geographical area of the school are North-West (Valle d'Aosta, Piemonte, Liguria, Lombardia), North-East (Trento, Bolzano, Veneto, Friuli Venezia Giulia, Emilia Romagna), Center (Toscana, Umbria, Marche, Lazio), South-Isles (Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicilia, Sardegna).

Math oral mark is instead an essay question open INVALSI coded as a continuous variable with range 1-10.

The Italian system school considers “regolare” the pupil who make 10 years by March 31, 2014, “anticipatari” the pupil who make 10 years after this date and “posticipatari” those who have 10 years old in 2013 or before.

Finally, we control for the class size, measured by the number of students in each classroom⁸.

We used data covering the entire population of students attending the fifth grade who have taken the math INVALSI test in the year 2013/2014⁹. The number of students who took the test is more than 300,000 units.

Our null hypothesis is that the conditional frequency of answering correctly is the same between Italians and foreigners (first and second generation).

3. The research: some results

Our results show that, holding the same socio-cultural background, being a foreign citizen is not always a clear predictor of failure in the math INVALSI test.

In the following figures, we present in the graphical form differences in the likelihood of correctly answering the items contained in the test between foreign (G1 and G2) and Italian pupils: on the horizontal axis there are the items administered during the test and on the ordinate the estimated difference in the frequency of correctly answering among Italians (our baseline category) and foreigners G1 (in red) and foreigners G2 (black). The little squares represent the estimated difference in the frequency of responding correctly to the item, while the bars draw confidence intervals (at 95% level) associated with these estimates. The confidence interval allows to compare the average probabilities of the three groups: if the confidence intervals of two means overlap, the difference is not significant; on the contrary if the ranges do not overlap, the difference is significant.

More specifically, the Math test is composed by 58 items that in turn belong to the following four thematic areas (INVALSI, 2011):

- Numbers;
- Space and Figures;
- Relations and Functions;
- Data and Forecasts.

The majority of “Number” items (Figure 5) have the trends theoretically expected: the foreigners have a frequency to respond properly lower than Italians. This trend is clearly observed, for example, in the items D6, D19, D25, D26 and D29, where the frequency of answering correctly are not so different between the two groups of foreigners of first and second generation. However, they are considerably lower than those of the Italians.

For other items (D11 and D12), there is no difference between foreigners and Italians in the frequency of answering correctly. The answers D11 and D12 are both closed-ended and, for the resolution, they require the ability of interpreting a written text and also the knowledge of some notions connected to the writing of numbers (D11) and the interpretation of geometric figures (D12).

Regarding the item D21, we cannot confidently affirm that such frequency differ among the three groups of students. Instead, in item D4 there is no significant difference between the Italians and the first generation.

8 The model was also included the square of the number of students to capture any effects of congestion (or decreasing returns to scale) in classes due to over-crowding.

9 See note 3.



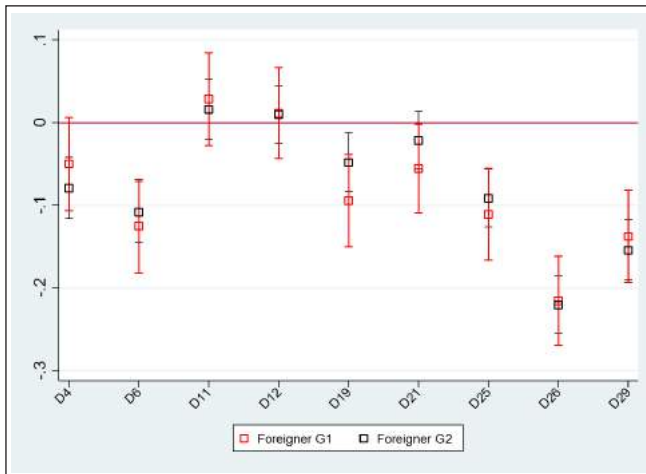


Fig. 5: Differences in the frequency of responding correctly to the item contained in the INVALSI test 2014 to I and II generation foreign students than Italian pupils - area “Numbers”.



The most insightful results of our study emerge from the analysis of the “Data and Forecast” thematic area. They are reported in Figure 6. In particular, the D8 question is composed of 6 items. In each of them, the three groups answer with highly heterogeneous likelihood.

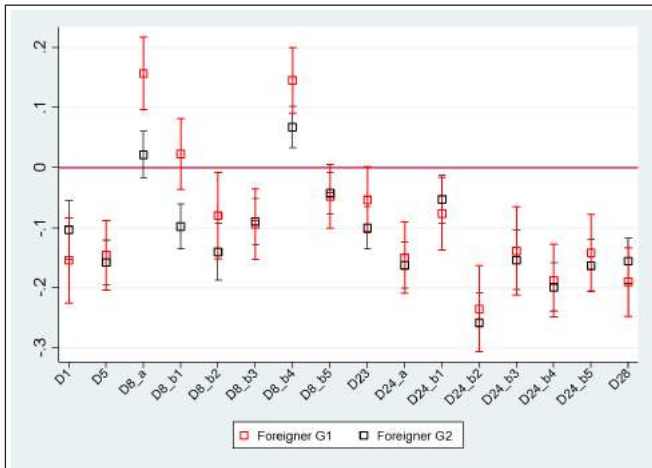


Fig. 6: Differences in the frequency of responding correctly to the item contained in the INVALSI test 2014 to I and II generation foreign students than Italian pupils - area “Data and Forecast”.

More specifically, question D8 is split in two big components: in the first (D8a) pupils are asked to answer to a multiple choice question through the graph interpretation in the second (D8b) they are asked to indicate whether some statements referring to the chart are true or false. It is very interesting to note that, in item D8a, the first generation immigrants (G1) have, on average, higher frequency of responding correctly than the second-generation immigrants (G2) and that second gener-

ation immigrants (G2) likelihood does not statistically different from that of Italians: apparently, being first generation foreign influences positively the correct item response. This finding, that at a first look might appear “strange”, could be justified noting that the item almost totally does not rely on language skills: the chart is easily interpreted without reading the initial delivery. The second part of the question D8, composed by 5 items, is characterized by a very varied situation: in item D8b1 the ability to answer properly to the first generation of foreigners is not statistically different from that of the Italians, while the second-generation foreigners are less likely to answer correctly than both Italian and foreign first-generation; the frequency of responding correctly to items D8b2 and D8b3 is not statistically different for G1 and G2 and, in any case, is smaller than that of the natives; the frequency of responding correctly to item D8b4 is not statistically different for G1 and G2, but both groups answer correctly on average with a higher frequency than those of the natives; finally, the frequency of responding correctly to item D8b5 is not statistically different for G1 and G2 and still slightly lower than those of Italian students. We speculate on these differences on the frequency of responding correctly to the items battery D8b arguing that items with “true” or “false” implies the knowledge of the notion of “truth” and “false” and, in this case, the linguistic understanding is a mandatory requirement. Questions D24 and D8 have same structure: they are formed by one multiple choice item and some statements “true” or “false” but, while the question D8 deals with a more “scholastic” issue, question D24 proposes a daily problem (interpreting the code of the eggs sold in supermarkets). In all these items the possibility of answer correctly of foreign students of first and second generation are lower than that of the Italians, with a spike down in the item D24b2. Even if these questions are similar, some peculiarities make question D24 more heavy for foreigners, because the pupil does not only have to acquire the notion of “true” or “false” but they also are required to understand each item, which in this case are not just composed by numbers -as we saw for question D8.

In the majority of “Relations and Functions” items (D3, D16, D18a, D18b1, D18b2, D18b3) the frequency of answering correctly for foreign students (G1 and G2) is not statistically different from that of the Italian students: the variable “citizenship”, therefore, does not seem to have significant effects on students’ ability (Figure 7).

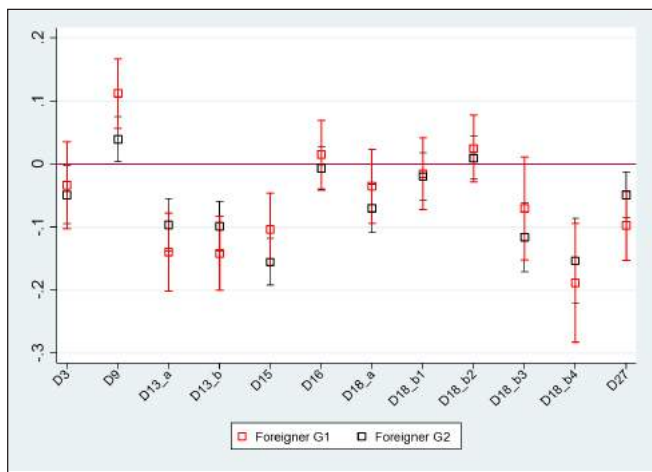


Fig. 7: Differences in the frequency of responding correctly to the item contained in the INVALSI test 2014 to I and II generation foreign students than Italian pupils - area “Relations and Functions”.

In the item D9, the frequency of answering correctly of foreign students is greater than that of the Italians: to answer correctly the pupil are required to understand a table with a series of numbers. In this type of task, foreign students show no difficulty and this is also confirmed in the item D3 (fulfilling a double entry table) where the answers of foreign students are not statistically lower than Italians. The way question D18 is constructed makes it substantially similar to questions D8 and D24 that we have commented in “Data and Forecasts:” answering correctly to the first part (D18a) requires that pupils interpret figures enumerated in a table within a multiple choice question scheme; in the second part they have a dichotomous item battery. In the item D18b1 and D18b2, the frequency of answering correctly of foreigners is not statistically different from that of Italians, but it is statistically lower in item D18b4. Finally, in item D18a and D18b3 the frequency of answering correctly is not statistically different between first generation immigrants and Italians, while second generation immigrants respond properly on average with a lower frequency. Even in this items battery we find that linguistic complexity of the posed questions adversely affect the outcome of foreign students.

The last thematic area is “Space and Figure” (Figure 8). Though there are not questions in which the frequency of correctly answering of foreign students exceeds that of the Italians, with the sole exception of the answer of second generation foreigners to item D17A, there are many items in which this frequency is not statistically different for the three groups (D2a1, D2a3, D14, D17b, D17c, D17d, D20, D22). This thematic area is therefore the least affected by the variable “citizenship”.

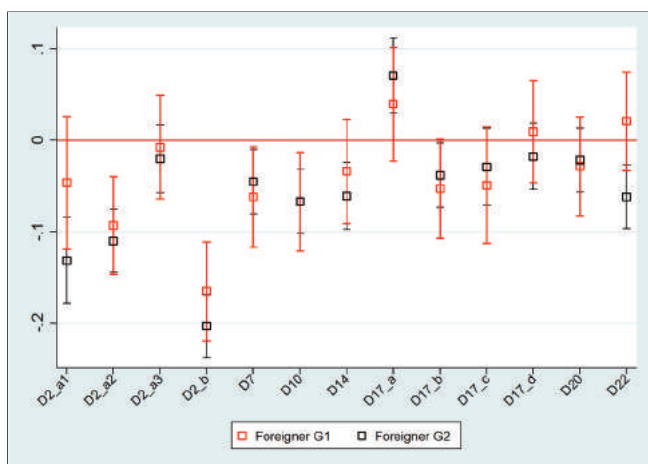


Fig. 8: Differences in the frequency of responding correctly to the item contained in the INVALSI test 2014 to I and II generation foreign students than Italian pupils - “Space and Figure”.

The question D2 is composed by two parts: in the first (D2a) the task requires to indicate whether some statements referring to the chart are true or false; on the second part pupils are asked to complete a graph by drawing the symmetry axis. In this item the frequency of answer correctly of foreign students is statistically inferior to that estimated for the Italians because, even if the task seems deceptively easy (to draw a line), it involves learning the concept of “symmetry.” Foreign students, however, do not seem to have more difficulties than Italians in other types of questions that require to conclude the shape of a geometric figure such as, for example, ques-

tion D20 (given a triangle ABC, the students are asked to draw a rectangle with one side already but with same area of the rectangle ABC). The tasks required in this question are three: calculate the area of the triangle, find the measure of the side of the missing rectangle and, according to this, draw the rectangle.

Along with foreigner status, other socio-cultural variables affect students' achievement. The attendance of nursery school and parent's level of education, for instance, both show a positive impact on the frequency of correctly answering of the pupils to almost all the items. Looking at the age of entry to school, one can rather note that regular students have greater frequency to correctly answering at most of the items. Males have better results than females on the whole, although in 11 item, related to the area "Relations and Functions" and in the area "Data and Forecasts", females show better results than males. As expected, the math oral mark is a clear predictor of correctly answering to all the items of the math INVALSI test.

Our results therefore confirm that, on the whole, socio-cultural variables account for much of the variation in the students' achievement. This is consistent with part of the sociological and economic literature that argues that social, cultural and family economic conditions play a key role in the students' learning, since their infancy (Cobalti and Schizzerotto, 1994; Checchi, 1997; Brint, 2006; OECD, 2012b). Welsch and Zimmer (2008), among others, document that parents with higher education allocate more time to direct child care despite their opportunity cost being larger. Our findings about the age of entry to school are also consistent with researches arguing that going to school before the age of 6 is not conducive to the achievement (e.g., Ponzo and Scoppa, 2014). An in-depth study, instead, should be done for students who are late in their studies because this category includes the repeaters and often also foreign students who are inserted in delay in the Italian school system.



4. Discussion

In this work we study the likelihood that first and second generation immigrants answer correctly to the 58 math INVALSI items administered to fifth-grade pupils at the end of the 2013/2014 year. We matched such information with a questionnaire devoted to measure socio-economic factors.

On the whole, our results indicate that, after controlling for socioeconomic background (gender, nursery school frequency, parents level of education, age of entry to school, geographical area where the school is located, main parents job and – only for first generation students – the age of entry in Italy), being a foreigner is not always a clear predictor of failure in the INVALSI Math test.

The study of the Maths test, analyzed within the respective thematic area (Numbers, Space and Figures, Relations and Functions, Data and Forecasts), shows interesting insights to understand not only the magnitude of the performance gap between Italian students and foreign students in this discipline, but also the contents in which foreign students show more difficulty.

According with research to date in the field (INVALSI, 2014; MIUR-ISMU 2015), in questions related to "Numbers" and "Data and Forecasts" "foreigner students are less likely to answer correctly than the natives. On the contrary, in the areas "Reports and functions" and "Space and Figure" variable "citizenship" does not produce heterogeneous effects: in fact in most of these items the frequency to answer correctly of foreign students of first and second generation is not statistically different from that of the Italians.

Our results therefore confirm that, socio-cultural variables account for much of the variation in the students' achievement. A deeper analysis -not limited in considering only aggregate information - conveys different and most encouraging understanding of outcomes of foreign students in mathematics.

If we consider mathematics as an important element of the cultural background of one person, used in everyday life as a calculation, representation and investigation tool, we can not refrain in dealing with the analysis of the interplay of mathematical competence and language skills. For example, as seen for the item D8a, first generation foreigners are more likely to answer correctly both for Italian and second generation foreigners: a possible interpretation of this result could be due to the type of stimulus that in this case suggests, after a short delivery, the interpretation of a chart, which could also be read without a full understanding of the Italian language.

Identify what characteristics of the item can facilitate or hinder the success of the task can be a starting point or just one of many ways to understand the difficulties of foreign students in a constructive way- stepping up from common beliefs that traditionally see those difficulties inevitable and systematic. In this sense the assessment, although implemented in the same way for Italian and foreigners, should pay particular attention to the cultural and socio-economic background and language skills of each student. Our analysis therefore suggests that in order to promote a really inclusive school system a policy maker cannot ignore such salient aspects. This, in our opinion, is relevant to guarantee genuine social integration of immigrants, a wider and stronger need in Italy and Europe.



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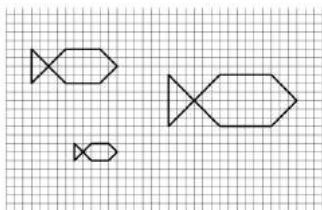


Attachment 1 – Item of Math INVALSI test (year 2013/2014 - fifth-grade pupils) analyzed in this work

The question D2 is composed by two parts: in the first (D2a) the task requires to indicate whether some statements referring to the chart are true or false; on the second part (D2b) pupils are asked to complete a graph by drawing the symmetry axis.

In item D2a1 and item D2a3, the frequency of correctly answering is not statistically different for the three groups (Italians, G1 and G2).

D2. Alice ha disegnato tre pesciolini sul suo quaderno a quadretti.



a. Indica se ciascuna delle seguenti affermazioni è vera (V) o falsa (F).

		V	F
1.	Le tre figure hanno la stessa forma	<input type="checkbox"/>	<input type="checkbox"/>
2.	Le tre figure hanno gli angoli corrispondenti della stessa ampiezza	<input type="checkbox"/>	<input type="checkbox"/>
3.	Il pesce più piccolo e il pesce più grande sono in scala 1 : 4	<input type="checkbox"/>	<input type="checkbox"/>

b. Disegna sulla figura del pesce più grande il suo asse di simmetria.

Item D3 is a cloze answer (fulfilling a double entry table) and the frequency of answering correctly for foreign students (G1 and G2) is not statistically different from that of the Italian students.

D3. Il venerdì la maestra controlla la tabella delle presenze alla mensa dei suoi alunni durante tutta la settimana. Nella tabella mancano due numeri: completala tu.

	Assenti	Presenti
Lunedì	3	18
Martedì	1	
Mercoledì		17
Giovedì	2	19
Venerdì	0	21

The answers D4 is closed-ended and, for the resolution, they require the ability of interpreting a written text and also the knowledge of some notions connected to math symbols.

In this item there is no significant difference between the Italians and the first generation.



D4. Osserva la seguente disuguaglianza:

$$1 < \blacktriangle < 2$$

Quale, tra i seguenti, è il numero che, messo al posto del triangolo, rende vera la disuguaglianza?

- A. 0,12
- B. 0,5
- C. 1,7
- D. 2,1

The D8 question is composed of 6 items. D8 is split in two big components: in the first (D8a) pupils are asked to answer to a multiple choice question through the graph interpretation, in the second (D8b) they are asked to indicate whether some statements referring to the chart are true or false.

In item D8a, the first generation immigrants (G1) have, on average, higher frequency of responding correctly than the second-generation immigrants (G2) and that second generation immigrants (G2) likelihood does not statistically different from that of Italians.

The second part of the question D8, composed by 5 items, is characterized by a very varied situation:

D8b1: the ability to answer properly to the first generation of foreigners is not statistically different from that of the Italians, while the second-generation foreigners are less likely to answer correctly than both Italian and foreign first-generation;

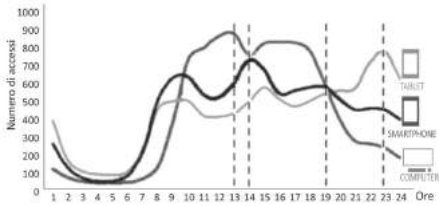
D8b2 and D8b3: the frequency of responding correctly to these items is not statistically different for G1 and G2 and, in any case, is smaller than that of the natives;

D8b4: the frequency of responding correctly to item is not statistically different for G1 and G2, but both groups answer correctly on average with a higher frequency than those of the natives;

D8b5: the frequency of responding correctly to item is not statistically different for G1 and G2 and still slightly lower than those of Italian students.



D8. Nella città dove vive Linda gli abitanti usano diversi dispositivi (computer, tablet o smartphone) per accedere al sito www.quotidianoonline.it. Il seguente grafico mostra il numero di accessi a questo sito dai diversi dispositivi in un giorno.



a. Quanti sono all'incirca gli accessi al sito da computer alle ore 13?

- A. Circa 900
- B. Circa 700
- C. Circa 600
- D. Circa 400

b. Facendo riferimento al grafico, scrivi se le seguenti affermazioni sono vere (V) o false (F).

		V	F
1.	Alle ore 14 si ha un massimo di accessi al sito da tutti e tre i tipi di dispositivi	<input type="checkbox"/>	<input type="checkbox"/>
2.	Intorno alle ore 19 il numero di accessi al sito è all'incirca uguale per tutti e tre i dispositivi	<input type="checkbox"/>	<input type="checkbox"/>
3.	Tra le 19 e le 21 il numero di accessi da computer e da smartphone diminuisce	<input type="checkbox"/>	<input type="checkbox"/>
4.	Alle ore 23 il numero di accessi al sito da tablet è massimo	<input type="checkbox"/>	<input type="checkbox"/>
5.	Gli accessi al sito da tablet aumentano sempre nel corso della giornata	<input type="checkbox"/>	<input type="checkbox"/>



In the item D9, the frequency of answering correctly of foreign students is greater than that of the Italians: to answer correctly the pupil are required to understand a table with a series of numbers. In this type of task, foreign students show no difficulty.

D9. I bambini di V B devono preparare lo sfondo del palcoscenico per la recita di fine anno. Franco ha ottenuto la giusta tonalità di azzurro del cielo mescolando 5 misurini di bianco e 2 misurini di blu.

Completa la tabella in modo che tutti i bambini ottengano la stessa tonalità di azzurro.

	Franco	Sara	Giulia	Marco
misurini di bianco	5	15	30
misurini di blu	2	4	12

The answers D11 is closed-ended and, for the resolution, they require the ability of interpreting a written text and also the knowledge of some notions connected to the writing of numbers.

For this D11, there is no difference between foreigners and Italians in the frequency of answering correctly.

D11. Quale tra le seguenti scritture non corrisponde al numero diciottomilaquaranta?

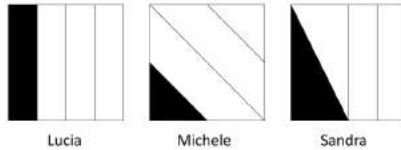
- A. 18040
- B. 18 migliaia + 4 decine
- C. $1 \times 10000 + 8 \times 1000 + 4 \times 10$
- D. $1000 + 8000 + 40$

The answers D12 is closed-ended and, for the resolution, they require the ability of interpretation of geometric figures.

For this item, there is no difference between foreigners and Italians in the frequency of answering correctly.

D12. L'insegnante chiede di colorare un quarto della superficie di un quadrato.

Lucia, Michele e Sandra eseguono il compito nei modi rappresentati in figura.



Chi ha svolto correttamente il compito?

- A. Solo Sandra
- B. Solo Lucia e Michele
- C. Solo Sandra e Lucia
- D. Tutti hanno svolto correttamente il compito



Item D16 is closed-ended and, for the resolution, they require the knowledge of conversions between units of measurement.

The frequency of answering correctly for foreign students (G1 and G2) is not statistically different from that of the Italian students.

D16. Per preparare una porzione di panna cotta occorrono 25 centilitri di latte. Claudia compra 4 litri di latte.

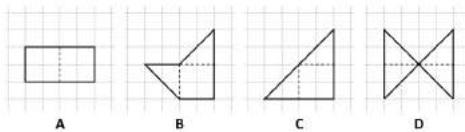
Quante porzioni di panna cotta può preparare?

- A. 10
- B. 16
- C. 8
- D. 12

In the question D17 pupils are asked to answer to a multiple choice question (true or false) through the draw interpretation.

In these items, the frequency of correctly answering is not statistically different for the three groups (Italians, G1 and G2).

D17. Osserva attentamente le seguenti figure.



Indica se ciascuna delle seguenti affermazioni è vera (V) o falsa (F).

	V	F
a. Le figure B e C hanno lo stesso perimetro	<input type="checkbox"/>	<input type="checkbox"/>
b. L'area della figura D è maggiore dell'area della figura A	<input type="checkbox"/>	<input type="checkbox"/>
c. Il perimetro della figura D è minore del perimetro della figura C	<input type="checkbox"/>	<input type="checkbox"/>
d. L'area della figura A è uguale all'area della figura B	<input type="checkbox"/>	<input type="checkbox"/>

The D18 question is composed of 5 items. D8 is split in two big components: in the first (D18a) pupils are asked to answer to a multiple choice question through the table interpretation, in the second (D18b) they are asked to indicate the need to know some characteristics of objects.

In these items, the frequency of answering correctly for foreign students (G1 and G2) is not statistically different from that of the Italian students.

D18. Osserva queste due bottiglie.



La seguente tabella riporta le loro caratteristiche.

CARATTERISTICA	Bottiglia A	Bottiglia B
PESO della bottiglia vuota	200 g	40 g
ALTEZZA	30 cm	15 cm
CAPACITÀ (volume interno)	300 cm ³	500 cm ³
COLORE	VERDE SCURO	TRASPARENTE
MATERIALE	VETRO	PLASTICA



a. **Quale delle due bottiglie può contenere più liquido?**

- A. La bottiglia A perché è più pesante
- B. La bottiglia B perché ha un volume maggiore
- C. La bottiglia A perché è più alta
- D. Il confronto non si può fare perché le bottiglie hanno forme diverse

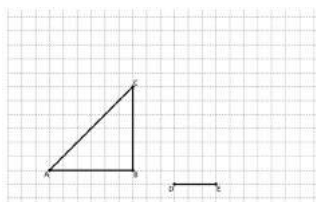
b. **Immagina di riempire completamente entrambe le bottiglie di acqua. Quali caratteristiche è necessario conoscere per poter prevedere quale delle due bottiglie sarà più pesante? Metti una crocetta per ogni riga.**

	CARATTERISTICA	È necessario conoscerla	Non è necessario conoscerla
1.	PESO della bottiglia vuota	<input type="checkbox"/>	<input type="checkbox"/>
2.	ALTEZZA	<input type="checkbox"/>	<input type="checkbox"/>
3.	CAPACITÀ (volume interno)	<input type="checkbox"/>	<input type="checkbox"/>
4.	COLORE	<input type="checkbox"/>	<input type="checkbox"/>

In the question D20 pupils are asked to draw a geometric figure.

In these items, the frequency of correctly answering is not statistically different for the three groups (Italians, G1 and G2).

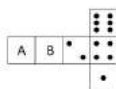
D20. Disegna un rettangolo che abbia un lato uguale a DE e la stessa area del triangolo ABC.



In the question D22 pupils are asked to recognize shapes in space and use for the resolution of geometrical problems or modeling.

In these items, the frequency of correctly answering is not statistically different for the three groups (Italians, G1 and G2).

D22. Anna vuole costruire un dado usando forbici, colla e cartoncino. Conosce la regola dei dadi secondo la quale la somma del numero dei pallini delle facce opposte è sempre 7.



Ha già disegnato i pallini su alcune facce.

Quanti pallini deve disegnare sulle facce A e B ?

Faccia A: pallini

Faccia B: pallini



Attachment 2 - Logit models to estimate the frequency of correctly responding to each item of Math INVALSI test¹⁰

Table 1: Logit model to estimate the frequency of correctly responding in the area “Numbers”

	D4	D6	D11	D12	D19	D21	D25	D26	D29
Foreigner G1	-0.050* (0.029)	-0.125*** (0.029)	0.029 (0.029)	0.012 (0.028)	-0.094*** (0.028)	-0.055** (0.027)	-0.111*** (0.028)	-0.215*** (0.027)	-0.137*** (0.029)
Foreigner G2	-0.079*** (0.019)	-0.108*** (0.019)	0.016 (0.019)	0.010 (0.018)	-0.048*** (0.018)	-0.021 (0.018)	-0.091*** (0.018)	-0.220*** (0.018)	-0.154*** (0.019)
Male	0.180*** (0.008)	0.069*** (0.008)	0.384*** (0.008)	0.090*** (0.008)	0.288*** (0.008)	-0.016** (0.007)	0.165*** (0.008)	0.543*** (0.008)	0.177*** (0.008)
Nursery school	0.075*** (0.016)	0.110*** (0.016)	0.056*** (0.016)	0.072*** (0.015)	0.040*** (0.015)	0.044*** (0.015)	0.070*** (0.015)	0.023 (0.015)	0.042** (0.016)
Father's level of education	0.039*** (0.004)	0.024*** (0.004)	0.028*** (0.004)	0.030*** (0.004)	0.028*** (0.004)	0.019*** (0.004)	0.038*** (0.004)	0.033*** (0.004)	0.019*** (0.004)
Mother's level of education	0.040*** (0.004)	0.021*** (0.004)	0.022*** (0.004)	0.028*** (0.003)	0.022*** (0.003)	0.011*** (0.003)	0.031*** (0.004)	0.034*** (0.004)	0.021*** (0.004)
Age of entry to school (anticipatorio)	-0.012 (0.039)	0.051 (0.039)	0.069* (0.038)	0.026 (0.034)	0.046 (0.034)	0.125*** (0.034)	-0.007 (0.035)	0.043 (0.036)	-0.030 (0.039)
Age of entry to school (posticipatorio)	-0.083*** (0.032)	-0.118*** (0.032)	-0.142*** (0.031)	0.093*** (0.031)	0.017 (0.031)	-0.025 (0.030)	-0.003 (0.032)	-0.079*** (0.031)	-0.062* (0.032)
North	-0.071*** (0.012)	0.006 (0.012)	-0.030** (0.012)	-0.197*** (0.011)	-0.055*** (0.011)	-0.119*** (0.011)	-0.054*** (0.011)	-0.064*** (0.011)	-0.029** (0.012)
South	-0.003 (0.013)	-0.065*** (0.013)	-0.010 (0.013)	0.286*** (0.012)	0.183*** (0.012)	0.203*** (0.012)	0.092*** (0.012)	0.091*** (0.012)	0.107*** (0.013)
Math oral mark	0.518*** (0.004)	0.482*** (0.004)	0.484*** (0.004)	0.306*** (0.004)	0.294*** (0.004)	0.301*** (0.004)	0.495*** (0.004)	0.298*** (0.004)	0.484*** (0.004)
Constant	-3.644*** (0.066)	-3.039*** (0.066)	-3.542*** (0.063)	-2.643*** (0.060)	-2.769*** (0.060)	-2.321*** (0.059)	-3.898*** (0.061)	-1.879*** (0.062)	-2.961*** (0.066)
Observations	300142	300142	300142	300142	300142	300142	300142	300142	300142
Pseudo R ²	0.066	0.056	0.058	0.030	0.027	0.024	0.059	0.038	0.055

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$



10 Each column represents a logistic regression conditioned to the controls reported in rows.

Table2: Logit model to estimate the frequency of correctly responding - area "Data and Forecast" (first part)

	D1	D5	D8_a	D8_b1	D8_b2	D8_b3	D8_b4	D8_b5
Foreigner G1	-0.154*** (0.036)	-0.146*** (0.029)	0.157*** (0.031)	0.023 (0.030)	-0.079** (0.037)	-0.094*** (0.030)	0.146*** (0.028)	-0.047* (0.027)
Foreigner G2	-0.103*** (0.025)	-0.158*** (0.019)	0.022 (0.020)	-0.098*** (0.019)	-0.140*** (0.024)	-0.089*** (0.020)	0.067*** (0.018)	-0.042** (0.017)
Male	-0.125*** (0.012)	0.294*** (0.008)	-0.016* (0.009)	0.286*** (0.008)	0.029*** (0.011)	0.148*** (0.009)	0.065*** (0.008)	0.132*** (0.007)
Nursery school	0.049** (0.022)	0.110*** (0.015)	0.067*** (0.017)	0.001 (0.017)	0.003 (0.021)	0.030* (0.017)	0.029** (0.015)	0.024* (0.015)
Father's level of education	0.025*** (0.006)	0.025*** (0.004)	0.011** (0.004)	0.041*** (0.004)	0.046*** (0.006)	0.025*** (0.004)	0.031*** (0.004)	0.013*** (0.004)
Mother's level of education	0.037*** (0.005)	0.020*** (0.004)	0.010** (0.004)	0.037*** (0.004)	0.035*** (0.005)	0.027*** (0.004)	0.026*** (0.003)	0.020*** (0.003)
Age of entry to school (anticipatorio)	-0.087 (0.053)	0.078** (0.034)	0.039 (0.041)	-0.008 (0.038)	-0.087* (0.049)	-0.082** (0.039)	-0.059* (0.034)	0.045 (0.034)
Age of entry to school (posticipatorio)	-0.266*** (0.038)	-0.003 (0.032)	-0.045 (0.033)	-0.064* (0.033)	-0.182*** (0.039)	-0.063* (0.033)	0.067** (0.030)	-0.088*** (0.030)
North	0.065*** (0.017)	-0.268*** (0.011)	0.010 (0.013)	0.180*** (0.013)	0.168*** (0.017)	0.085*** (0.013)	0.093*** (0.011)	0.053*** (0.011)
South	-0.088*** (0.018)	0.316*** (0.012)	0.139*** (0.014)	-0.209*** (0.013)	-0.267*** (0.017)	-0.051*** (0.014)	0.029** (0.012)	-0.022* (0.012)
Math oral mark	0.541*** (0.006)	0.413*** (0.004)	0.307*** (0.004)	0.403*** (0.004)	0.463*** (0.005)	0.270*** (0.004)	0.166*** (0.004)	0.164*** (0.004)
Constant	-2.280*** (0.089)	-3.770*** (0.061)	-1.300*** (0.068)	-2.642*** (0.066)	-1.844*** (0.085)	-1.357*** (0.067)	-1.024*** (0.059)	-1.161*** (0.058)
Observations	300142	300142	300142	300142	300142	300142	300142	300142
Pseudo R2	0.069	0.052	0.021	0.053	0.061	0.022	0.010	0.009

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ 

Table3: Logit model to estimate the frequency of correctly responding - area "Data and Forecast" (second part)

	D23	D24	D24	D24_b2	D24_b3	D24_b4	D24_b5	D28
Foreigner G1	-0.053* (0.028)	-0.150*** (0.030)	-0.076** (0.031)	-0.235*** (0.037)	-0.138*** (0.038)	-0.188*** (0.031)	-0.141*** (0.033)	-0.190*** (0.029)
Foreigner G2	-0.100*** (0.018)	-0.162*** (0.020)	-0.053*** (0.020)	-0.258*** (0.025)	-0.153*** (0.025)	-0.199*** (0.021)	-0.162*** (0.022)	-0.155*** (0.019)
Male	0.086*** (0.007)	0.001 (0.009)	0.132*** (0.009)	0.023** (0.012)	0.032*** (0.012)	0.032*** (0.009)	-0.043*** (0.010)	0.063*** (0.009)
Nursery school	0.051*** (0.015)	0.074*** (0.017)	0.056*** (0.017)	0.126*** (0.021)	0.062*** (0.022)	0.047*** (0.018)	0.054*** (0.019)	0.089*** (0.017)
Father's level of education	0.024*** (0.004)	0.028*** (0.005)	0.029*** (0.004)	0.045*** (0.006)	0.038*** (0.006)	0.036*** (0.005)	0.052*** (0.005)	0.024*** (0.004)
Mother's level of education	0.024*** (0.003)	0.039*** (0.004)	0.032*** (0.004)	0.060*** (0.006)	0.044*** (0.005)	0.044*** (0.004)	0.051*** (0.005)	0.017*** (0.004)
Age of entry to school (anticipatorio)	0.030 (0.034)	-0.038 (0.042)	-0.026 (0.040)	-0.015 (0.052)	-0.008 (0.052)	-0.057 (0.043)	-0.002 (0.045)	-0.077* (0.041)
Age of entry to school (posticipatorio)	-0.057* (0.031)	-0.171*** (0.033)	-0.122*** (0.033)	-0.315*** (0.038)	-0.237*** (0.039)	-0.224*** (0.034)	-0.206*** (0.035)	-0.112*** (0.032)
North	-0.163*** (0.011)	-0.002 (0.013)	0.030** (0.013)	0.161*** (0.018)	0.045** (0.018)	0.044*** (0.014)	0.078*** (0.015)	-0.133*** (0.013)
South	0.175*** (0.012)	-0.004 (0.014)	-0.151*** (0.014)	-0.368*** (0.018)	-0.273*** (0.018)	-0.178*** (0.015)	-0.263*** (0.016)	0.152*** (0.014)
Math oral mark	0.324*** (0.004)	0.422*** (0.004)	0.209*** (0.004)	0.465*** (0.006)	0.388*** (0.005)	0.473*** (0.005)	0.485*** (0.005)	0.537*** (0.004)
Constant	-2.737*** (0.059)	-2.208*** (0.071)	-0.478*** (0.069)	-1.914*** (0.088)	-1.120*** (0.088)	-2.567*** (0.073)	-2.519*** (0.076)	-3.251*** (0.069)
Observations	300142	300142	300142	300142	300142	300142	300142	300142
Pseudo R2	0.029	0.046	0.016	0.069	0.044	0.060	0.068	0.066

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ 

Table 4: Logit model to estimate the frequency of correctly responding - area "Relations and Functions"

	D3	D9	D13_a	D13_b	D15	D16	D18_a	D18_b1	D18_b2	D18_b3	D18_b4	D27
Foreigner G1	-0.034 (0.035)	0.112*** (0.028)	-0.140*** (0.032)	-0.142*** (0.030)	-0.104*** (0.029)	0.015 (0.028)	-0.035 (0.030)	-0.015 (0.029)	0.025 (0.027)	-0.070* (0.042)	-0.189*** (0.048)	-0.098*** (0.028)
Foreigner G2	-0.049** (0.023)	0.039** (0.018)	-0.097*** (0.021)	-0.099*** (0.020)	-0.155*** (0.019)	-0.007 (0.018)	-0.070*** (0.020)	-0.020 (0.019)	0.010 (0.017)	-0.116*** (0.028)	-0.154*** (0.035)	-0.049*** (0.018)
Male	0.135*** (0.011)	0.242*** (0.008)	0.028*** (0.010)	0.104*** (0.009)	0.237*** (0.008)	0.371*** (0.008)	0.126*** (0.009)	-0.003 (0.008)	0.122*** (0.007)	0.039*** (0.013)	-0.105*** (0.016)	-0.057*** (0.008)
Nursery school	0.070*** (0.021)	0.033*** (0.015)	0.087*** (0.019)	0.057*** (0.017)	0.052*** (0.016)	0.062*** (0.015)	0.060*** (0.017)	0.033*** (0.016)	0.049*** (0.015)	0.098*** (0.024)	0.097*** (0.028)	0.071*** (0.016)
Father's level of education	0.016*** (0.006)	0.016*** (0.004)	0.034*** (0.005)	0.038*** (0.005)	0.034*** (0.004)	0.029*** (0.004)	0.028*** (0.004)	0.024*** (0.004)	0.023*** (0.004)	0.024*** (0.007)	0.070*** (0.008)	0.007* (0.004)
Mother's level of education	0.015*** (0.005)	-0.010*** (0.004)	0.026*** (0.005)	0.032*** (0.004)	0.024*** (0.004)	0.016*** (0.004)	0.032*** (0.004)	0.016*** (0.004)	0.016*** (0.003)	0.034*** (0.006)	0.048*** (0.007)	-0.001 (0.004)
Age of entry to school (anticipatorio)	0.090* (0.052)	0.207*** (0.034)	-0.020 (0.047)	-0.032 (0.041)	0.060* (0.035)	0.066* (0.036)	0.072* (0.041)	-0.018 (0.037)	0.076** (0.034)	0.061 (0.059)	-0.032 (0.068)	0.063 (0.040)
Age of entry to school (posticipatorio)	-0.177*** (0.037)	0.123*** (0.031)	-0.194*** (0.034)	-0.239*** (0.033)	-0.151*** (0.033)	0.020 (0.031)	-0.182*** (0.032)	0.022 (0.032)	0.007 (0.030)	-0.343*** (0.042)	-0.438*** (0.047)	-0.115*** (0.031)
North	0.038** (0.016)	-0.315*** (0.011)	-0.027* (0.015)	0.041*** (0.013)	-0.133*** (0.011)	-0.166*** (0.011)	-0.084*** (0.013)	-0.034*** (0.012)	0.002 (0.011)	0.053*** (0.020)	0.212*** (0.025)	-0.167*** (0.012)
South	0.037** (0.017)	0.492*** (0.012)	-0.026 (0.016)	-0.104*** (0.014)	0.265*** (0.012)	0.224*** (0.012)	-0.024* (0.014)	-0.065*** (0.013)	0.076*** (0.012)	-0.183*** (0.020)	-0.468*** (0.025)	0.290*** (0.013)
Math oral mark	0.537*** (0.005)	0.267*** (0.004)	0.620*** (0.005)	0.538*** (0.005)	0.610*** (0.004)	0.442*** (0.004)	0.352*** (0.004)	0.198*** (0.004)	0.281*** (0.004)	0.324*** (0.006)	0.469*** (0.007)	0.454*** (0.004)
Constant	-2.795*** (0.081)	-2.120*** (0.060)	-3.609*** (0.077)	-3.212*** (0.071)	-5.067*** (0.063)	-3.186*** (0.062)	-1.538*** (0.069)	-0.526*** (0.064)	-2.198*** (0.059)	-0.334*** (0.098)	-1.050*** (0.116)	-2.587*** (0.065)
Observations	300142	300142	300142	300142	300142	300142	300142	300142	300142	300142	300142	300142
Pseudo R ²	0.061	0.039	0.085	0.071	0.083	0.052	0.032	0.011	0.020	0.028	0.071	0.049

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Logit model to estimate the frequency of correctly responding - area "Space and Figure"

	D2_a1	D2_a2	D2_a3	D2_b	D7	D10	D14	D17_a	D17_b	D17_c	D17_d	D20	D22
Foreigner G1	-0.047 (0.037)	-0.093*** (0.027)	-0.008 (0.029)	-0.165*** (0.028)	-0.062** (0.028)	-0.067** (0.027)	-0.034 (0.029)	0.039 (0.032)	-0.053* (0.028)	-0.049 (0.032)	0.009 (0.028)	-0.028 (0.028)	0.021 (0.027)
Foreigner G2	-0.131*** (0.024)	-0.110*** (0.018)	-0.020 (0.019)	-0.203*** (0.018)	-0.045** (0.018)	-0.067*** (0.018)	-0.061*** (0.019)	0.071*** (0.021)	-0.038** (0.018)	-0.029 (0.021)	-0.018 (0.018)	-0.022 (0.018)	-0.062*** (0.018)
Male	-0.057*** (0.011)	0.139*** (0.008)	0.087*** (0.008)	-0.178*** (0.008)	0.097*** (0.008)	0.021*** (0.008)	0.185*** (0.008)	-0.018** (0.009)	0.071** (0.008)	-0.031*** (0.009)	0.079*** (0.008)	-0.035*** (0.008)	0.030*** (0.008)
Nursery school	0.034* (0.020)	0.042*** (0.015)	0.033** (0.016)	0.108*** (0.015)	0.072*** (0.015)	0.069*** (0.015)	0.069*** (0.015)	0.022 (0.017)	0.025* (0.015)	0.046** (0.018)	0.050*** (0.016)	0.068*** (0.015)	0.059*** (0.015)
Father's level of education	0.018*** (0.005)	0.025*** (0.004)	0.016*** (0.004)	0.014*** (0.004)	0.036*** (0.004)	0.023*** (0.004)	0.021*** (0.004)	0.014*** (0.005)	0.023*** (0.004)	0.020*** (0.005)	0.025*** (0.004)	0.021*** (0.004)	0.015*** (0.004)
Mother's level of education	0.045*** (0.005)	0.030*** (0.003)	0.015*** (0.004)	0.019*** (0.004)	0.032*** (0.004)	0.012*** (0.004)	0.005 (0.004)	0.012*** (0.004)	0.030** (0.004)	0.031** (0.004)	0.031** (0.004)	0.015** (0.004)	0.024*** (0.004)
Age of entry to school (anticipatorio)	-0.012 (0.048)	-0.055 (0.034)	0.046 (0.037)	-0.064* (0.036)	-0.039 (0.036)	0.069* (0.036)	0.093*** (0.035)	-0.065 (0.040)	-0.079** (0.034)	-0.014 (0.042)	-0.027 (0.036)	0.043 (0.036)	0.067* (0.036)
Age of entry to school (posticipatorio)	-0.027 (0.040)	0.014 (0.030)	-0.066** (0.031)	-0.136*** (0.030)	-0.101*** (0.031)	-0.100*** (0.030)	0.047 (0.032)	-0.077** (0.034)	0.006 (0.031)	-0.148*** (0.035)	-0.002 (0.031)	-0.044 (0.031)	-0.082*** (0.030)
North	0.081*** (0.016)	0.082*** (0.011)	0.043*** (0.012)	-0.049*** (0.011)	-0.211*** (0.011)	-0.169*** (0.011)	-0.266*** (0.011)	-0.030** (0.013)	0.115*** (0.011)	0.105*** (0.014)	0.131*** (0.012)	-0.232*** (0.011)	-0.052*** (0.011)
South	-0.182*** (0.017)	-0.008 (0.012)	0.010 (0.013)	0.257*** (0.012)	0.155*** (0.012)	0.188*** (0.012)	0.492*** (0.012)	-0.069*** (0.014)	-0.122*** (0.012)	-0.213*** (0.015)	-0.137*** (0.012)	0.174*** (0.012)	0.169*** (0.012)
Math oral mark	0.282*** (0.005)	0.259*** (0.004)	0.224*** (0.004)	0.378*** (0.004)	0.495*** (0.004)	0.407*** (0.004)	0.433*** (0.004)	0.230*** (0.004)	0.327*** (0.004)	0.355*** (0.004)	0.383*** (0.004)	0.41*** (0.004)	0.265*** (0.004)
Constant	-0.201** (0.084)	-1.945*** (0.059)	-0.923*** (0.063)	-2.340*** (0.062)	-3.367*** (0.061)	-2.703*** (0.061)	-3.419*** (0.061)	-0.610** (0.069)	-2.321*** (0.060)	-1.473*** (0.073)	-2.519*** (0.063)	-2.634*** (0.061)	-1.556*** (0.061)
Pseudo R ²	0.025	0.021	0.013	0.038	0.061	0.041	0.056	0.013	0.032	0.037	0.042	0.043	0.020

Robust standard errors in parentheses

*p < 0.10, **p < 0.05, ***p < 0.01



