CHALLENGES AND OPPORTUNITIES OF THE SCHOOL SYSTEM

IX Seminar "Data from and for educational systems: tools for research and teaching"

edited by
Patrizia Falzetti

FrancoAngeli

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Introduction

by Patrizia Falzetti

In recent decades, educational inequalities have emerged as a central issue in scientific and political debate. Educational systems are now expected to do more than guarantee access to education; they must also promote equity in educational outcomes and learning opportunities. Factors such as gender, social background, migrant status and economic conditions have a significant impact on educational pathways, creating cumulative advantages and disadvantages throughout students' lives.

This volume is situated within this analytical framework, bringing together six papers presented at the ninth edition of the INVALSI Seminar "Data from and for educational systems: tools for research and teaching", which was held in Rome from 17 to 19 October 2024. The papers collected here share the objective of analysing the mechanisms that produce educational inequalities and reflecting on possible strategies and policies aimed at countering them.

The first three chapters primarily focus on analysing educational outcomes, paying particular attention to gender inequalities. Chapter 1 begins by examining the extent of the gender gap in mathematics results revealed by the 2022 PISA survey and then looks at the Italian case through an original integration of PISA data with that of the INVALSI national surveys.

Chapter 2 shifts the focus from learning outcomes to educational choices, concentrating on the crucial transition phase from upper secondary school to university.

Chapter 3 broadens the scope further by adopting an intersectional perspective that considers gender, migrant background, and socio-economic-cultural status together. Using an analysis of INVALSI data from lower secondary schools, this chapter shows how educational inequalities arise from the interaction between multiple dimensions of disadvantage, creating complex and sometimes counterintuitive patterns.

Subsequent chapters shift the focus from inequalities in outcomes to those manifested in educational processes, teaching practices and intervention policies. Chapter 4 addresses inclusive education in the era of the Fourth Industrial Revolution, focusing on the role of Evidence-Based Education (EBE) in support teacher training.

Chapter 5 is dedicated to personalising educational pathways and developing talents, offering reflections on striking a balance between merit-based criteria and inclusion objectives.

Finally, chapter 6 turns its attention to higher education, analysing the impact of financial incentives on students' academic outcomes. Taken together, the contributions provide a detailed, multi-level picture of educational inequalities in Italy. They show that the observed gaps do not result from isolated individual factors, but emerge from the interplay between social contexts, institutional frameworks, public policies, and educational practices. Understanding these mechanisms is essential for constructing a more equitable and inclusive education system that can realise the potential of all students in an increasingly diverse society.

1. The gender gap in Mathematics in the Italian results of PISA 2022

by Angela Martini, Maria Teresa Siniscalco

In the latest edition of the PISA survey, Italian 15-year-olds boys scored 21 points higher in Mathematics than girls, showing the widest gap among all 37 OECD countries. In this paper, we analyzed the Italian results of boys and girls in the PISA 2022 Mathematics test in a smaller sample than the original one, limited to the students in the second grade of upper secondary school (PISA survey's modal class in Italy) who in 2022 participated in both PISA and the INVALSI national assessment, which made it possible to supplement the PISA scores with other information, such as grades in Mathematics. The results showed that the gender gap narrows considerably when controlling for the type of school attended and for some variables relating to the social and psychological profile of boys and girls: the socio-economic-cultural status of the student's family, anxiety towards Mathematics and sense of self-efficacy. The analysis also showed that girls, with equal results in PISA, obtain better grades in Mathematics than boys.

Nell'ultima edizione dell'indagine PISA i quindicenni italiani hanno conseguito nel test di Matematica un punteggio di 21 punti superiore a quello delle loro coetanee, facendo registrare il divario più ampio tra tutti i 37 Paesi OCSE. In questo lavoro si analizzano i risultati italiani di maschi e femmine nel test PISA 2022 di Matematica in un campione più ristretto di quello originale, limitato ai soli studenti della seconda classe della scuola secondaria di II grado (classe modale in Italia) che nel 2022 hanno partecipato sia a PISA sia alla rilevazione nazionale INVALSI dello stesso anno, cosa che ha permesso di integrare i punteggi PISA con altre informazioni, come i voti in Matematica. I risultati delle analisi hanno fatto emergere che il gap di genere si riduce considerevolmente quando si tengono sotto controllo il tipo di scuola frequentata e alcune variabili attinenti al profilo sociale e

psicologico di ragazzi e ragazze: lo status socio-economico-culturale della famiglia dello studente, l'ansia nei confronti della Matematica e il senso di autoefficacia. L'analisi ha anche mostrato come le femmine, a parità di risultato in PISA, ottengano in Matematica voti migliori rispetto ai maschi.

1. Introduction

In the last round of the PISA survey, which took place in 2022 and had Mathematics as its main domain[1], the difference on the math proficiency scale[2] between the score of boys, 482, and that of girls, 461, was 21 points for Italy, the highest among the OECD countries, in which the average difference is 9 points (OECD, 2023). The data was reported and variously commented on in the national press with accents of more or less marked concern. Moreover, in a newspaper article the sociologist Luca Ricolfi (2023) denied the existence of a gender gap in Mathematics. However, it must be noted that the press, if taken on its own and without further analysis, only provides us with rather rough information and therefore the data needs to be examined in detail and in depth if we are to reconstruct a more precise picture of the gender gap in Mathematics emerging from PISA and the variables affecting it in Italy.

The analyses whose results will be illustrated in the remainder of this paper do not take into consideration the entire Italian sample, but only those students – the vast majority, however – who in the year 2022 were attending the second grade of upper secondary education, i.e. the PISA "modal" class in Italy[3], and who took part in both the PISA and the INVALSI survey in the same year. This made it possible to supplement the PISA database with additional information, including, in particular, the grade in Mathemat-

[1] PISA (*Programme for International Student Assessment*) is a periodic survey promoted by the OECD (Organisation for Economic Co-operation and Development) which always includes the domains of reading, mathematics and science skills of 15-year-old students, with additional, optional domains changing in each PISA round. At each round, all three domains are tested, but one is, in turn, given special attention and space.

[2] The PISA scale has mean 500 and standard deviation 100. The reference standard against which to assess the trend in the scores of countries participating in the survey from one round to the next in each subject domain is the OECD average of the year in which it was first the main focus of the survey. For mathematics, that year is 2003.

[3] The target population of Pisa is based on age, 15 years, and includes all students of this age regardless of the attended grade: the Italian sample therefore also includes pupils in the first and third grade of upper secondary school and a small number of pupils still in lower secondary school, as well as those attending vocational training courses, who are not included in the INVALSI surveys.

ics obtained at the end of the first four months of schooling. The examined sample is composed of 7,671 subjects, of which 4,027 girls and 3,644 boys, representing, respectively, a population of 205,906 girls and 198,508 boys, corresponding to 73% and 82% of the unweighted and weighted data of the original Italian sample.

2. The gender gap in Mathematics

Let us begin by recalling, firstly, that the gender gap in Mathematics is not new to PISA 2022 but had also appeared in previous editions of the survey, in which the average score of girls in Italy and in OECD countries was always lower than that of boys[4], as can be seen in Figure 1, which shows the differences in results between boys and girls from 2000, the year of the first round of PISA, to 2022. Secondly, the gap is pervasive: among the 37 OECD countries that participated in PISA 2022, 34 had an advantage for boys in Mathematics, in most cases statistically significant.

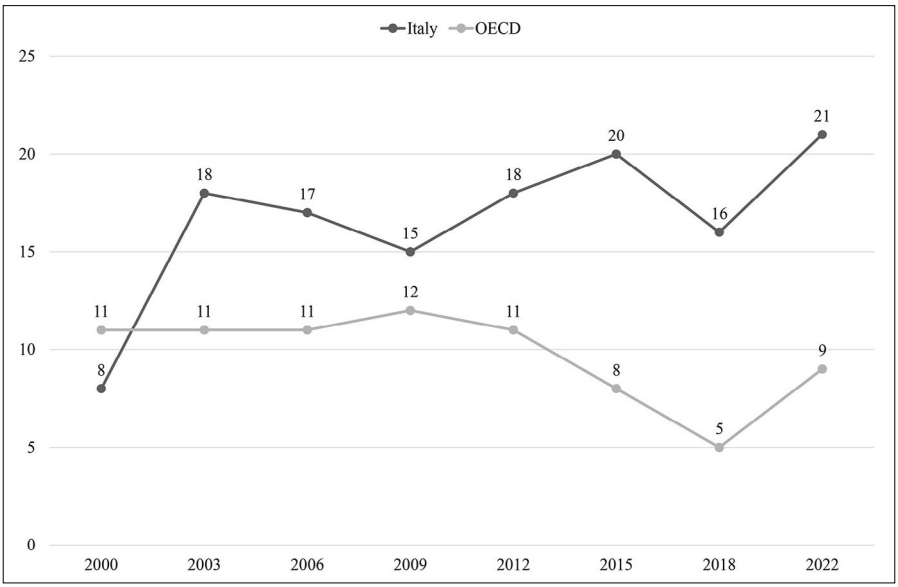

Fig. 1 – Difference between boys' and girls' Mathematics scores (M-F) from 2000 to 2022 in Italy and OECD countries

[4] The only exception with regard to Italy was in the year 2000, when the difference between boys and girls, in favour of boys, was not statistically significant.

Only in three countries did girl scored higher than boys: in two of them (Norway and Slovenia), however, the difference was small and not statistically significant, while the only exception to the general trend was Finland, where girls scored significantly higher than boys by 5 points.

As far as Italy is concerned, the difference in results between boys and girls is found both on the overall scale of mathematical competence and on the content and process subscales[5] that compose it. As Mathematics was the main domain in 2022, the questions on the PISA test relating to this subject area were more numerous than those relating to Reading comprehension and Science, and, alongside the score on the overall scale, the scores on the individual subscales were also available.

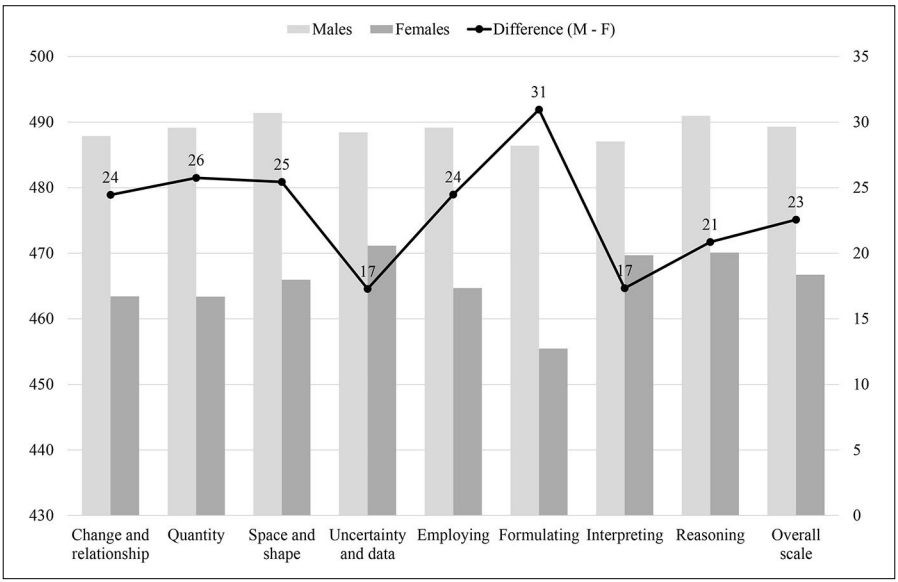

Fig. 2 – Boys' and girls' scores and score differences on the subscales and on the overall mathematical competence scale

In our sample, consisting, as mentioned above, only of upper-secondary students, the differences in the results of girls compared to boys in each subscale and on the overall scale are slightly higher than those recorded in the total sample and always statistically significant, ranging from a minimum of

[5] The content scales are: 1) Change and relationships, 2) Quantity, 3) Space and shape, 4) Data and uncertainity, roughly corresponding to the fields of Algebra, Arithmetic, Geometry and Statistics. The process scales are: 1) Employing, 2) Formulating, 3) Interpreting and evaluating, 4) Reasoning.

17 points in the subscales Data and uncertainty and Interpreting and evaluating to a maximum of 31 in the subscale Formulating. Figure 2 shows the scores of boys and girls and the differences in scores on the subscales and on the overall scale of the PISA Mathematics test.

The difference in performance between males and females in Mathematics is also reflected in the percentage of boys and girls on each of the six levels into which the overall proficiency scale is divided. The levels, ordered hierarchically from the highest to the lowest, provide, unlike numerical scores which are a purely quantitative measure, qualitative information on what 15-year-old students are able to do, or, in other words, on their ability to tackle problems of varying difficulty in Mathematics: a student at a given level should in fact be able to successfully complete, in addition to the tasks at his or her own level, all the tasks at the previous levels, but not those at the next level.

If we disaggregate the percentage of students at the different levels by gender, we can see (Fig. 3) that girls are in greater proportion than boys at the low levels of the competence scale (1 and 2) and in smaller proportions at the high levels (4, 5 and 6), while at level 3, intermediate, the proportion of females and males is almost equal. The gap between boys and girls increases more and more from level 4 onwards. The size of the difference is thus not the same throughout the scale but widens especially at the higher levels.

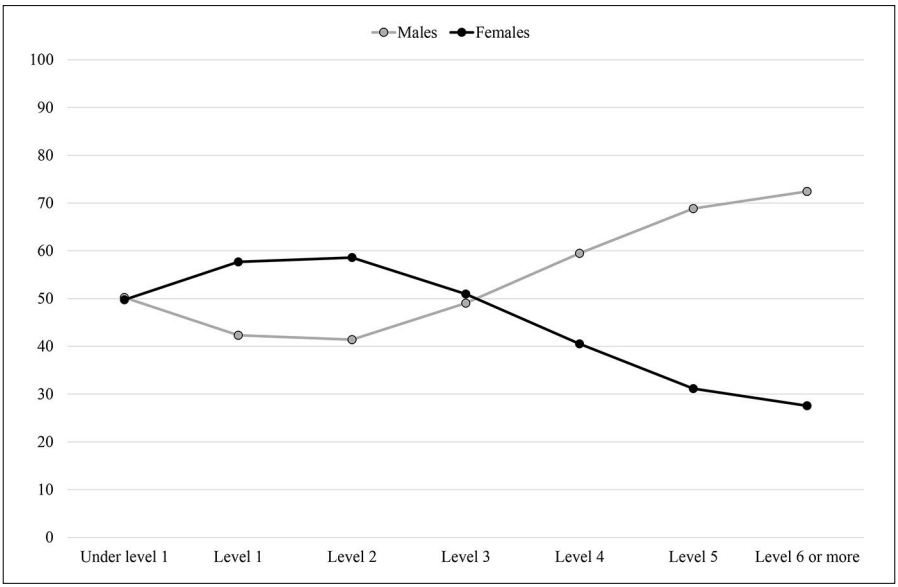

Fig. 3 – Percentage of boys and girls in each level of the PISA mathematical competence scale

This explains why, when disaggregating the data by geographical macro-area (North-West, North-East, Centre, South, South and Islands), the gap between boys and girls in Mathematics varies with respect to the average difference found at the national level: it widens the more the average score in each macro-area increases, reaching a maximum in the North-West and a minimum in the South, the two areas with the best and worst average results respectively. Similarly, disaggregating the data by school type[6], the difference between males and females is lowest in Vocational schools, attended mostly by students with lower ability, and highest in Academic schools and Technical schools.

The following two Figures (4 and 5) show the average score and the differences in scores between boys and girls for each macro-area and type of school.

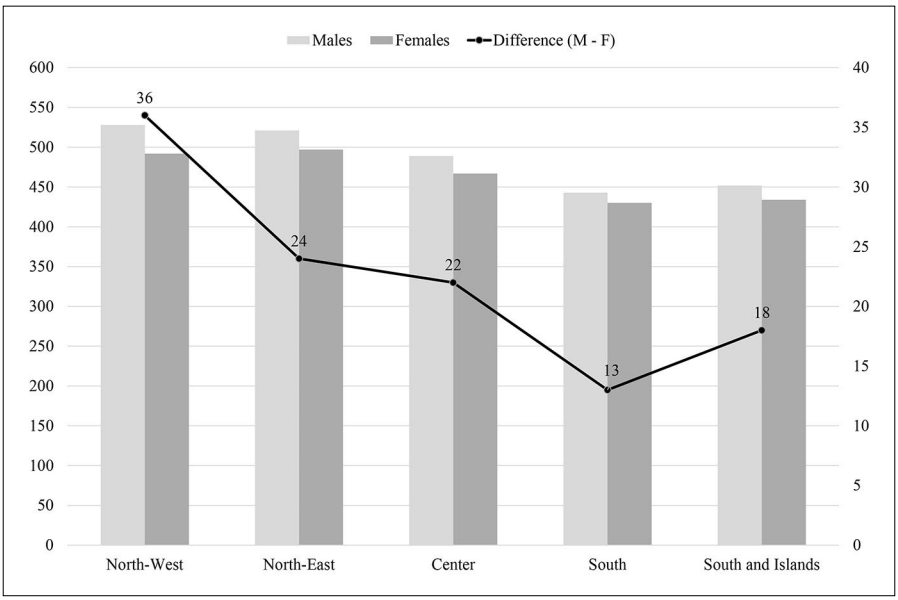

Fig. 4 – Average score and score differences between boys and girls in Mathematics by macro-area

[6] The types of schools considered are four: Scientific academic schools, Other academic schools, Technical schools and Vocational schools. The Italian terms "Licei", "Istituti tecnici", "Istituti professionali" are translated, respectively, with Academic schools, Technical schools, Vocational schools. In analyzing the data, we followed the subdivision adopted by INVALSI, which is more appropriate than the one used in PISA, which considers the Academic schools all together, despite the fact that there are considerable differences between them, in terms of both curriculum content and weekly hours of mathematics teaching.

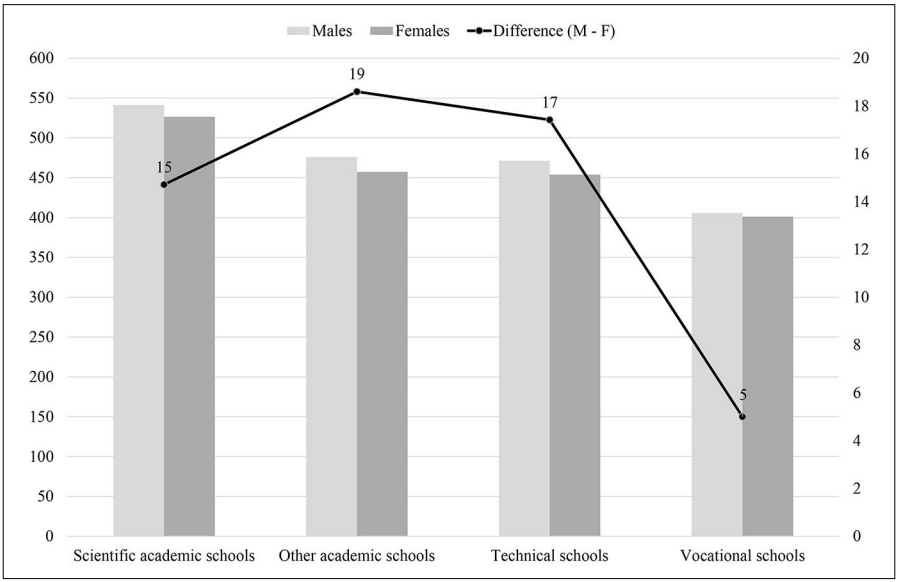

Fig. 5 – Average score and score differences between boys and girls in Mathematics by type of school

It should also be noted (Fig. 5) that the gap between boys and girls is smaller in the Scientific academic schools, which, unlike the Other academic schools and Technical schools (divided internally into a plurality of courses with different characteristics) generally have the same curriculum and the same number of hours per week of Mathematics teaching.

This last point deserves particular emphasis, since the mere difference in the national PISA scores of boys and girls – which is the only figure reported in the press – does not take account of the diversity in the content of the curricula and in the number of weekly hours of Mathematics teaching in the various branches of upper secondary education in Italy. Moreover, it does not take into account the social and psychological conditioning that influences the mathematical performance of boys and girls, which we shall now focus on.

3. The social and psychological profile of boys and girls

The PISA Student Questionnaire collects information on a wide range of individual variables that affect, positively or negatively, the results in the test.

Investigations in the field of education on the relationship between social background and educational achievement have shown that there is a positive

correlation between the former and the latter: socially advantaged pupils perform better than disadvantaged pupils, although this does not imply a deterministic relationship. PISA measures the quality of the students' family of origin by means of an index called ESCS, i.e. the socio-economic-cultural status index[7].

In the sample of students analysed here, a one-unit increase in ESCS leads to an average increase of 33 points in Mathematics performance; however, the weight of the index is not the same for boys and girls but is more pronounced for the former: 35 points (boys) versus 29 (girls). Moreover, as can be seen from Figure 6, the average status index for females is lower than that of males, both overall and in each type of school, a difference to which we will return later.

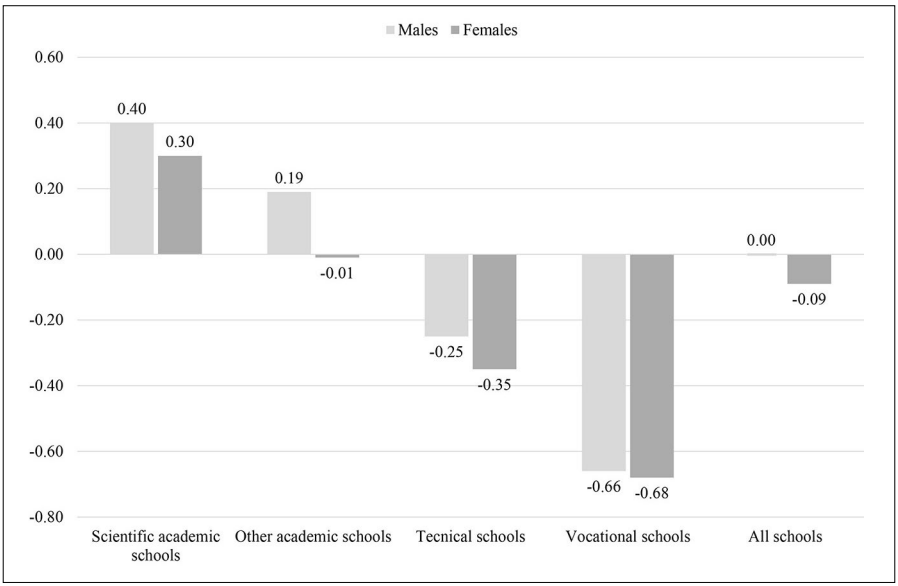

Fig. 6 – Average ESCS values of boys and girls by school type and overall

The table 1 shows, in alphabetical order, eight indicators, calculated on the basis of the answers to the Student Questionnaire, measuring the respondents' perception of their attitudes, feelings and emotions towards Mathematics[8].

[7] The ESCS index is a composite index, which includes three variables: the parents' level of education, the prestige of their occupation, the presence of cultural and instrumental goods in the home. The index is standardized across OECD countries with a mean of 0 and a standard deviation of 1.

[8] Like the ESCS index, the eight indicators are standardized with a mean of 0 and a standard deviation of 1. Zero corresponds to the average of the OECD countries.

Tab. 1 – Indexes measuring students' attitudes and emotions towards Mathematics

Index	*Description*
ANXMAT	Anxiety towards Mathematics
FAMCON	Subjective feeling of familiarity with mathematical concepts
MATHEASE	Perception of Mathematics as easier for oneself than other subjects
MATHEFF	Self-efficacy in formal and applied Mathematics
MATHEFF21	Self-efficacy in mathematical reasoning and in skills relevant to current times (e.g. knowing how to programme, use software, etc.)
MATHMOT	Motivation to succeed in Mathematics
MATHPERS	Effort and persistence in the study of Mathematics
MATHPREF	Preference for Mathematics over any other subject

It is important to emphasize, as the *PISA 2022 International Report* clarifies (vol. II, p. 262), that a negative or positive value on each of the indicators simply means that the student answered the questionnaire's questions on which the index is constructed more negatively or more positively than his or her peers in OECD countries did on average. What is of interest here, in any case, are not so much the values recorded on each indicator by Italian boys and girls compared to the average of the OECD countries and represented in Figure 7, but the differences between the values of girls and boys.

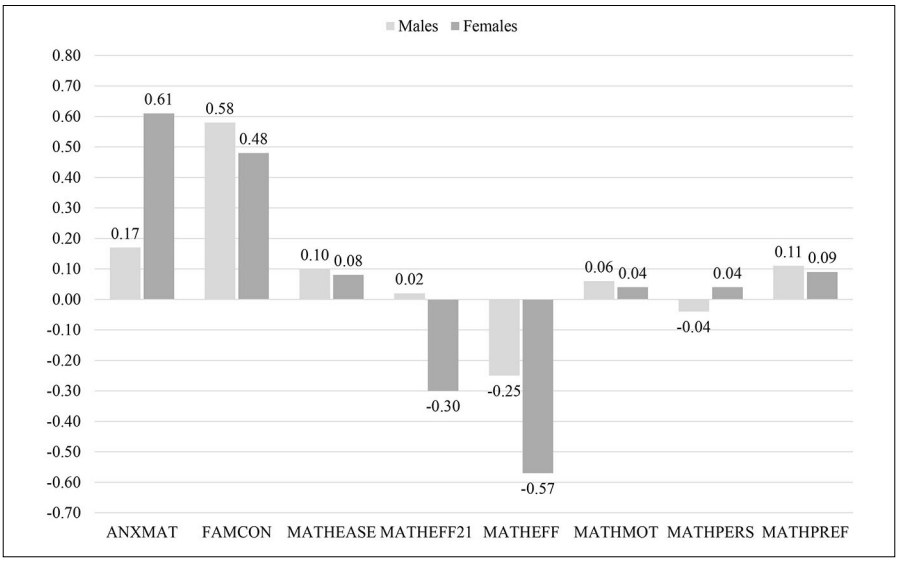

Fig. 7 – Values recorded by boys and girls on the eight indicators listed in Table 1

As can be seen, on all the indicators that have a positive relationship with success in Mathematics, boys have higher values than girls – with one exception – while the opposite occurs for those that have a negative relationship with success; the gap is particularly evident for anxiety towards Mathematics and for the sense of self-efficacy, almost half a unit of standard deviation in the first case (0.44) and about a third in the second (on both indexes measuring self-efficacy, the difference between boys and girls is, in absolute value, 0.32).

As far as the first variable is concerned, psychological research has long shown (Yerkes and Dodson, 1908) that anxiety, if moderate and kept under control, generates a state of general activation, known as "arousal", which up to a certain point favours concentration and commitment to the task at hand. However when its level increases beyond a given limit, it negatively affects cognitive processes, disorganising them. The degree of arousal interacts with the difficulty of the task faced, worsening performance in complex, difficult or unfamiliar tasks, improving it in simpler ones.

As for self-efficacy, psycho-social research shows that self-confidence, i.e. confidence in your ownability to adequately manage activities and situations, is positively associated with actual success in various areas (Bandura, 2000; Caprara, 2001). People with a high sense of personal self-efficacy appear more inclined to view difficulties as an opportunity to test themselves rather than as insurmountable obstacles, react more readily to experiences of frustration instead of indulging in depressive feelings, focus on problem solutions and make the best use of available resources.

It should, however, be emphasized that the direction of the relationship between anxiety and self-efficacy on the one hand and mathematical achievement on the other hand is unclear, due to the difficulty of establishing whether it is the experience of failure or, conversely, success that generates anxiety about Mathematics in the first case and a positive perception of one's own abilities in the second, or whether the opposite is the case.

The only indicator on which the difference between boys and girls, as can be seen from Figure 7, is in favour of girls is effort and perseverance in the study of Mathematics (MATHPERS). This latter aspect is linked to another difference between boys and girls which emerges from the answers to the student questionnaire and which concerns the overall time devoted each day to doing homework and, within this, to studying Mathematics in particular: while boys report spending between 3 and 4 hours a day on homework (mean = 3.3), girls report spending more than 4 hours a day (mean = 4.2).

However, the percentage of time devoted to Mathematics out of the total time is higher for boys than for girls, although this is probably also to be

put in relation to the fact that boys more frequently than girls are enrolled in secondary school courses where Mathematics has a greater space in the curriculum. The distribution of boys and girls between the various types of school is in fact far from homogeneous, as can be seen from Figure 8 below.

This moreover, only partly reflects the imbalances in the distribution of boys and girls in upper secondary education since it only considers the main school types but not the numerous streams into which these are divided and in which boys and girls are enrolled in proportions often very different. For example, the industrial stream of the Technical school is attended almost exclusively by boys, and, on the other hand, in the Academic human sciences school there is a preponderant presence of girls.

This is not without consequences for the subject we are dealing with: the gender segregation that occurs in most cases between the courses of secondary education in Italy can lead to a drift, beyond what is formally established by the official programmes, in the curriculum actually taught. Not infrequently, in classes attended exclusively or almost exclusively by girls, the teaching-learning requirements for Mathematics and science lower (Grisay, 1984).

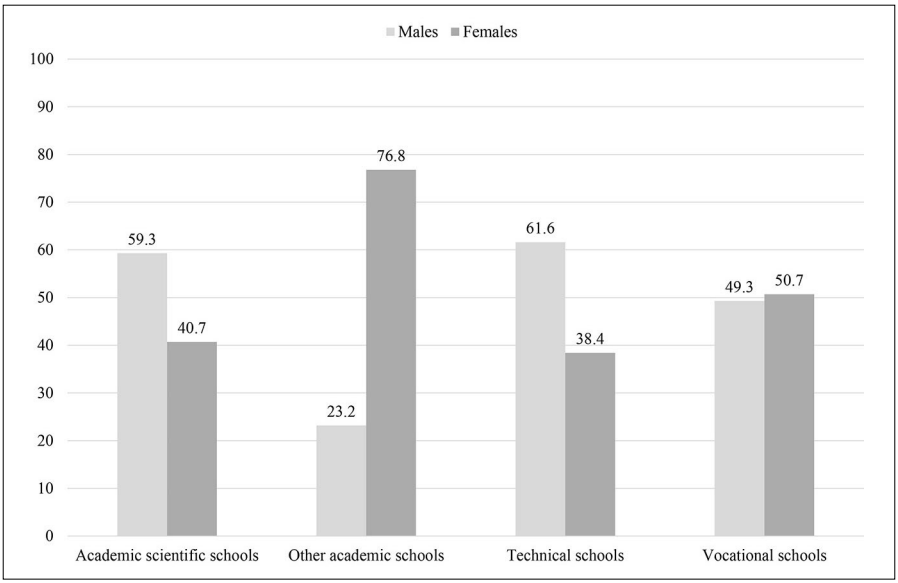

Fig. 8 – Percentages of boys and girls out of total enrolment in each type of school

Taking into account what has been said so far, a regression analysis was conducted to estimate the extent to which the gender gap varies when con-

trolling for AnxMat and Matheff, the two of the above-mentioned variables that have the strongest effect on girls performance in PISA Mathematics test. The reference in the analysis is to a male student, attending an Academic scientific school, with values of 0 on the variables ESCS, AnxMat and Matheff.

As it can be seen (Tab. 2), given the same social background and type of school attended, the average score difference between boys and girls is reduced, from the 23 points of the unconditional difference initially found at national level in our sample, to 13 points (model 1), to drop further to 7 points – although remaining significant – when controlling also for anxiety and sense of self-efficacy in Mathematics (model 2).

Tab. 2 – Regression coefficients on the PISA 2022 Mathematics test score

	Model 1			*Model 2*		
	Reg. coeff.	*St. Er.*	*t-value*	*Reg. coeff.*	*St. Er.*	*t-value*
Costant	533.46	5.02		537.10	4.23	
ESCS	19.86	2.10	9.46	14.37	1.74	8.24
O. Academic sc.	-62.02	5.86	-10.59	-42.62	5.71	-7.47
Technical sc.	-54.57	6.18	-8.84	-46.39	5.34	-8.69
Vocational sc.	107.70	7.93	-13.57	-89.63	7.36	-12.18
AnxMat	–	–	–	-9.64	1.31	-7.34
Matheff	–	–	–	25.82	1.50	17.16
Gender	-13.30	3.05	-4.36	-7.22	2.78	-2.60
R2	0.26	0.03		0.36	0.02	

4. School grades and student background

To deepen the picture further, we would like, finally, to draw attention to two aspects that deserve to be emphasised.

The first is the relative discrepancy existing between teachers' evaluation, expressed by means of a decimal grade, and the result obtained in the PISA Mathematics test by boys and girls. At the same level on the proficiency scale, the grade in Mathematics awarded by teachers to girls is, in every type of school, somewhat higher than that awarded to boys. Similarly, while the average score achieved by girls in the PISA test is, as we have seen, lower in every type of school than that of boys (see Fig. 5), the average grade assigned by teachers to girls in Mathematics is always higher than that of boys. The following two Figures (9 and 10) illustrate the situation described above.

From Figure 9, it can be seen, firstly, that there is a positive relationship between teachers' marks in Mathematics and the performance of students –

both boys and girls – in the PISA test: as the level on the proficiency scale rises (horizontal axis), the average mark (vertical axis) also rises in parallel. However, the mark given to girls at each level is always, on average, a little higher than that given to boys, and the same pattern is obtained when comparing the average score in the PISA test in Mathematics and the average mark in the same subject obtained by boys and girls in each of the four school types, as Figure 10 shows.

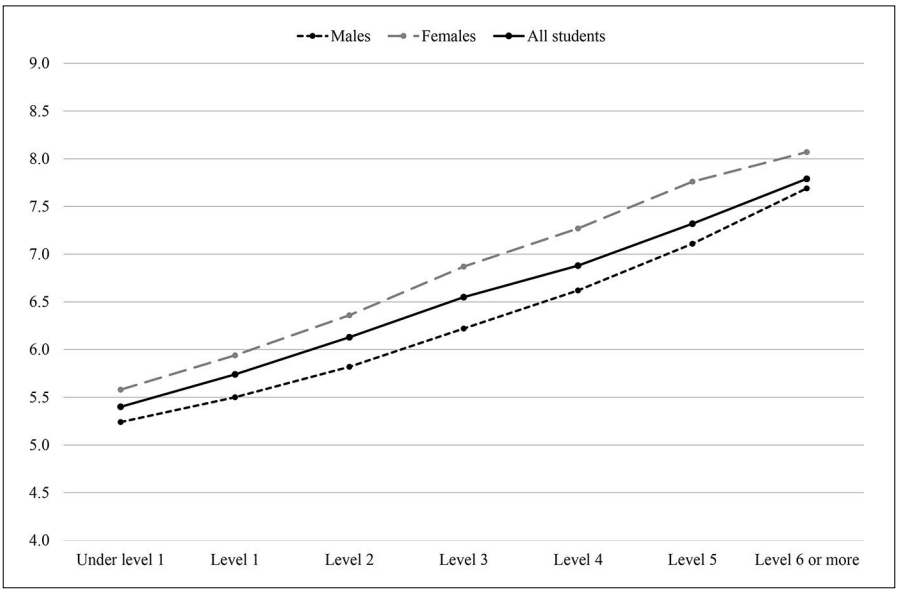

Fig. 9 – Teacher assigned Mathematics marks by gender and level of the PISA Mathematics proficiency scale

This does not mean that teachers do not adequately assess their students. In the first place, as the research literature shows (Dardanoni, Modica and Pennisi, 2009, 2011), teachers' grades are inevitably conditioned by the context in which they operate: the grade given to a student in a class where the average level of pupils is low would change if the same student were assigned to a class where the average level is high. This is why school grades, unlike the result of an "objective" test[9], are not directly comparable. In this regard, it is noteworthy that, as can be seen from Figure 10, the average Mathematics grades in the various school types do not differ much from

[9] The term "objective" simply means that the outcome of standardized tests, such as the PISA and INVALSI tests, is independent of who assesse them.

each other (the average grade in Academic schools is 6.3 and in Vocational schools is 6.1), despite the considerable differences in performance between the respective students that emerge from international and national surveys.

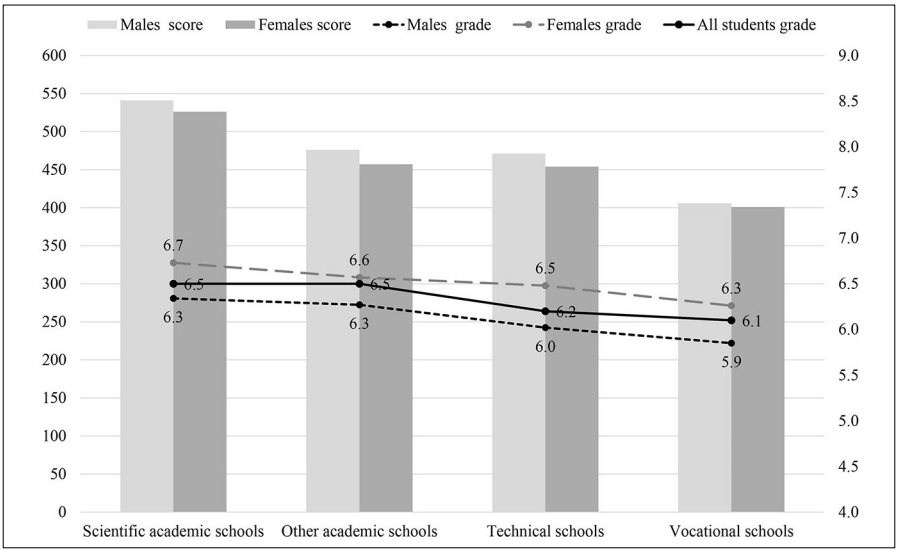

Fig. 10 – Score on the PISA scale and average grade in Mathematics for boys and girls by school type

Secondly, school marks also reflect, in fact, student characteristics (diligence in study, intensity and continuity of application, discipline in the classroom, etc.) that go beyond the mere level of ability and represent aspects of personality and behavior in which girls generally distinguish themselves positively from their peers of the opposite sex. This last consideration explains why, as we have seen from the two Figures above, girls generally obtain better marks at school than boys at the same level of competence as measured by an objective instrument.

The second point to which we would like to draw attention concerns the background of the boys and girls in our sample. As already mentioned, socio-economic-cultural status on average exerts a greater weight on the mathematical achievement of boys than of girls, and the average index of the latter is, overall and in every type of school, always lower than that of the former. As a further confirmation of the lower status of girls compared to boys whatever the type of school attended, it can be observed (see Fig. 11) that the percentage distribution of boys and girls within the ESCS quartiles reveals a greater presence of girls compared to boys in the two lower quartiles (first and

second) and a lower presence of them in the two upper quartiles (third and fourth) of the distribution, particularly in the Academic schools, in the Italian tradition deputed to prepare for the continuation of studies at university level.

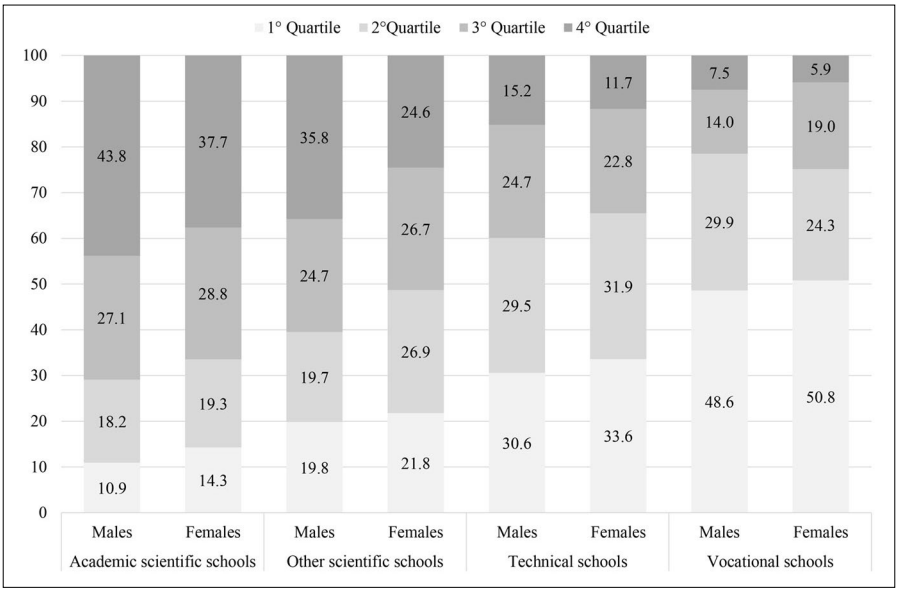

Fig. 11 – Percentages of males and females in ESCS quartiles by type of school

How should this somewhat unexpected data be interpreted? The hypothesis we put forward, also supported by the discrepancy highlighted earlier between teacher evaluation and the scores of an objective instrument, is that the school does in fact – though not intentionally – operate a more pronounced selection towards boys. The hypothesis is that schools "expels" boys of low social status more frequently from the education system, or it directs them towards less prestigious paths. In this way it thus indirectly favours, given equal status and potential abilities, permanence in school and upward mobility of girls. This last point may contribute to explain why girls are over-represented in Academic schools and under-represented in Technical and Vocational schools: in the sample examined here, out of the total number of girls, 64% attended an Academic school and 36% a Technical or Vocational school, as opposed to 52% and 48%, respectively, out of the total number of boys[10]. Added to this is the fact that, in general, pupils falling behind in their

[10] In the original Italian sample of students taking part in PISA the figures are very similar: among females 62.9% were enrolled in an Academic school, 23.3% in a Technical

regular course of study or dropping out of school are more numerous among boys than among girls.

5. Conclusions

To sum up, the analyses carried out on secondary school students in the Italian PISA 2022 sample show that males outperform females both on the overall mathematical competence scale and on the content and process subscales. The gender gap, moreover, is not equal across the scale but widens at the higher levels and narrows at the lower ones.

The profile of girls, from a social and psychological point of view, differs from that of boys in several respects: firstly, the effect of socio-economic-cultural status on achievement in Mathematics is stronger for boys than for girls, whose status is overall and in every type of school, lower than that of boys; secondly, girls show, compared to boys, higher levels of anxiety and lower confidence in their own ability to succeed in Mathematics, so much so that when these variables are controlled for, together with status and type of school attended, the gender gap is considerably reduced.

Respect to gender equity, the functioning of Italian school system appears ambivalent. On the one hand, it seems in fact to act in a "discriminatory" way towards boys. On the other hand, however, the greater success of girls in terms of what we might call "institutional evaluation", which also results in a higher rate of high school graduation and participation in university studies, runs the risk of turning into a "Pyrrhic victory": indeed, it remains tied to traditional choices of educational itineraries, first at upper secondary level and then at tertiary level. This leads women to exclude themselves from university faculties focusing on STEM disciplines and, as a consequence, from today's better paid and more sought-after professions, with the end result of reproducing the historical division between the "two cultures" according to a gender clivage.

This is probably also to be seen in relation to the fact that women, in deciding which course of study to take, are, in a certain sense, "freer" than men. While social pressure offers men the only possibility of fulfilment in work, pushing them towards studies that lead to occupations in demand on the current labour market and conveniently remunerated, it is not unbecom-

school, 11.9% in a Vocational school, 1.7% in a vocational training course and 0.3% in lower secondary education; the corresponding figures for males are, in order: 45.0%, 39.9%, 12.5%, 2.3%, 0.5%.

ing for women to fulfill themselves as wives and mothers rather than in a working career. An interesting finding that emerged from PISA 2003 was that instrumental motivation[11] for studying Mathematics, which was lower in general in girls than in boys, was an important predictor of the choice of university studies and professional activity: in the countries where the gap between boys and girls on this variable was greater, the percentage of female graduates in Mathematics or computer science was below the OECD average (OECD, 2004).

In conclusion, the gender gap that the PISA survey on learning levels highlights in Mathematics – but also in reading, with opposite results[12] – is a multifaceted issue in which several factors intervene, which cannot be reduced to a single component. It therefore deserves to be further investigated and deepened, as there is still no certain and definitive answer.

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[11] Motivation is distinguished into "instrumental" and "intrinsic": the former is that which drives one to study a given discipline not for its own sake but for utilitarian reasons external to it, the latter is that which drives one to study a discipline out of passion, for the gratification one receives from it.

[12] In reading comprehension girls outperform boys in every country, but, unlike mathematics, in this case the gender gap widens at the lowest levels and narrows at the highest levels of the proficiency scale.

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2. The gender gap in school-to-university transition in Italy: Insights from the integration between INVALSI and ANS data sources

by Valentina Tocchioni, Gabriele Lombardi, Samuele Milone

The issue of the gender gap in university enrolment is widely investigated across the world. Very few studies have comprehensively addressed the topic of university enrolment in Italy by gender, as most research has primarily focused on issues related to academic careers. Nonetheless, female students have consistently shown higher enrolment rates and lower drop-out rates than males. This study aims to describe the transition from upper secondary school to university in Italy, identifying potential gender inequalities based on school macro-region, type of school attended, and the socio-economic status of the upper secondary school. The proposed descriptive analysis may serve as a starting point for: i) Identifying schools that exhibit gender-balanced enrolment trends; ii) Assessing whether gender inequalities exist at the macro level, which could, in turn, encourage further micro-level analyses of the school-to-university transition in Italy and help design targeted policies to promote more equitable access to higher education.

La questione del divario di genere nell'iscrizione universitaria è ampiamente investigata in tutto il mondo. Per l'Italia, pochi studi hanno affrontato il tema dell'immatricolazione universitaria suddivisa per genere, concentrandosi maggiormente su questioni relative alla carriera accademica. Tuttavia, le ragazze hanno tassi di iscrizione più elevati e tassi di abbandono più bassi rispetto ai loro coetanei maschi. Questo lavoro intende descrivere la transizione scuola-università in Italia degli studenti provenienti dalle scuole secondarie di secondo grado, individuando eventuali disuguaglianze di genere in relazione alla macro-area geografica della scuola, alla tipologia di scuola frequentata e allo status socio-economico e culturale dell'istituto. L'analisi proposta può essere considerata un punto di partenza per: i) identificare le scuole che presentano un equilibrio di genere nelle immatri-

colazioni universitarie; ii) verificare l'esistenza di disuguaglianze a livello macro, le quali potrebbero stimolare analisi a livello micro sulla transizione scuola-università in Italia.

1. Introduction

The issue of the gender gap in university enrolment is widely investigated across the world. The United States has experienced a long-term increase in female students' university enrolment and admissions, including in disciplines traditionally dominated by their male counterparts (Adebayo, 2008). This trend is driven by well-documented evidence that females outperform males, thereby gaining an advantage in selection procedures (Conger, 2015). Nonetheless, studies on European countries indicate that this long-term trend has only resulted in approximately equal representation in enrolment (Francesconi and Parey, 2018; Steinmann and Rutkowski, 2023).

With regard to Italy, few studies have examined transition rates to university in terms of gender gaps, as research has predominantly focused on differences in young women's and men's academic careers. Nonetheless, females have higher enrolment rates and lower drop-out rates than their male counterparts (Contini *et al.*, 2018), although these outcomes are significantly influenced by both prior schooling tracks (Contini and Salza, 2020) and financial conditions (Contini and Zotti, 2022). The ANVUR report on gender disparities in Italian higher education indicates that, while the female enrolment rate declined by one percentage point between 2012 and 2021, it has consistently remained above the European average, particularly in fields such as Arts and Humanities and Health Studies (ANVUR, 2024). Since 2018, Italy has also maintained a female enrolment rate above the European average in Natural Sciences, Mathematics, Statistics, and Engineering – fields crucial to the labour market but historically male-dominated (D'Agostino *et al.*, 2021).

Given this context, this study examines the transition to higher education among upper secondary school graduates in Italy, focusing on enrolment in an Italian university. Utilising individual-level data and maintaining a focus on gender differences, we present three upper secondary school-level indicators that enable us to assess the school-to-university transition in Italy and how it varies by gender.

Furthermore, these indicators are analysed by stratifying them according to three key characteristics: the geographical area in which the upper secondary schools attended by graduates are located; the type of upper secondary school attended; and the average socio-economic and cultural background

of the students' schools. This approach accounts for important variations in school characteristics at the end of upper secondary education and thus plays a role on graduates' university enrolment decisions.

The chapter proceeds as follows. First, we present the data used in this study and the three types of indicators calculated for each Italian upper secondary school – separately for both genders and jointly for males and females. Second, we present the results, stratified by geographical area, type of upper secondary school attended, and the school's average socio-economic and cultural background. Finally, a concluding discussion brings the chapter to a close.

2. Materials and Methods

2.1. Data

This article aims to describe gender differences in university entry rates by upper secondary schools. We rely on the MOBYSU.IT[1] database, which merges two administrative data sources.

The primary data source comes from the Istituto nazionale per la valutazione del sistema educativo di istruzione e di formazione (INVALSI), namely the National Institute for the Evaluation of the Education and Training System. This source provides information on all Italian upper secondary schools, enabling us to analyse each student enrolled in the 2018/2019 school year (s.y.) in the 13th grade, who took the INVALSI test – a standardised national assessment in Italian, English, and Mathematics – and graduated in the same s.y.

The second source is the Anagrafe nazionale studenti (ANS), namely the National Student Registry, which contains information on all students enrolled in Italian universities during the 2019/2020 academic year (a.y.).

Overall, the INVALSI data for the 2018/2019 s.y. includes 449,482 students enrolled in grade 13th in 7,425 upper secondary schools (to be noticed that 125 schools do not have male graduates, and 329 schools do not have female graduates). Of these, 225,593 students were registered in the Anagrafe Nazionale Studenti (ANS) database as enrolled in Italian tertiary education

[1] The data used in this study have been processed in accordance with the research protocol for the study *From high school to the job placement: analysis of university careers and university mobility from Southern to Northern Italy* among the Ministry of University and Research, the Ministry of Education and Merit, the University of Palermo as the lead institution, and the INVALSI Institute. The reference researcher for the University of Florence is Bruno Bertaccini.

for the 2019/2020 a.y. Thus, the overall transition rate from upper secondary school to university is 50.2% in that a.y.

For our analysis, we focus on the school-to-university transition immediately after graduation, considering graduates from upper secondary school who choose whether or not to enrol in an Italian university in the following academic year. The entire region of Valle d'Aosta is excluded due to missing data, likely related to its status as an autonomous region with a distinct administrative framework, which may affect data collection and integration.

2.2. Indicators

To explore differences in gender composition concerning university enrolment from Italian upper secondary schools, we computed three distinct indicators at the school level: Entry Rate, Gender Gap in Entry Rate, and Choice Similarity Index. Each of these indicators is calculated in both a pooled version (i.e., considering both male and female students in the school) and separately by gender (i.e., considering male/female students in the school only), allowing for a comparison of the school-to-university transition between female students and male students[2]. The Gender Gap in Entry Rate is the only exception, as its formulation already takes gender composition differences into account.

The Entry Rate is defined as the percentage of students from a given school who enrol in the higher education system. This indicator is calculated as follows:

Overall Entry Rate	*Female Entry Rate*	*Male Entry Rate*
$n\%_j = \frac{n_j}{N_j} \times 100$	$n\%_j^{(F)} = \frac{n_j^{(F)}}{N_j^{(F)}} \times 100$	$n\%_j^{(M)} = \frac{n_j^{(M)}}{N_j^{(M)}} \times 100$

Thus, N_j represents the number of students in grade 13th in school j who took the INVALSI test and graduated during the 2018/2019 s.y., where $N_j^{(F)}$ and $N_j^{(M)}$ indicate the number of female and male students, respectively. Similarly, n_j, $n_j^{(F)}$, $n_j^{(M)}$ represent the total number of students, as well as the number of female and male students, respectively, in grade 13th in school j who enrolled in university during the 2019/2020 a.y. The entry rate ranges from

[2] Although our measure captures sex assigned at birth, we refer throughout the manuscript to "gender" gaps, on the grounds that the observed differences are largely driven by gender norms, expectations, and stereotypes rather than by biological sex itself.

0% to 100%, where a value of 0% indicates that no students from the school enrolled in higher education, while a value of 100% means that all students proceeded to university.

The second proposed indicator is the Gender Gap in Entry Rate (for brevity: Gender Gap Index), which represents the excess percentage of female students enrolling in university compared to male students. This indicator is calculated as follows:

$$GG\%_j = \frac{n\%_j^{(F)} - n\%_j^{(M)}}{n\%_j^{(F)} + n\%_j^{(M)}} \times 100$$

Thus, the Gender Gap Index is an indicator that ranges from -100% to 100%, where negative values indicate a higher proportion of male students enrolling in university compared to female students, while positive values indicate a higher proportion of female students enrolling compared to male students. Within this framework, the percentage of female or male students from school *j* who enrolled in university corresponds to the female or male Entry Rate, respectively[3].

Finally, the third proposed indicator is the Choice Similarity Index, a reinterpretation of Simpson's Diversity Index (Simpson, 1949), which measures the distribution of different characteristics within a group. In our context, we aim to assess the extent to which upper secondary school graduates choose to enrol in the same university as their peers from the same school and graduating cohort. In this study, we focus exclusively on the choice of the same higher education institution, irrespective of the chosen field of study. We consider it the most appropriate starting point for a first implementation of this indicator, because examining similarity in institutional choice – rather than in field of study – allows us to capture the extent to which students from the same peer community remain embedded in a shared social context during the transition. This, in turn, provides novel insight into how peer concentration within the same destination institution may shape enrolment decisions, even when students pursue different academic pathways. To achieve this, we compute the Choice Similarity Index as follows:

[3] If a school does not have neither female graduates nor male graduates that enrolled in university, both entry rates are equal to 0%, and thus the Gender Gap Index cannot be calculated and is missing.

$$CSI\%_j = \frac{\sum n_{jk}(n_{jk} - 1)}{n_j(n_j - 1)} \times 100$$

In this formula, n_{jk} represents the number of students in grade 13th in school j who took the INVALSI test and graduated during the 2018/2019 s.y. who enrolled in university k. The summation is taken over all possible K universities chosen by students from school j. In the denominator, denotes the total number of students from school j who enrolled in university[4].

A $CSI\%_j$ value of 0% indicates that each student from school j enrolled in a different university, while a value of 100% indicates that all students from the same school who enrolled in university (at least two) have chosen the same athenaeum. This indicator is calculated overall, as well as separately for female and male students. At a later stage, we will compute the Choice Similarity Index by simultaneously taking into account both the university of enrolment and the chosen field of study, for which an application can be found in Sulis, Tocchioni and Vitale (2026). By doing so, the shared destination social context among upper secondary school graduates becomes even more narrowly defined, further highlighting the extent to which peers' choices may be similar or dissimilar depending on their school of origin.

However, when presenting these indicators, we accounted for the size of each school by applying a weighted average approach, based on the number of students in each school. The sample size reported in the tables refers to the number of schools within each specific stratum.

3. Results

This section presents some descriptive statistics for the three indicators illustrated above, namely Entry Rate, Gender Gap Index, and Choice Similarity Index. In particular, the weighted average values are reported on the basis of three main stratification criteria: geographical location of the upper secondary school, type of upper secondary school, and socio-economic and cultural status of the school. Firstly, we present the mean values of the indicators for the five Italian macro-regions defined by the NUTS1 classification: North-West, North-East, Centre, South, and Islands. Secondly, mean values

[4] If a school does not have female and/or male graduates who enrolled in university, the Choice Similarity Index cannot be calculated and is missing. Similarly, the index is also missing when only one student from the school enrols in university, as it requires a comparison between at least two students.

are presented by type of upper secondary schools, considering the main curricula offered by the Italian education system, which includes six types of lyceums (Classical, Scientific, Linguistic, Social Sciences, Artistic and a residual category, Other lyceums), two types of technical institutes (Economic and Technological) and Vocational schools. The ESCS (Economic, Social, and Cultural Status) indicator, provided by INVALSI, is calculated at the individual, student-level and is based on various economic, social, and cultural factors (INVALSIopen, 2020). For this analysis, we use a school-level measure, obtained by averaging the ESCS values of all students within each school. Based on this average, schools are assigned to one of the four quartiles at the regional level. The original ESCS index ranges from -2.62 to 1.82, with higher values indicating a higher socio-economic and cultural status. The four quartiles are defined as *low*, *lower-middle*, *upper-middle*, and *high* socio-economic and cultural status.

3.1. Indicators by macro-region of upper secondary school

Figure 1 shows the values of the Entry Rate and Gender Gap Index, whose values can be observed in detail by looking at Table 1. In terms of Entry Rate, it is evident that the overall mean for the central (53.0%) and north-western (52.0%) macro-regions is above the national average (50.2%), while the lowest share of students who choose to enrol in university is reported for the Islands (46.9%). Regarding gender composition, the female Entry Rate is consistently higher than the male rate across all macro-regions by at least 9.3 percentage points. The highest values are recorded for the Central macro-region for both subgroups (females: 59.0%; males: 47.0%).

Concerning the Gender Gap Index, the values reported in Figure 1 are quite homogeneous across macro-regions. Italy is characterised by a general excess of female students over male ones who choose to enrol in university after graduating from upper secondary school (the Gender Gap Index varies between 5.7% in the North-East and 8.7% in the Centre, with a national average of 7.3%). Moreover, the Gender Gap Index highlights that the two macro-regions with the highest excess of females over males in university enrolment are the North-West (7.5%) and the Centre (8.7%). However, the South and the Centre exhibit the highest variability in terms of interquartile range (South: 33.6%; Centre: 27.9%), while the North-East emerges as the more gender-balanced (26.5%), with fewer schools having a particularly high excess of male and female students over the opposite gender.

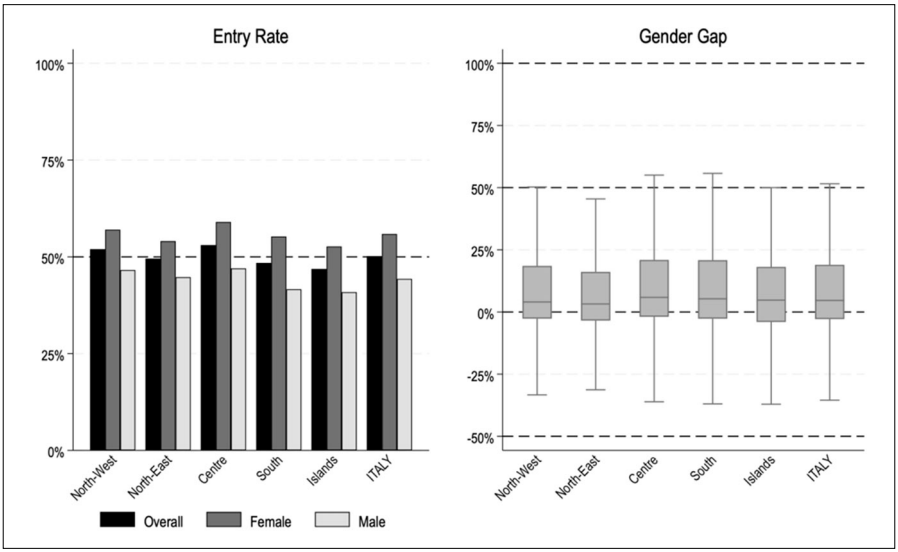

Fig. 1 – Entry Rate and Gender Gap Index by macro-region of upper secondary school

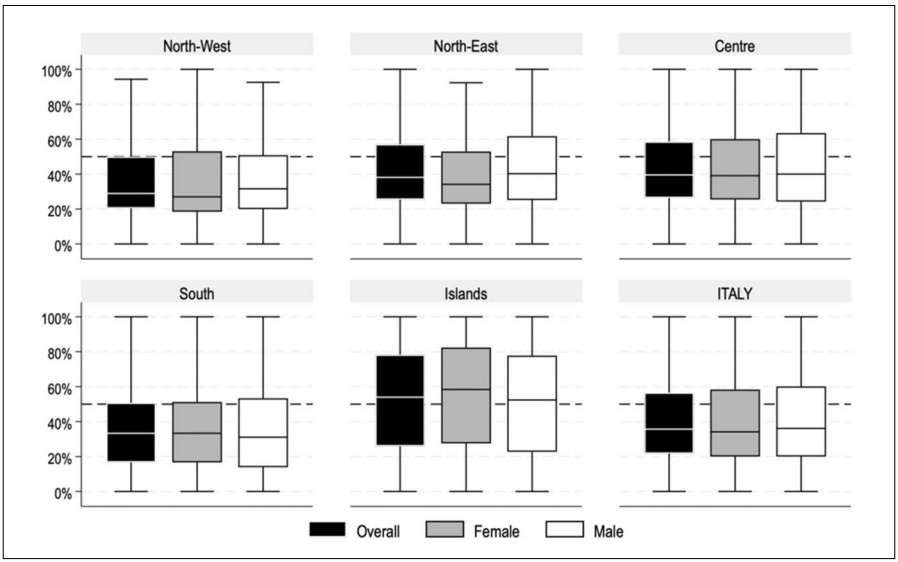

Fig. 2 – Choice Similarity Index by macro-region of upper secondary school

Figure 2 shows the values for the Choice Similarity Index by macro-region, as detailed in Table 1. Notably, the CSI is consistently higher for males than for females. This evidence suggests a more pronounced ten-

dency for male students to enrol in the same university as their peers who graduated in the same school and year. In particular, schools located in the Islands exhibit, on average, the highest levels of choice similarity (52.8%), likely due to the limited connections between Sicily and Sardinia and the mainland, which restricts choices to the most accessible universities with transportation (e.g., those reachable by aeroplane or ferry), or to the few universities located in those islands (4 in Sicily and 2 in Sardinia). In contrast, schools in the South show lower levels of choice similarity, with an overall CSI of 35.8%, and even lower values when broken down by gender (Females: 36.0%; Males: 36.9%).

Tab. 1 – Descriptive Statistics for the Entry Rate, Gender Gap Index and Choice Similarity Index by macro-region of upper secondary school

	Entry Rate				
	N schools/	*Mean*	*SD*	*Min*	*Max*
Macro-region			*Overall*		
North-West	1,704	52.0%	27.0%	0.0%	100.0%
North-East	1,130	49.5%	27.3%	0.0%	100.0%
Centre	1,471	53.0%	27.8%	0.0%	100.0%
South	2,160	48.4%	30.2%	0.0%	100.0%
Islands	960	46.9%	27.6%	0.0%	100.0%
Italy	7,425	50.2%	28.3%	0.0%	100.0%
			Female		
North-West	1,641	57.0%	25.1%	0.0%	100.0%
North-East	1,079	54.1%	26.1%	0.0%	100.0%
Centre	1,413	59.0%	26.1%	0.0%	100.0%
South	2,070	55.2%	29.1%	0.0%	100.0%
Islands	893	52.7%	26.8%	0.0%	100.0%
Italy	7,096	55.9%	26.9%	0.0%	100.0%
			Male		
North-West	1,692	46.6%	29.4%	0.0%	100.0%
North-East	1,122	44.8%	29.1%	0.0%	100.0%
Centre	1,448	47.0%	29.7%	0.0%	100.0%
South	2,106	41.6%	31.0%	0.0%	100.0%
Islands	932	40.9%	28.7%	0.0%	100.0%
Italy	7,300	44.3%	29.9%	0.0%	100.0%

(to be continued)

Tab. 1 – Descriptive Statistics for the Entry Rate, Gender Gap Index and Choice Similarity Index by macro-region of upper secondary school

		Gender Gap Index			
Macro-region	*N schools**	*Mean*	*SD*	*Min*	*Max*
North-West	1,611	7.5%	26.9%	-100.0%	100.0%
North-East	1,060	5.7%	29.3%	-100.0%	100.0%
Centre	1,371	8.7%	29.2%	-100.0%	100.0%
South	1,946	7.4%	35.2%	-100.0%	100.0%
Islands	833	6.7%	32.1%	-100.0%	100.0%
Italy	6,821	7.3%	30.8%	-100.0%	100.0%
		Choice Similarity Index			
			Overall		
North-West	1,642	38.2%	24.3%	0.0%	100.0%
North-East	1,081	42.4%	21.7%	0.0%	100.0%
Centre	1,381	43.4%	23.2%	0.0%	100.0%
South	1,897	35.8%	22.9%	0.0%	100.0%
Islands	831	52.8%	29.4%	0.0%	100.0%
Italy	6,832	40.9%	24.4%	0.0%	100.0%
			Female		
North-West	1,477	38.0%	26.2%	0.0%	100.0%
North-East	965	38.8%	21.4%	0.0%	100.0%
Centre	1,212	42.7%	23.3%	0.0%	100.0%
South	1,653	36.0%	23.3%	0.0%	100.0%
Islands	703	53.9%	29.8%	0.0%	100.0%
Italy	6,010	40.2%	25.1%	0.0%	100.0%
			Male		
North-West	1,477	39.3%	25.3%	0.0%	100.0%
North-East	957	47.2%	25.5%	0.0%	100.0%
Centre	1,216	44.9%	26.8%	0.0%	100.0%
South	1,581	36.9%	26.6%	0.0%	100.0%
Islands	695	52.2%	32.1%	0.0%	100.0%
Italy	5,926	42.6%	27.3%	0.0%	100.0%

* The number of schools for these indicators differs from the number of schools for the Entry Rate because schools without any students enrolled, or without students of both genders graduated, result in missing values for the calculation of the Gender Gap Index and the Choice Similarity Index.

As the Italian framework is characterised by regional peculiarities, Figure 3 provides a comparison at the NUTS2 level for all the proposed indicators. The female Entry Rate is consistently higher than the male Entry Rate, even

at the regional level. On average, the Gender Gap Index is also consistently positive. However, regions such as Umbria, Molise, and Basilicata exhibit a particularly high excess of females over males enrolling in university, while Emilia Romagna, Campania, and Sicily show a more balanced gender representation.

Finally, some useful insights can be gleaned regarding the CSI. From Figure 3, it can be inferred that the lowest levels of Choice Similarity Index are found in the southern regions, while students from Piedmont, Liguria, Tuscany, and Emilia Romagna (along with their peers from the Islands, as explained above), tend to exhibit a higher tendency to make similar choices as their school colleagues. This evidence could reflect, for students residing in the North-West and Centre, the tendency at applying in nearer university, as they are already settled in attractive territories (Lombardi and Ghellini, 2019).

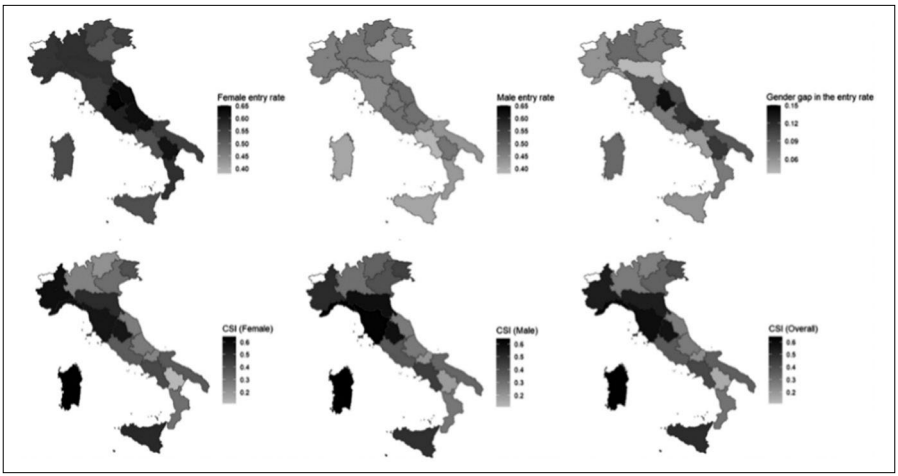

Fig. 3 – Female and male Entry Rates, Gender Gap Index (on the top), and female, male, and overall CSI (on the bottom) by Italian regions

3.2. Indicators by upper secondary school curriculum

Figure 4 shows results for Entry Rate and Gender Gap Index grouped by upper secondary school curriculum, as detailed in Table 2. Even in this case, female Entry Rates are consistently higher than male ones. Unsurprisingly, on average the highest Entry Rates attain to Classical (83.4%) and Scientific (80.9%) lyceums, which are considered as the most academic tracks in

the Italian upper secondary education system. On the other side, Vocational schools (12.4%) and the residual category of Other lyceums (9.5%) are characterised by the lowest mean rates of enrolment.

Consistent results emerge when looking at the Gender Gap Index. Indeed, Classical and Scientific lyceums are characterised by the most gender balanced values (mean values of 1.5% and 1.2%, respectively), associated with the lowest standard deviations (respectively 9.9% and 9.8%, see Table 2). In this case, Artistic, Other lyceums and Vocational schools exhibit an average female student enrolment that exceeds male enrolment by more than 10%. This reflects the trend that females are more likely to enrol in universities than males, particularly when they come from these types of schools.

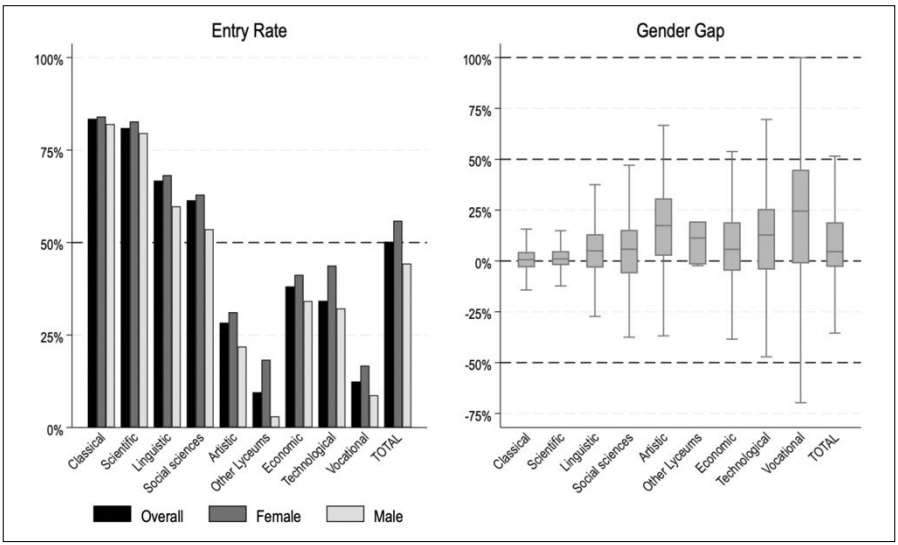

Fig. 4 – Entry Rate and Gender Gap Index by upper secondary school curriculum

When examining the Choice Similarity Index, as shown in Figure 5 and detailed in Table 2, it becomes evident that the CSI is not consistently higher for males than for females across all curricula. Overall, the lowest average scores are observed in Classical (34.3%), Linguistic (36.3%), Artistic (36.8%), and Scientific (38.3%) lyceums, while the highest average scores correspond to Economic (43.9%), Vocational and Technological schools (both 44.8%), and the group of Other lyceums (65.8%).

Regarding the most notable gender differences, the smallest gaps in the Choice Similarity Index are observed in Economic schools (0.7 percentage points in favour of females) and Vocational schools (0.5 percentage points

in favour of females), indicating that male and female students in these curricula exhibit similar patterns in university choice similarity. Conversely, the largest differences are found in the category of Other lyceums, where the CSI is 14.7 percentage points higher for females than for males, followed by Technological schools, where males show a 3.2 percentage point higher CSI than females. Social Sciences also show a notable gender difference, with female students exhibiting a CSI that is 3.1 percentage points higher than their male counterparts. These patterns suggest that in Technological schools, male students tend to enrol in the same universities as their male peers more often than female students do with their female peers, while in Social Sciences and Other lyceums, female students show a stronger tendency to choose the same university as their female colleagues.

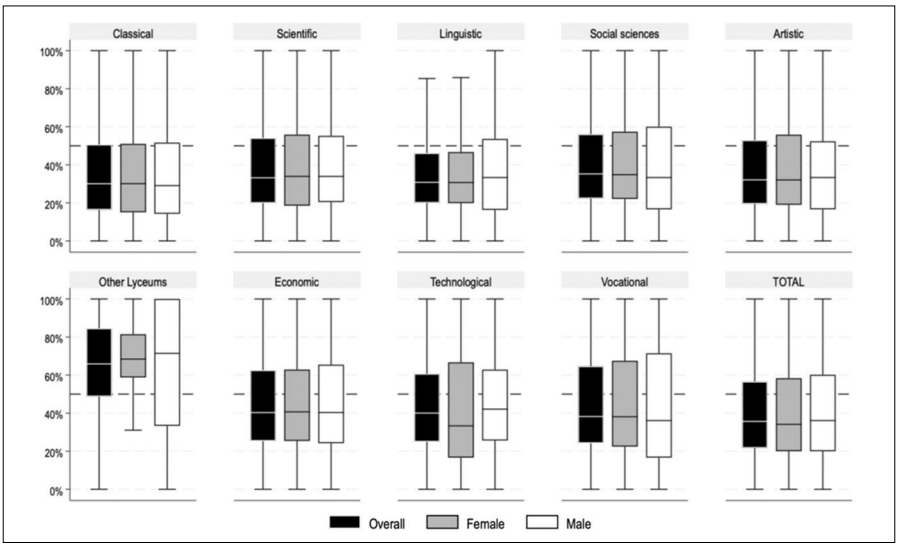

Fig. 5 – Choice Similarity Index by upper secondary school curriculum

Table 2 provides a detailed exploration of the results described above. As expected, the overall picture highlights the fundamental role of Classical and Scientific lyceums in fostering participation in the Italian tertiary education system. These two curricula exhibit the highest Entry Rates and the lowest levels of gender disparity. Their CSI scores are also the lowest (34.3% and 38.3%), with minimal differences even when the indicator is broken down by gender (1.2 percentage points higher for males in both cases).

Tab. 2 – Descriptive statistics for the Entry Rates, Gender Gap Index and Choice Similarity Index by upper secondary school curriculum

			Entry Rate		
	N schools	*Mean*	*SD*	*Min*	*Max*
Curriculum			*Overall*		
Classical	649	83.4%	7.6%	0.0%	100.0%
Scientific	1,448	80.9%	10.6%	4.5%	100.0%
Linguistic	762	66.7%	10.9%	7.7%	100.0%
Social Sciences	677	61.4%	14.2%	0.0%	100.0%
Artistic	399	28.3%	8.8%	0.0%	100.0%
Other lyceums	233	9.5%	18.4%	0.0%	100.0%
Economic	1,071	38.1%	14.7%	0.0%	100.0%
Technological	1,158	34.2%	13.7%	0.0%	93.3%
Vocational	1,028	12.4%	8.0%	0.0%	100.0%
Total	7,425	50.2%	28.3%	0.0%	100.0%
			Female		
Classical	645	84.1%	8.3%	0.0%	100.0%
Scientific	1,435	82.7%	10.9%	0.0%	100.0%
Linguistic	762	68.2%	10.6%	0.0%	100.0%
Social Sciences	676	63.0%	13.6%	0.0%	100.0%
Artistic	398	31.2%	10.1%	0.0%	100.0%
Other lyceums	146	18.3%	23.5%	0.0%	100.0%
Economic	1,063	41.3%	15.3%	0.0%	100.0%
Technological	1,027	43.8%	20.2%	0.0%	100.0%
Vocational	944	16.7%	10.6%	0.0%	100.0%
Total	7,096	55.9%	26.9%	0.0%	100.0%
			Male		
Classical	639	82.0%	12.4%	0.0%	100.0%
Scientific	1,447	79.6%	12.2%	0.0%	100.0%
Linguistic	743	59.8%	19.1%	0.0%	100.0%
Social Sciences	636	53.6%	22.8%	0.0%	100.0%
Artistic	390	21.9%	11.4%	0.0%	100.0%
Other lyceums	203	3.0%	11.1%	0.0%	87.5%
Economic	1,068	34.2%	16.9%	0.0%	100.0%
Technological	1,157	32.2%	13.3%	0.0%	78.4%
Vocational	1,017	8.7%	6.7%	0.0%	100.0%
Total	7,300	44.3%	29.9%	0.0%	100.0%

(to be continued)

Tab. 2 – Descriptive statistics for the Entry Rates, Gender Gap Index and Choice Similarity Index by upper secondary school curriculum

		Gender Gap Index			
Curriculum	*N schools**	*Mean*	*SD*	*Min*	*Max*
Classical	634	1.5%	10.0%	-100.0%	100.0%
Scientific	1,434	1.2%	9.8%	-100.0%	100.0%
Linguistic	743	7.2%	19.2%	-100.0%	100.0%
Social Sciences	632	9.0%	26.1%	-100.0%	100.0%
Artistic	386	19.0%	31.5%	-100.0%	100.0%
Other lyceums	15	20.1%	47.3%	-100.0%	100.0%
Economic	1,053	6.2%	30.7%	-100.0%	100.0%
Technological	1,022	3.8%	40.0%	-100.0%	100.0%
Vocational	902	18.8%	46.0%	-100.0%	100.0%
Total	6,821	7.3%	30.8%	-100.0%	100.0%
		Choice Similarity Index			
			Overall		
Classical	643	34.3%	20.5%	0.0%	100.0%
Scientific	1,437	38.3%	22.0%	0.0%	100.0%
Linguistic	756	36.3%	21.5%	0.0%	100.0%
Social Sciences	663	40.6%	23.5%	0.0%	100.0%
Artistic	370	36.8%	23.8%	0.0%	100.0%
Other lyceums	16	65.8%	22.5%	0.0%	100.0%
Economic	1,013	43.9%	25.0%	0.0%	100.0%
Technological	1,079	44.8%	25.4%	0.0%	100.0%
Vocational	855	44.8%	28.1%	0.0%	100.0%
Total	6,832	40.9%	24.4%	0.0%	100.0%
			Female		
Classical	632	34.3%	21.0%	0.0%	100.0%
Scientific	1,368	38.1%	23.0%	0.0%	100.0%
Linguistic	749	36.0%	21.6%	0.0%	100.0%
Social Sciences	654	41.4%	23.7%	0.0%	100.0%
Artistic	352	37.2%	24.8%	0.0%	100.0%
Other lyceums	12	69.7%	18.0%	31.1%	100.0%
Economic	895	45.3%	25.5%	0.0%	100.0%
Technological	682	42.8%	30.1%	0.0%	100.0%
Vocational	666	45.5%	29.9%	0.0%	100.0%
Total	6,010	40.2%	25.1%	0.0%	100.0%

(to be continued)

Tab. 2 – Descriptive statistics for the Entry Rates, Gender Gap Index and Choice Similarity Index by upper secondary school curriculum

		Choice Similarity Index			
	*N schools**	*Mean*	*SD*	*Min*	*Max*
Curriculum			*Male*		
Classical	593	35.5%	24.2%	0.0%	100.0%
Scientific	1,420	39.3%	22.6%	0.0%	100.0%
Linguistic	621	38.7%	28.9%	0.0%	100.0%
Social Sciences	478	38.3%	30.6%	0.0%	100.0%
Artistic	258	38.4%	30.3%	0.0%	100.0%
Other lyceums	11	55.0%	37.6%	0.0%	100.0%
Economic	872	44.6%	29.0%	0.0%	100.0%
Technological	1,033	46.0%	25.9%	0.0%	100.0%
Vocational	640	45.0%	33.6%	0.0%	100.0%
Total	5,926	42.6%	27.3%	0.0%	100.0%

* The number of schools for these indicators differs from the number of schools for the Entry Rate because schools without any students enrolled, or without students of both genders graduated, result in missing values for the calculation of the Gender Gap Index and the Choice Similarity Index.

In summary, Classical and Scientific lyceums contribute the largest number of students to higher education while also displaying the greatest heterogeneity in students' choices in terms of higher education institution and the lowest levels of gendered behaviour. This is consistent with the well-known evidence that these curricula correspond to the most academic tracks in the Italian upper secondary education system. However, it should also be emphasised that their students, on average, exhibit a higher socio-economic status, providing them with greater resources for academic investment (Tocchioni, Milone and Lombardi, 2025).

3.3. Indicators by ESCS quartiles

Figure 6 shows the results of Entry Rates and the Gender Gap Index grouped by ESCS quartiles. More details are available in Table 3. The most interesting evidence emerging from Figure 6 is that, on one hand, the Entry Rate increases as the ESCS quartile of the schools increases; on the other hand, the Gender Gap Index decreases as the ECSC quartile increases. Indeed, schools in the two highest quartiles are the only ones with Entry Rates above the average for all groups: overall (mid-high: 59.9%, high:

77.8%; average: 50.2%), male (mid-high: 54.5%, high: 76.4%; average: 44.3%), and female (mid-high: 64.1%, high: 79.1%; average: 55.9%). Schools in high socio-economic contexts are also characterised by a substantial gender equality in university enrolment (Gender Gap Index equal to 1.4%). In summary, schools with students with a wealthy socio-economic background exhibit higher Entry Rate and a more equal gender balanced situation.

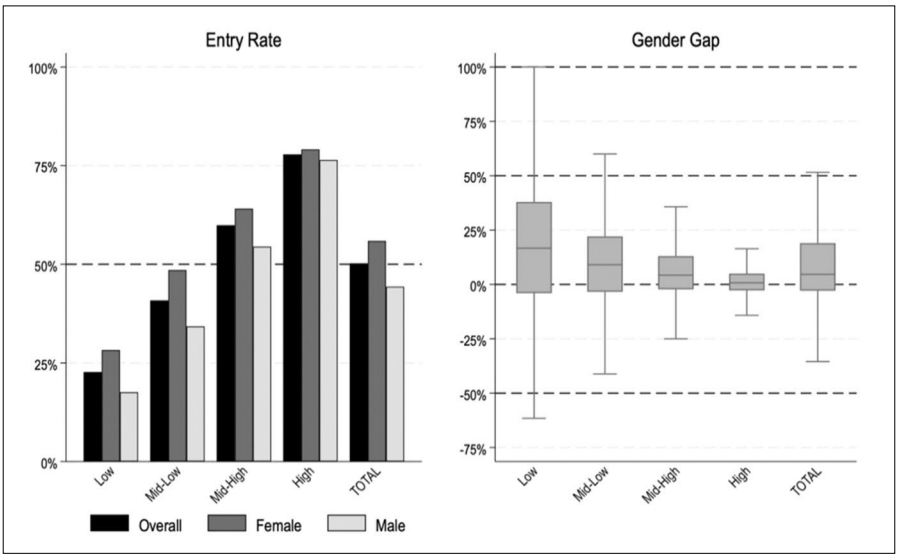

Fig. 6 – Entry Rate and Gender Gap Index by ESCS quartile

Figure 7 plots the Choice Similarity Index, then detailed in Table 3. As usual, male students tend to concentrate in the same universities more than female students. Nonetheless, as in the case of the Gender Gap Index, the tendency to make similar university choices decreases as the ESCS quartile increases. Accordingly, students from the two highest ESCS quartiles are the only ones exhibiting average Choice Similarity Index values below the population average of 40.9 %.

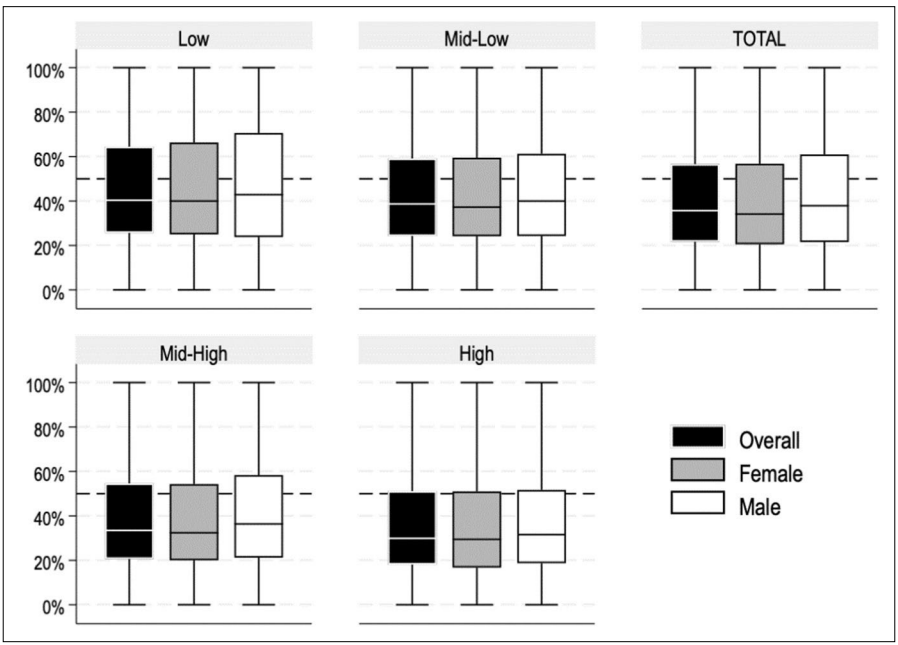

Fig. 7 – Choice Similarity Index by ESCS quartile

Tab. 3 – Descriptive Statistics for the Entry Rates, Gender Gap Index and Choice Similarity Index by ESCS quartile

		Entry Rate			
	N schools	*Mean*	*SD*	*Min*	*Max*
Curriculum			*Overall*		
Low	1,883	22.7%	17.6%	0.0%	100.0%
Mid-low	1,738	40.8%	19.5%	0.0%	100.0%
Mid-high	1,873	59.9%	22.7%	0.0%	100.0%
High	1,931	77.8%	17.3%	0.0%	100.0%
Total	7,425	50.2%	28.3%	0.0%	100.0%
			Female		
Low	1,733	28.3%	19.8%	0.0%	100.0%
Mid-low	1,657	48.5%	20.7%	0.0%	100.0%
Mid-high	1,819	64.1%	20.4%	0.0%	100.0%
High	1,887	79.1%	16.0%	0.0%	100.0%
Total	7,096	55.9%	26.9%	0.0%	100.0%

(to be continued)

Tab. 3 – Descriptive Statistics for the Entry Rates, Gender Gap Index and Choice Similarity Index by ESCS quartile

	Entry Rate				
	N schools	*Mean*	*SD*	*Min*	*Max*
Curriculum			*Male*		
Low	1,846	17.6%	15.9%	0.0%	100.0%
Mid-low	1,708	34.2%	18.1%	0.0%	100.0%
Mid-high	1,841	54.5%	26.3%	0.0%	100.0%
High	1,905	76.4%	20.3%	0.0%	100.0%
Total	7,300	44.3%	29.9%	0.0%	100.0%
			Gender Gap Index		
Low	1,616	14.4%	41.2%	-100.0%	100.0%
Mid-Low	1,597	7.9%	33.1%	-100.0%	100.0%
Mid-High	1,759	5.6%	25.4%	-100.0%	100.0%
High	1,849	1.4%	17.2%	-100.0%	100.0%
Total	6,821	7.3%	30.8%	-100.0%	100.0%
			Choice Similarity Index		
			Overall		
Low	1,590	46.1%	26.4%	0.0%	100.0%
Mid-low	1,617	43.0%	24.2%	0.0%	100.0%
Mid-high	1,767	39.2%	24.0%	0.0%	100.0%
High	1,858	35.4%	21.5%	0.0%	100.0%
Total	6,832	40.9%	24.4%	0.0%	100.0%
			Female		
Low	1,295	45.9%	28.1%	0.0%	100.0%
Mid-low	1,383	42.7%	24.8%	0.0%	100.0%
Mid-high	1,608	38.5%	24.2%	0.0%	100.0%
High	1,724	35.0%	22.0%	0.0%	100.0%
Total	6,010	40.2%	25.1%	0.0%	100.0%
			Male		
Low	1,260	47.3%	31.3%	0.0%	100.0%
Mid-low	1,390	44.4%	26.5%	0.0%	100.0%
Mid-high	1,574	41.5%	26.5%	0.0%	100.0%
High	1,702	36.8%	23.2%	0.0%	100.0%
Total	5,926	42.6%	27.3%	0.0%	100.0%

* The number of schools for these indicators differs from the number of schools for the Entry Rate because schools without any students enrolled, or without students of both genders graduated, result in missing values for the calculation of the Gender Gap Index and the Choice Similarity Index.

3.4. Concluding remarks

This work has proposed three indicators calculated at the school level aiming at investigating gender differences in university enrolment. The integration of INVALSI data, which provides information about 13th grade graduates in 2018/2019, and ANS data, which informs about university enrolment in 2019/2020, represents an invaluable tool for exploring this topic.

The first indicator, the Entry Rate, is highest in central regions and decreases towards peripheral areas. Entry Rates then decrease as students belong to schools with lower socio-economic backgrounds on average. Moreover, this category of students typically opts for low academic tracks in upper secondary school, specifically Technological and Vocational schools, which are indeed characterised by the lowest Entry Rates, while Classical and Scientific lyceums by the highest.

In this framework, female Entry Rates are consistently higher than male rates, especially in Vocational schools, southern regions, and among students from lower socio-economic backgrounds. It is noteworthy that the poorer the students' context, the higher the female university Entry Rate compared to the male rate. This conclusion is further supported by the second indicator proposed. Indeed, the Gender Gap Index, which measures the excess of females over males enrolling in university, appears to be amplified as the socio-economic and cultural background of students decreases. The indicators presented offer a descriptive representation of reality but suggest hypotheses that warrant further investigation. In particular, the wider values for the Gender Gap Index observed in Vocational schools, southern regions, and among students from lower socio-economic backgrounds suggest that male students are especially disadvantaged in their educational trajectories when facing more challenging contexts.

The final indicator proposed is the Choice Similarity Index, which represents the main novelty of our work. As far as we know, this is the first time such an index has been employed in the educational framework. The primary evidence obtained indicates that males tend to enrol in the same university as their peers who graduated from the same school and year more than females. This suggests that for male students, the presence of an existing social context during university enrolment plays a crucial role in their academic decisions. Even more, students from Sardinia and Sicily exhibit particularly high levels of choice similarity. We attribute this evidence to the poor connections between these islands and the mainland, which limit access to easily reachable universities.

Finally, the Choice Similarity Index tends to increase as the social context of origin declines (e.g., Technological and Vocational schools, and low-

ESCS schools). This finding suggests two mechanisms at play, which should be tested in further research. First, students in Vocational curriculum in the Italian upper secondary education system seem to rely more on their peers, namely, to enrol in the same university as their peers do. Second, students attending upper secondary schools with, on average, higher socio-economic backgrounds tend to face fewer constraints in their university career choices. Owing to their family of origin, they are likely to enjoy greater flexibility in selecting their institution of enrolment, which in turn may lead to more diverse and heterogeneous educational pathways.

Further research will involve recalculating this indicator on the basis of fields of study, rather than solely on the institution chosen. As previously noted, these three indicators, along with the three proposed stratifications, provide valuable insights for a deeper analysis of gender differences in university enrolment within the Italian education system. This provides a foundation for further development. These indicators can be used to empirically investigate whether, and to what extent, these factors concurrently contribute to Italian students' participation in tertiary education. Currently, the analysis of these dynamics cannot be fully explored without benefiting from the valuable integration of INVALSI and ANS data sources. Synergies between different public institutions collecting administrative data about the Italian education system are already yielding positive research outcomes, and this approach should always be promoted and incentivized.

3.5. Acknowledgments

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3. Beyond barriers: gender, migration background, and socio-economic inequalities in school performance in Italy

by Enrico Deleo, Paola D'Elia, Sergio Di Sano

Education is frequently regarded as the catalyst for both individual and social advancement. Nevertheless, persistent disparities impede the realisation of the ideal of equitable opportunities for all. The present study seeks to explore the intricate interplay between gender, migration background and socio-economic status (ESCS) in shaping educational attainment in Italy. While there has been extensive documentation of the impact of these factors individually, there is a paucity of research on their interactions, particularly in core subjects such as Italian and Mathematics. This study aims to unravel hidden patterns in the intersection of these dimensions by analysing gender, school performance and migration background. It also takes into account how socio-economic-cultural conditions amplify or reduce these inequalities. To this end, the analysis of INVALSI data from eighth-grade students (school year 2022/2023) employs multiple regression models to investigate these dynamics. The findings reveal a multifaceted and occasionally counterintuitive picture: first generation immigrant students encounter the most pronounced disadvantages, while second generation students exhibit signs of educational convergence with their native peers. The interaction between gender and these dynamics is also of interest, with first generation immigrant girls outperforming their male peers in Mathematics, defying traditional gender trends. These preliminary findings give rise to a number of crucial questions for research and educational policies. The identification of the mechanisms that underlie these phenomena is imperative to inform future research and educational policy. What strategies can break cycles of disadvantage? The present study aims to stimulate a broader reflection on how to build a truly inclusive and equitable education system in an era of increasing diversity by shedding light on these pressing questions.

L'istruzione è spesso considerata la chiave per il progresso individuale e sociale, eppure persistono disuguaglianze che mettono in discussione l'ideale di pari opportunità per tutti. In che modo genere, background migratorio e status socio-economico (ESCS) si intrecciano nel determinare il rendimento scolastico in Italia? Sebbene la ricerca abbia ampiamente documentato l'impatto di questi fattori singolarmente, molto meno si sa sulle loro interazioni, soprattutto in discipline fondamentali come l'Italiano e la Matematica. Questo studio mira a svelare schemi nascosti nell'intersezione di queste dimensioni, analizzando genere, rendimento scolastico e background migratorio, tenendo conto di come le condizioni socio-economiche-culturali e amplificano o riducono queste disuguaglianze. Attraverso l'analisi dei dati INVALSI degli studenti di terza media (anno scolastico 2022/2023), utilizziamo modelli di regressione multipla per indagare queste dinamiche. I risultati restituiscono un quadro complesso e a tratti contro-intuitivo: gli studenti immigrati di prima generazione affrontano gli svantaggi più marcati, mentre quelli di seconda generazione mostrano segnali di convergenza educativa con i loro coetanei nativi. Sorprendentemente, il genere interagisce con queste dinamiche in modi inattesi: le ragazze immigrate di prima generazione ottengono risultati migliori dei loro coetanei maschi in Matematica, sfidando le tendenze di genere tradizionali. Questi risultati preliminari aprono interrogativi cruciali per la ricerca e le politiche educative. Quali meccanismi sottendono questi fenomeni? Quali strategie possono interrompere i cicli di svantaggio? Gettando luce su queste questioni urgenti, questo studio intende stimolare una riflessione più ampia su come costruire un sistema scolastico realmente inclusivo ed equo in un'epoca di crescente diversità.

1. Introduction

The correlation between socio-economic status, migratory background and educational performance constitutes a pivotal issue in the global discourse on education. Within the context of Italy, educational inequalities are intricately intertwined with territorial disparities, as the social and economic divide between the northern and southern regions of the country is also reflected in school performance. The existence of such inequalities is consistently confirmed by INVALSI data, which can be attributed to a combination of contextual factors. These include family characteristics (e.g. parents' level of education and profession), socio-economic peculiarities of the territory, the quality of educational resources and school facilities (Bratti *et al.*, 2007; Riccardi, Donno and Bagnarol, 2020). A substantial body of research has

examined the impact of migration background and socio-economic-cultural status (ESCS) on academic performance, particularly in fundamental subjects such as Italian and Mathematics (Goni and Bello, 2016). However, there remains a paucity of research into the interaction between gender, origin and socio-economic status, an aspect deemed crucial for a more profound understanding of educational inequalities. Recent studies have demonstrated that, in contrast to the outcomes observed in Italian and Mathematics tests, in English tests, first and second generation immigrant students demonstrate equivalent or superior performance in comparison to native-born students (INVALSI, 2019). These findings suggest that the factors affecting English language skills may differ from those affecting performance in other disciplines. In light of this evidence, the present study aims to analyse differences in performance in Italian and Mathematics between native and first and second generation immigrant students in Italy, considering the role of gender and socio-economic status. The objective of this research is to provide an updated empirical assessment on the promotion of inclusive educational policies, with the capacity to address inequalities associated with migration background and socio-economic conditions.

2. Inequalities in education

2.1. Economic-Socio-Cultural-Status (ESCS)

Socio-economic and cultural status (ESCS) is a significant predictor of educational outcomes, exerting a substantial influence on students' access to educational opportunities. According to Bourdieu and Passeron (1971), the concept of cultural capital highlights how families with a high socio-economic status can provide more educational resources, contributing to their children's educational success. Conversely, students from disadvantaged socio-economic backgrounds encounter structural and material barriers that impede their educational progress (Ballarino and Checchi, 2006; Checchi, 2010). These barriers manifest themselves in the form of schools with poor infrastructure, reduced opportunities for extracurricular support and reduced availability of adequate educational resources. Furthermore, the lack of a conducive home environment, characterised by precarious housing conditions or the financial burden on the family, acts as an additional obstacle to the educational success of these students. This disparity manifests through constrained access to private lessons, extracurricular pursuits and advanced learning materials, all of which exert a detrimental effect on academic perfor-

mance (Gottfried, 2014). Educational inequalities linked to socio-economic status are amplified in the different Italian regions. Notably, the North-South divide is a salient aspect, with students in the South demonstrating lower average scores on standardised tests compared to their peers in the North, attributable to disparities in access to educational resources and school infrastructure (Di Sano and Balenzano, 2023).

The extant literature confirms a positive correlation between regional PIL and educational outcomes, suggesting that general economic conditions significantly influence educational opportunities (Branchetti *et al.*, 2015.). Furthermore, the phenomenon of social tracking, i.e. the practice of assigning students to different educational pathways based on socio-economic and performance criteria, commences as early as primary school and contributes to accentuating differences between students from different backgrounds. This process gives rise to school segregation, which frequently precludes the most economically disadvantaged students from accessing quality educational opportunities, thereby impeding their social mobility. This phenomenon manifests in diverse ways, including the establishment of different levels of school sections based on students' readiness for more advanced learning, and the early referral of students to less prestigious educational pathways.

A substantial body of research has demonstrated the manner in which this practice serves to reinforce existing inequalities, with students lacking cultural and social resources being particularly disadvantaged (Raffinetti and Romeo, 2015). Another salient factor pertains to the influence exerted by the school environment on migrant students. According to Minello and Barban (2012), migrant students benefit from attending schools with Italian peers who have high educational aspirations, as this context favours their inclusion and academic improvement. Conversely, schools attended by students with low socio-economic status tend to receive less funding than European standards, with a distribution of resources that is not always efficient (Giacomo *et al.*, 2013; Sirin, 2005). This phenomenon has a detrimental effect on educational opportunities, thereby exacerbating existing inequalities. However, it should be noted that there are exceptions to this pervasive picture of inequality.

Some resilient students, despite belonging to disadvantaged backgrounds, manage to achieve well thanks to factors such as family support, a positive school environment and the presence of motivated teachers (Longobardi, 2013). Consequently, the role of educational institutions becomes pivotal in attenuating the deleterious effects of socio-economic disadvantage through the implementation of inclusive strategies, targeted investments in human capital, and the execution of personalised support pro-

grammes (Goel, 2019). In particular, the school climate has been demonstrated to play a crucial role in the success of students from disadvantaged backgrounds (La Salle *et al.*, 2020).

A welcoming school environment characterised by positive relationships between students and teachers has been shown to mitigate the effects of socio-economic inequalities. Recent studies have demonstrated that schools with a positive climate engender a greater sense of belonging and involvement, which are pivotal factors in enhancing the academic performance and psychological well-being of vulnerable students. Furthermore, the educational attainment of children is significantly influenced by their parents' level of education. Children from low-income families often begin school with cognitive disadvantages due to a lack of early stimulation (Chung, 2015), while the educational attainment of children is directly influenced by their parents' level of education (Hassan, 2009). Consequently, family involvement can serve as a mitigating factor in the adverse effects of socio-economic status, to a certain extent compensating for the absence of economic resources (Munir *et al.*, 2023). Despite efforts to narrow the gap, the Italian school system remains highly stratified by social class, reflecting economic inequalities and perpetuating cycles of disadvantage that limit social mobility (Leone-Pizzighella, 2019).

In this context, educational inclusion policies play a pivotal role: targeted support strategies can enhance the performance of disadvantaged students and reduce the ESCS gap (Goel, 2019). Furthermore, educational interventions such as tutoring programmes and academic progress monitoring have been shown to improve the outcomes of students from low socio-economic status backgrounds (Dietrichson *et al.*, 2017), thereby helping to address existing inequalities and foster a more equitable and accessible education system.

2.2. Gender

Within the Italian education system, the gender gap represents a salient variable in school performance, with profound ramifications for the comprehension of social and educational inequalities. Historically, girls have demonstrated superior performance in Italian language proficiency assessments. However, a more nuanced landscape emerges when Mathematics is considered, where boys tend to exhibit higher levels of proficiency. Recent studies and empirical data, including those from the OECD (2018) and INVALSI (2024), demonstrate a consistent trend of higher scores for girls in Italian tests, while boys demonstrate stronger performance in Science and Maths disciplines.

Gallagher *et al.* (2000) report that girls, particularly in Italy, regularly outperform boys on language tests, suggesting a school system preference for cognitive characteristics traditionally associated with girls, such as attention to detail and verbal communication skills. However, this female advantage in reading is not reflected in other subject areas, such as Mathematics.

Guiso *et al.* (2008) posit that the gender disparity in Mathematics is partly attributable to social and cultural factors associated with female empowerment. While there has been a marked improvement in the performance of girls in Mathematics over time, the perception that it is a masculine discipline persists, continuing to influence educational and vocational choices. A number of Italian studies have demonstrated that the gender gap in Mathematics is evident from elementary school onwards and grows wider with advancing age (Contini *et al.*, 2017).

According to data from the Italian Institute for the Evaluation of Education and Training (INVALSI) (2024), male students demonstrate higher average performance than their female counterparts in national Mathematics tests. The gap in performance between the two groups becomes more pronounced in more complex contexts, such as advanced Mathematics. This phenomenon is further substantiated by the evidence collated by PISA, which reveals a pronounced gender divide in mathematical aptitudes, with male students demonstrating a marked superiority in performance related to these disciplines (Sartori and Buzzi, 2018).

The contrast between girls' superior performance in Italian and boys' advantage in Mathematics can be seen as a manifestation of gender stereotypes embedded in school culture. For instance, Italian school textbooks frequently perpetuate conventional gender roles, reinforcing the notion that girls are better suited to verbal and relational activities, while boys are naturally more inclined to scientific and logical disciplines (Biemmi, 2015). This phenomenon is particularly evident in secondary schools, where course selection and participation in Mathematics excellence groups are influenced by gender biases, with girls often underrepresented despite comparable performance (Matteucci and Mignani, 2010).

Another salient issue pertains to school participation. Research has indicated that girls exhibit a greater propensity to engage in school activities, demonstrating a more dedicated approach and a reduced likelihood of experiencing burnout in comparison to their male counterparts (Jelas *et al.*, 2014). This phenomenon is also related to the heightened confidence girls have in their cognitive abilities, which is reflected in their future educational choices. However, despite increased effort and higher achievement, girls encounter underachievement in science disciplines, with difficulties in ac-

cessing leadership positions and high performance groups. The gender disparities observed in Italy are not confined to the school environment, but extend to subsequent phases of life, including the labour market. It has been demonstrated that female students frequently achieve superior educational outcomes (Castagnetti and Rosti, 2010), yet nevertheless encounter considerable wage inequalities (*ibid.*), with lower economic returns than their male counterparts for equivalent qualifications.

This phenomenon is further compounded by the persistent presence of gender stereotypes, which not only affect school participation rates but also have a detrimental impact on women's future career opportunities. The persistence of gender disparities in Italian schools underscores the necessity for systemic change. Educational approaches must evolve to address the specific needs of each gender and foster an environment that promotes equity and inclusiveness. Furthermore, educational institutions must recognise the necessity to challenge prevailing gender stereotypes that impede the potential of both male and female students, by promoting a more balanced engagement in subjects that are traditionally dominated by either gender.

2.3. Migration background

2.3.1. Shifting demographics in Italian schools: immigrant students' growth

From the 2019/2020 school year to the 2022/2023 school year, Italian schools have undergone a substantial transformation in terms of the composition of the student population. There has been a continuous increase in the number of pupils with migrant backgrounds, both first and second generation. Data presented in Ministry of Education reports demonstrate a trend of declining Italian student populations, whilst foreign student populations have increased. Specifically, the proportion of pupils with non-Italian citizenship has been rising steadily, reaching 10.3% of the total in primary and secondary schools in 2020/2021, although this figure has decreased from previous years. According to the ISMU Report, in 2022 Lombardy welcomed 222,364 pupils with non-Italian citizenship, Emilia-Romagna 106,280 and Veneto 96,105. At the national level, it is noteworthy that approximately 66.7 percent of students with non-Italian citizenship were born in Italy, indicating a progression towards greater integration of subsequent immigrant generations.

The predominant countries of origin of foreign students are Europe (44%), Africa (26.9%), and Asia (20.2%), with a notable influence of the Albanian,

Moroccan, and Chinese communities in Italian schools. The increase in the number of immigrant pupils in Italian schools gives rise to significant questions regarding the relationship between migration status and other factors, including socio-economic and gender-related issues.

Research has demonstrated that immigrant students, while benefiting from greater integration, still face numerous obstacles related to social, economic and cultural inequality. The challenges faced by these students, including difficulties in accessing quality educational resources and experiencing marginalization due to their migration status and gender, necessitate targeted interventions. In this context, educational policies should be designed to be flexible and inclusive, with the aim of promoting educational success for all students without exception, and preventing forms of exclusion that could hinder their future social and economic participation.

The increasing demographic of pupils from migrant backgrounds underscores the necessity for ongoing refinement of educational policies and the continuous professional development of school personnel. Teachers and school leaders must be adequately prepared to manage cultural and linguistic diversity, foster an inclusive environment, and positively welcome plurality of experiences. This process enriches the school environment and provides an opportunity to educate future generations in global and intercultural citizenship. Consequently, the institutional response must encompass more than mere adaptation to these shifting demographic dynamics; it should also be an opportunity to enhance the overall quality of education in Italy.

2.3.2. The role of migration background in academic performance: theories and empirical perspectives

In the context of research on the factors influencing students' educational achievement in Italy, migration background emerges as a pivotal aspect. A plethora of sociological theories and empirical studies have indicated that the integration pathways of migrant students are subject to considerable variation in relation to factors such as their country of origin, the age at which they immigrated, their socio-economic background, and the prevailing educational policies. Portes and Zhou's (1993) theory of segmented assimilation posits that there is no singular path to integration for migrants; rather, migrant groups may follow distinct pathways, influenced by variables such as social class of origin, ethnicity, and available educational resources. In Italy, the discrepancy in educational performance between native students and students with migrant backgrounds is well document-

ed, with first generation students demonstrating significantly lower educational achievement compared to their native peers, as evidenced by Bratti and Checchi (2007). The National Report of the INVALSI (2024) corroborates this trend, with first generation students demonstrating lower scores in Italian and Mathematics (23.7 percent lower in Italian and 13.5 percent lower in Mathematics). The second generation students also demonstrate a discrepancy in their academic performance, though it is notably less pronounced, with a 13.3 percent lower score in Italian and a 7.9 percent lower score in Mathematics compared to their native counterparts. Another critical aspect that has been identified is the phenomenon of implicit school dropout. Data show that first generation students have higher rates of implicit dropout during secondary education, with an implicit probability of 24.4 percent, significantly higher than native and second generation students (5.3 percent and 4 percent, respectively). This phenomenon is particularly pronounced in technical-vocational pathways, where the gap is even wider (Aina *et al.*, 2015).

The impact of migrant background on educational opportunities is also influenced by school segregation. Spatial and school segregation is a salient issue, as migrant students tend to be concentrated in schools with fewer resources, creating a disparity in educational opportunities. This phenomenon is often characterised by a high concentration of migrant students in the same classrooms, which has been shown to have negative consequences for learning, especially for students from low-income families (Contini, 2013). Moreover, language barriers have been identified as a significant impediment to the educational success of migrant students. The challenge of acquiring the Italian language has been shown to impact not only academic performance but also the perceived social inclusion of migrant students, who frequently experience feelings of marginalisation within the school environment (Natalini, 2024).

The role of language in fostering an inclusive school environment, where migrant students can fully express and develop their abilities, is a determining factor in their educational success. The subjective well-being of migrant students, which encompasses factors such as family support and perceptions of discrimination, has been found to be positively correlated with their educational achievement (Paparusso, 2021).

Studies such as Paparusso's (2021) demonstrate that students who perceive their well-being as high, who receive family support and do not experience discrimination, tend to perform better, while the experience of discrimination is found to have a negative effect on their school performance. Finally, it is important to note that despite the difficulties encountered, many migrant

students, particularly those of the second generation, continue to exhibit high levels of educational aspiration. These students often aspire to higher levels of education than their native counterparts, although structural barriers and social and economic disadvantages may impede their ability to realise these aspirations (Buonomo *et al.*, 2024).

In conclusion, the educational integration of students with migrant backgrounds in Italy is influenced by multiple factors, including language difficulties, school segregation, family support, experiences of discrimination, and socio-economic inequalities. To this end, educational policies must take these dynamics into consideration in order to reduce the achievement gap between migrant and native students, and to create a school environment that fosters inclusion and equality of opportunity.

3. The research question: intersectionality and educational inequalities

3.1. The influence of gender, socio-economic status, and migration background on academic outcomes

Intersectionality is a pivotal concept in comprehending the educational predicaments that emerge when contemplating the interplay of overlapping social and identity factors, including gender, socio-economic status, and migration background. Specifically, the interaction between gender and ESCS (socio-economic and cultural index) with migration background has been shown to create unique experiences and additional difficulties for certain groups of students. Research conducted by Arnot and Mac an Ghaill (2006) has demonstrated the intricate interweaving of these dimensions and their substantial influence on access to and success in education. Furthermore, Heath and Brinbaum's (2007) research indicates that immigrant students from socio-economically disadvantaged families encounter a dual disadvantage, both in terms of gender and socio-economic background. Bratti and Checchi (2007) further confirm that these students tend to have a lower ESCS, resulting in difficulties in coping with education. Consequently, addressing gender inequalities in education necessitates an approach that considers not only gender, but also socio-economic and migration background, distinguishing between first and second generation immigrants. This intersectional perspective is crucial to the development of inclusive education policies that address the diverse needs of students, thereby promoting equity in access to education.

In this study, intersectionality is adopted as an analytical framework rather than as a post-structural or standpoint epistemology. Specifically, it is operationalised within a quantitative stratification perspective through the inclusion of interaction terms among structural dimensions of inequality (gender, socio-economic status, and migration background). This approach allows us to empirically test whether the effects of these dimensions operate additively or whether they combine in ways that produce differentiated patterns of advantage and disadvantage. In doing so, the study aligns with empirical research traditions that translate intersectional insights into statistical modeling of interaction effects.

The aims of our study align well with this intersectional approach, with the intent to explore how inequalities in socio-economic status, gender, and migration status affect students' educational outcomes. Firstly, the present study aims to investigate the influence of economic, social, and cultural status (ESCS) on grade eight students' learning outcomes with a focus on the subjects of Italian and Mathematics during the school year 2022/2023. The ESCS analysis encompasses variables such as parental occupation, parental education level, and domestic resource availability, with the objective of comprehending how these factors may influence students' academic performance. Secondly, the study will analyse how the effect of ESCS varies in relation to gender and migration status. Of particular interest is the analysis of how immigrant students, distinguishing between first and second generation, encounter specific educational challenges in comparison to their native peers. This will facilitate the capture of the intricacies of educational inequalities and the identification of specific barriers that may impede educational success for particular groups, such as immigrant girls or students from socio-economically disadvantaged backgrounds.

The aim of this study is to enhance our understanding of the intersectional dynamics that influence educational outcomes, thereby providing insights that can inform the development of more inclusive and targeted educational policies. These policies aim to address existing inequalities and promote equity for all students. From a methodological standpoint, this requires moving beyond descriptive comparisons and testing explicitly whether the effects of social dimensions vary across groups through interaction terms in statistical models.

4. Method and data analysis plan

4.1. Sample

This study is based on secondary data provided by INVALSI for Grade 8 students in the 2022/2023 school year. The total population of students participating in the INVALSI assessment amounted to 550,284 individuals. The analyses presented in this chapter rely on the official monitored sample, comprising approximately 3,888 students.

The sample was selected through a two-stage sampling design: first, schools were randomly drawn; second, within selected schools, typically two classes were sampled. The monitored sample is administered under the supervision of external observers to ensure strict adherence to standardized testing procedures. This feature enhances the reliability and internal validity of the data, reducing potential distortions related to irregular administration practices.

All analyses were conducted using the final student weight provided by INVALSI. These weights allow the sample estimates to approximate population-level parameters, thus ensuring representativeness despite the reduced sample size. While weighting procedures restore representativeness in terms of point estimates and standard errors, they do not increase statistical power. Therefore, particular attention was paid to model specification and parsimony, especially in the estimation of interaction effects, which typically require larger sample sizes than main effects.

The choice to rely on the monitored sample reflects a methodological trade-off between maximizing sample size and ensuring higher measurement quality and procedural control. Given the focus of this study on interaction effects among structural dimensions of inequality, the monitored sample was considered appropriate due to its data quality and the availability of reliable weighting procedures. Nonetheless, findings related to interaction terms should be interpreted with due caution, acknowledging that their contribution to explained variance is typically modest in stratification research and that future studies based on full population data or multilevel designs could further strengthen the robustness of these results.

4.2. Variables, procedure, and methodological choices

The research examined the results of the INVALSI Tests of the National Survey of Italian and Mathematics learning relating to the 2022/2023 school

year. The Italian tests examine two types of language skills, among those provided for by the National Indications and the Guidelines: 1) the ability to understand an authentic text, thanks to the competence in identifying salient information, reconstructing the meanings expressed in the text and reflecting on the content and textual form; 2) the ability to reflect on the language, that is, the knowledge of grammar necessary to express oneself correctly.

The grade 8 test includes, specifically, a section for reading comprehension of three texts of various kinds, a vocabulary section, and a grammar section. The Mathematics test measures some fundamental skills among those provided by the National Indications and the Guidelines, in different areas. The questions proposed often start from real world problems and verify the disciplinary knowledge, the ability to solve problems and reflect on processes by arguing the reasons for the choices made. The content domains tested in the grade 8 test are Numbers, Space and figures, Data and predictions, Relations and functions. Specifically, the research examined the scores of the students' skills in the tests of Italian (WLE ITA) and Mathematics (WLE MAT), respectively obtained through the estimate made according to the model of Rasch (1980), which allows to put on the same continuum the difficulty of the items and the ability to be measured. These scores, expressed on a scale with mean 200 and standard deviation 40, were used as dependent variables in the tested models. The following factors were considered as independent variables:

– Student-level socio-economic and cultural status (ESCS-s), constructed by INVALSI based on parental employment status, parental education level, and availability of home resources. The index is standardized (M = 0; SD = 1) (Campodifiori *et al.*, 2010);
– Gender (coded as 1 = male, 2 = female);
– Migration background (coded as 1 = native Italian, 2 = first generation immigrant, 3 = second generation immigrant).

To ensure the generalizability of the results, the data used were preliminarily weighted with the final weight of the student (or sample weight), which indicates how many pupils not involved in the sample survey are represented by the pupil participating in the surveys (Falorsi, Falzetti, and Ricci, 2019).

4.3. Models of analysis

To investigate the intersectional nature of educational inequalities, hierarchical linear regression analyses were conducted using SPSS and the EN-

TER method. All analyses were performed on weighted data using the final student weight provided by INVALSI. In a first step, a baseline model was estimated including only student-level socio-economic and cultural status (ESCS-s). In a second step, gender and migration background (native, first generation immigrant, second generation immigrant) were added to assess their additive contribution to academic outcomes. To explicitly test the intersectional framework guiding this study, a third model introduced interaction terms between:

– Gender and migration background;
– ESCS-s and migration background;
– ESCS-s and gender.

Continuous predictors were mean-centered prior to the creation of interaction terms to reduce multicollinearity and facilitate interpretation. Variance Inflation Factors (VIF) were examined to assess potential multicollinearity issues, and all values were within acceptable thresholds. The use of the final student weight provided by INVALSI ensures that estimates are representative of the underlying student population. Given the complexity of interaction models, particular attention was paid to statistical power; although analyses were conducted on the official sample dataset (N ≈ 3,888), Weighting procedures allow the estimates to approximate population parameters while maintaining the higher data quality of the monitored sample in Italy (Grade 8 students). Dummy coding was applied to categorical variables, with native male students serving as the reference group. This modeling strategy allowed us to examine whether the effect of socio-economic status varies depending on gender and migration background, and whether the disadvantage associated with migration differs between boys and girls. By testing interaction effects, we moved beyond an additive approach and directly assessed whether inequalities operate in an intersectional manner across social dimensions. Separate models were estimated for Italian and Mathematics achievement (WLE scores).

Tab. 1 – Summary of tested models

Models	*Predictor variables*
Model 1	Student ESCS (ESCS-s)
Model 2	ESCS-s + Gender
Model 3	ESCS-s + Gender + Immigrant status
Model 4	ESCS-s + Gender + Immigrant status + Interaction terms (Gender × Migration; ESCS × Migration; ESCS × Gender)

5. Results

Tables 2 and 3 report the results of the hierarchical regression models for Italian and Mathematics achievement, respectively. In addition to additive models, interaction terms were introduced to explicitly test whether the effects of socio-economic status, gender, and migration background operate in an intersectional manner.

5.1. Italian achievement

For Italian achievement (Tab. 2), the baseline model including only student-level ESCS explained 10.7% of the variance. ESCS was positively associated with performance, indicating that higher socio-economic status corresponded to higher achievement levels. When gender and migration background were added, the explained variance increased substantially. Female students outperformed males, while both first and second generation immigrant students scored significantly lower than native peers. The inclusion of migration background increased the explained variance to 16.6%, confirming its strong association with Italian achievement. To assess intersectional dynamics, interaction terms were introduced. The results indicate that the disadvantage associated with first generation status varies by gender. Although first generation students show a substantial performance gap compared to native students, this gap is significantly larger for boys than for girls. In other words, the migration-related disadvantage is attenuated among female students. Moreover, the effect of ESCS differs across social groups.

The positive association between ESCS and Italian achievement is stronger for female students compared to males. However, the ESCS effect is weaker among both first and second generation immigrant students relative to native students. This suggests that socio-economic resources do not translate into academic returns in the same way across migration backgrounds, highlighting a differential stratification process. Overall, these findings suggest that inequalities in Italian achievement are not merely additive but vary depending on the intersection between gender, socio-economic status, and migration background. Although the increase in explained variance is modest, the significant interaction terms indicate substantively meaningful differential patterns across groups.

Tab. 2 – Regression analysis Italian WLE scores

	Model 1 ESCS-s	*Model 2 + Gender*	*Model 3 + Immigrant*	*Model 4 + Interactions*
Constant	198.70***	188.76***	191.68***	197.96***
ESCS-s	12.06***	12.09***	9.92***	9.47***
Female		6.63***	6.86***	6.66***
First gen. immigrant			-38.62***	-43.01***
Second gen. immigrant			-16.19***	-17.50***
Female × First gen.				6.53***
Female × Second gen.				1.67***
ESCS × First gen.				-2.77***
ESCS × Second gen.				-1.81***
ESCS × Female				2.09***
R-squared	0.107	0.115	0.166	0.166

*** Significance at level 0.01.

5.2. Mathematics achievement

For Mathematics (Tab. 3), ESCS alone explained 7.6% of the variance in achievement. As in Italian, higher ESCS was associated with higher scores. Adding gender revealed a reversed pattern compared to Italian: female students scored significantly lower than males. The inclusion of migration background further increased the explained variance to 8.9%, with first generation students showing the largest performance gap, followed by second generation students.

The interaction model reveals a distinct intersectional configuration compared to Italian. The migration disadvantage is again moderated by gender: the negative effect of first generation status is substantially stronger among boys than girls. Thus, male first generation students appear to represent the most disadvantaged group in Mathematics. In contrast to Italian, the effect of ESCS in Mathematics is amplified among first generation students, suggesting that socio-economic resources play a particularly important compensatory role for this group in the mathematical domain. Additionally, the ESCS effect is stronger for female students, indicating that socio-economic advantages are associated with greater gains among girls. Taken together, the Mathematics results confirm that the relationship between social background and academic achievement differs across intersecting identities and varies by subject domain.

Tab. 3 – Regression analysis Matemathics WLE scores

	Model 1 ESCS-s	*Model 2 + Gender*	*Model 3 + Immigrant*	*Model 4 + Interactions*
Constant	195.99***	203.91***	204.95***	200.34***
ESCS-s	11.35***	11.32***	10.59***	9.37***
Female		-5.28***	-5.28***	-6.78***
First gen. immigrant			-21.20***	-29.85***
Second gen. immigrant			-2.73***	-6.50***
Female × First gen.				23.41***
Female × Second gen.				6.31***
ESCS × First gen.				4.46***
ESCS × Second gen.				-0.94***
ESCS × Female				2.55***
R-squared	0.076	0.080	0.089	0.095

*** Significance at level 0.01.

5.3. Summary of intersectional patterns

Across both subjects, migration background remains a central axis of inequality. However, its impact is not uniform. The magnitude of the migration-related disadvantage depends on gender, and the strength of the socio-economic gradient differs across both gender and migration groups.

These findings provide empirical support for an intersectional interpretation of educational inequalities. Rather than operating independently, gender, socio-economic status, and migration background interact in shaping academic outcomes. Furthermore, the configuration of these interactions varies between Italian and Mathematics, suggesting that intersectional dynamics are subject-specific.

6. Conclusions

6.1. Returning to the research aims

The present study was guided by two main objectives. First, we aimed to examine the extent to which student-level socio-economic and cultural status (ESCS) predicts academic achievement in Italian and Mathematics among Grade 8 students in the 2022/2023 school year. Second, we sought to investi-

gate whether the effects of ESCS vary conditionally by gender and migration background, thereby testing whether educational inequalities operate in an additive or intersectional manner. From a methodological standpoint, this required moving beyond descriptive comparisons and estimating interaction terms to assess whether structural dimensions of inequality combine differently across social groups.

6.2. Summary of main findings

The results confirm that ESCS remains a central axis of educational stratification. In both Italian and Mathematics, higher ESCS is consistently associated with higher achievement, with a stronger explanatory power in Italian.

Gender differences follow the well-documented disciplinary pattern: girls outperform boys in Italian, while boys show higher average scores in Mathematics.

Migration background constitutes another significant dimension of inequality. First generation immigrant students display the largest performance gaps relative to native peers in both subjects, while second generation students show partial convergence, although disparities persist. Importantly, the inclusion of interaction terms reveals that these inequalities are not purely additive. The disadvantage associated with migration background varies by gender, with first generation boys emerging as particularly vulnerable in Mathematics. Moreover, the association between ESCS and achievement differs across migration and gender groups, indicating that socio-economic resources do not translate into academic returns uniformly across social positions. Although the incremental contribution of interaction terms to overall explained variance is modest, their statistical significance and consistent patterning across models provide evidence of conditional stratification processes.

6.3. Interpretation within an intersectional framework

These findings support a quantitative interpretation of intersectionality as conditional inequality. Rather than operating independently, socio-economic status, gender, and migration background combine in ways that produce differentiated configurations of advantage and disadvantage.

The results suggest that intersectional dynamics are subject-specific. In Italian, socio-economic background plays a particularly strong role, while

in Mathematics gender and migration interactions appear more pronounced. This disciplinary differentiation indicates that structural inequalities are mediated by the cultural and institutional characteristics of subject domains.

The evidence does not point to entirely new mechanisms, but rather refines existing knowledge by demonstrating how established axes of inequality interact in differentiated ways within the contemporary Italian educational context.

6.4. Policy and educational implications

From a policy perspective, the results underscore the importance of moving beyond single-axis interventions. Targeted support strategies should consider how socio-economic disadvantage intersects with gender and migration status. For example: first generation immigrant boys may require particular support in Mathematics; socio-economic resources appear to have differential returns across groups, suggesting that equal provision does not necessarily produce equal outcomes; school-level interventions aimed at strengthening inclusive climates and academic support structures may mitigate compounded disadvantages.

An intersectionally informed policy framework may therefore enhance the precision and effectiveness of educational equity strategies.

6.5. Limitations and future research

Several limitations must be acknowledged. The analyses rely on cross-sectional data, precluding causal inference. Moreover, although interaction effects were statistically significant, their contribution to explained variance remains relatively modest, which is consistent with findings in social stratification research. The use of the monitored sample ensures high data quality but entails limitations in statistical power for detecting small interaction effects. Future research based on full population data and multilevel modeling strategies could further explore school-level moderation and contextual effects. Longitudinal data would also be valuable for assessing the stability of intersectional patterns over time.

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4. Challenges and opportunities for an inclusive school: the potential of Evidence-Based Education (EBE)

by Giusy Antonia Toto

The advent of the fourth technological revolution introduces critical opportunities and challenges for inclusive education. This study explores how the integration of Evidence-Based Education (EBE) into pedagogical practices can enhance inclusion, with a focus on the training of support teachers at the University of Foggia. An exploratory investigation, involving 638 teachers enrolled in a TFA specialization course, analyzed cognitive, affective, and behavioral dimensions influencing attitudes and beliefs about inclusive education. Using a validated self-report questionnaire (SACI), findings reveal strong cognitive support for inclusion (M = 4.49), alongside notable challenges in implementing inclusion strategies in practice (M = 3.45) and fostering effective collaboration among colleagues (M = 3.57). Despite these barriers, teachers demonstrate high empathy and confidence in engaging students with special educational needs (SEN), with particular strengths in promoting active participation and valuing diversity (M = 4.45). The research emphasizes the importance of adopting evidence-based practices to address gaps in teacher preparation, improve professional collaboration, and enhance inclusive strategies. Developing a culture of continuous learning and teamwork in schools is vital to translating inclusion from a theoretical ideal into a tangible, meaningful reality for all learners.

L'avvento della quarta rivoluzione tecnologica introduce opportunità e sfide cruciali per l'educazione inclusiva. Questo studio esplora come l'integrazione dell'Educazione basata sull'evidenza (EBE) nelle pratiche pedagogiche possa migliorare l'inclusione, con un focus sulla formazione degli insegnanti di sostegno presso l'Università di Foggia. Un'indagine esplorativa, che ha coinvolto 638 insegnanti iscritti a un corso di specializzazione TFA, ha analizzato le dimensioni cognitive, affettive e comportamentali che

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influenzano atteggiamenti e credenze sull'educazione inclusiva. Utilizzando un questionario autovalutativo validato (SACI), i risultati rivelano un forte supporto cognitivo per l'inclusione (M = 4,49), accanto a sfide significative nella messa in pratica delle strategie inclusive (M = 3,45) e nella promozione di una collaborazione efficace tra colleghi (M = 3,57). Nonostante queste difficoltà, gli insegnanti dimostrano un'elevata empatia e fiducia nell'interagire con studenti con bisogni educativi speciali (BES), con particolari punti di forza nella promozione della partecipazione attiva e nella valorizzazione della diversità (M = 4,45). La ricerca sottolinea l'importanza di adottare pratiche basate sull'evidenza per colmare le lacune nella preparazione degli insegnanti, migliorare la collaborazione professionale e potenziare le strategie inclusive. Sviluppare una cultura di apprendimento continuo e lavoro di squadra nelle scuole è fondamentale per tradurre l'inclusione da un ideale teorico a una realtà tangibile e significativa per tutti gli studenti.

1. Introduction

In the age of the fourth technological revolution, education systems are at a pivotal crossroads. The rapid digitalization of society and the integration of advanced cybernetic systems demand not only innovative teaching methods but also a steadfast commitment to creating inclusive environments that cater to the diverse needs of all learners. Inclusion, as defined by the United Nations Educational, Scientific, and Cultural Organization (UNESCO, 1994), represents a transformative process aimed at addressing and responding to the varied needs of students by increasing participation in learning and reducing exclusion within and from education. At its core, inclusion involves recognizing and valuing individual differences while actively combating biases and barriers that hinder equitable access to education.

The work of Ianes, Demo, and Zambotti (2022) underscores the importance of dialogical education, where the actual experiences of learners gain importance in shaping their educational journey. This approach aligns with the principles of inclusive education, emphasizing the need for continuous reflection and adaptation to support the self-determination and empowerment of students. However, ensuring genuine inclusion in increasingly complex classroom environments requires a structured and evidence-driven approach. Herein lies the critical role of Evidence-Based Education (EBE), which integrates empirical research findings with professional judgment to inform pedagogical practices (Slavin, 2002). By aligning teaching strategies with the specific needs of learners, EBE provides educators with the tools to

navigate diverse classrooms effectively and foster meaningful engagement for all students, including those with special educational needs (SENs).

This study focuses on the implementation of EBE to enhance inclusive teaching practices, particularly in the training of support teachers at the University of Foggia. The exploratory research investigates cognitive, affective, and behavioral dimensions that shape teachers' attitudes and beliefs about inclusive practices, using the SACI (Scale for Assessing Teachers' Attitudes and Beliefs toward Inclusive Processes) questionnaire, developed by Castellana *et al.* (2023). This tool draws on the tripartite model of attitudes proposed by Bandura (1997), which examines cognitive (beliefs), affective (emotions), and behavioral (actions) components. Additionally, the study aligns with the Profile of Inclusive Teachers framework developed by the European Agency for Development in Special Needs Education (2012), emphasizing the essential competencies required for fostering inclusive learning environments.

Through the analysis of responses from 638 teachers enrolled in a TFA specialization course, this research aims to: a) identify gaps in teacher preparation; b) highlight challenges in translating theory into practice; and c) propose strategies for fostering a collaborative, evidence-based culture within educational institutions. By addressing these areas, the present study seeks to contribute to the broader goal of making inclusion not only an ideal but the actual reality of school communities.

The integration of inclusive education practices supported by evidence-based frameworks has become a milestone of contemporary educational reforms. Research highlights the importance of training teachers on the necessary skills and attitudes to foster inclusive environments, especially in diverse and underserved contexts (Menzin, Bar Nir and Kimhi, 2024; Ní Bhroin and King, 2019). Evidence-Based Education (EBE) serves as a critical tool to bridge the gap between theory and practice, enabling teachers to address complex needs and different learning styles (Calvani and Menichetti, 2013; Nebraska Department of Education, 2024).

Despite advancements, challenges persist, including misconceptions about inclusion and the need for better collaboration among educators (Marchisio *et al.*, 2024; Vergani and Kielblock, 2021). The role of support teachers is particularly pivotal in ensuring the success of inclusive strategies, as they bring specialized skills and empathy necessary for working with students with disabilities and special needs (Ferrara, 2021; Wilcox, Fernandez Conde and Kowbel, 2021). Additionally, ongoing professional development and institutional support are crucial for translating inclusive ideals into sustainable practices (Ianes, Demo and Zambotti, 2022).

By exploring these dimensions, this study aims to provide insights into improving the practical application of inclusive education through evidence-based approaches.

2. Methods and materials

This study was designed to explore the attitudes and beliefs of support teachers in training regarding inclusive education practices. It employed a quantitative, exploratory approach to assess cognitive, affective, and behavioral dimensions that influence teachers' perspectives on inclusion. The following describes the participants, instruments, and data collection and analysis methods used in this cross-sectional study.

3. Participants

The study included a sample of 638 teachers enrolled in the so-called TFA Sostegno, which is a training and professional development specialization program for SENs Teachers at the University of Foggia. The sample mostly consisted of female participants (87%), most of whom worked in secondary education and had prior teaching experience.

4. Instrument

Data collection was carried out using a structured self-report questionnaire, administered through Google Forms. The questionnaire included two main sections:

– Socio-demographic information: this section collected data on participants' gender, teaching level, years of experience, and other relevant background information;
– SACI Scale: The *Scale for Assessing Teachers' Attitudes and Beliefs toward Inclusive Processes* (SACI), developed by Castellana *et al.* (2023), was employed to evaluate participants' attitudes toward inclusive education. The SACI scale is grounded in Rosenberg and Hovland's (1960) tripartite model of attitudes and includes 47 items categorized into four subscales: Cognitive positive beliefs: 10 items assessing teachers' perceptions of inclusion principles (e.g., equity and diversity); Cognitive misconceptions: 10 items identifying misconceptions or neutral positions

on complex inclusion topics; Affective dimension: 12 items exploring emotional responses and potential frustrations related to inclusive practices; Behavioral dimension: 15 items measuring teachers' self-reported inclusive behaviors in classroom contexts.

Participants rated their agreement with each item on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

5. Data collection and procedure

The questionnaire was distributed online via Google Forms to ensure accessibility to all participants. Data were collected over a specific time frame, ensuring participants had adequate time to respond. All responses were anonymous, and informed consent was obtained prior to participation.

6. Data analysis

The data collected were analyzed using Microsoft Excel. Descriptive statistics, including mean (M) and standard deviation (SD), were computed for each subscale of the SACI. Key areas of interest included:

- Cognitive positive beliefs (M = 4.49; SD = 0.11): reflecting consensus on inclusion principles;
- Cognitive misconceptions (M = 2.79; SD = 0.40): highlighting areas of neutrality or misunderstanding.
- Affective dimension (M = 2.96; SD = 0.42): indicating emotional responses, including frustration linked to collaboration challenges (M = 3.57; SD = 1.01).
- Behavioral dimension (M = 4.45; SD = 0.08): evaluating actions that promote inclusivity, particularly fostering participation among students with special educational needs (M = 4.34; SD = 0.75).

The analysis focused on identifying patterns in beliefs and behaviors, pinpointing areas where teachers faced challenges in applying inclusive principles, and evaluating the overall alignment between theoretical knowledge and practical application.

7. Results

The analysis of data collected from the 638 respondents provided valuable insights into the cognitive, affective, and behavioral dimensions of teachers' attitudes and beliefs toward inclusive education. These findings revealed strengths and challenges in how inclusive practices are understood and implemented.

The results showed differences across the four dimensions considered in the study. Among the cognitive components, Positive beliefs obtained a mean score of 36.45 (SD = 0.11), indicating a generally favorable orientation toward inclusive education and the principles of equity and diversity. By contrast, Misconceptions recorded a slightly lower mean score of 33.88 (SD = 0.40), suggesting the persistence of some uncertainty or problematic assumptions, particularly in relation to the management of heterogeneous classrooms and the development of personalized learning pathways. The Affective dimension showed a mean score of 37.45 (SD = 0.42), reflecting a moderately positive emotional stance overall, although some item-level responses pointed to frustrations related to collaboration with colleagues and professional recognition. Finally, the Behavioral dimension obtained the highest mean score, 55.67 (SD = 0.08), highlighting teachers' strong commitment to inclusive classroom practices and to the active promotion of participation, acceptance, and respect for diversity. Overall, these findings suggest that while teachers report positive beliefs and strong behavioral engagement in relation to inclusion, some cognitive and affective challenges remain. The 15-20% of participants showed comparatively low scores across all four dimensions. A small but significant positive bivariate association was observed between Positive beliefs and the Behavioral dimension ($r = .29$, $p < .001$), indicating that more positive beliefs about inclusion were associated with greater engagement in inclusive practices.

The distribution of mean scores across the four dimensions is presented in Figure 1.

Overall, while teachers demonstrated a clear theoretical alignment with inclusive principles and actively engaged in inclusive practices, significant challenges emerged in applying these principles in complex classroom settings. In particular, issues related to managing diversity, fostering collaboration among educators, and addressing misconceptions about inclusion indicate areas where further professional development and institutional support are required. These findings suggest a need for targeted strategies to bridge the gap between theoretical support for inclusion and its practical application.

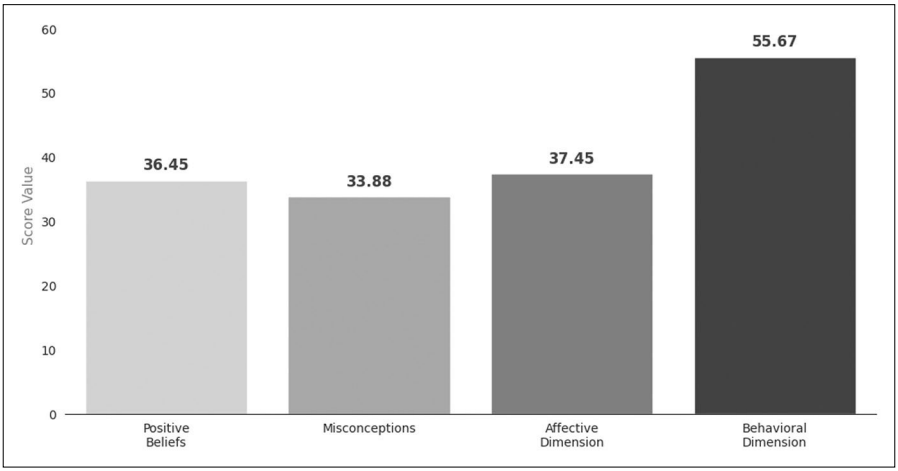

Fig. 1 – Mean score distribution across the four dimensions of the study: Positive beliefs, Misconceptions, Affective dimension, and Behavioral dimension

8. Discussion

The findings of this study provide a nuanced understanding of the attitudes and beliefs of support teachers in training toward inclusive education. Teachers demonstrated a strong theoretical commitment to the principles of inclusion, as evidenced by the high scores in the cognitive positive beliefs subscale. This aligns with existing literature highlighting the widespread acceptance of inclusivity as a fundamental value in contemporary education (UNESCO, 1994). However, the results also underscore persistent challenges in translating these principles into practice, pointing to critical areas for intervention and professional development.

One notable challenge is related to misconceptions and uncertainties regarding the management of diverse classrooms and the implementation of personalized learning strategies. This finding is consistent with research by Florian and Black-Hawkins (2011), who emphasize that inclusion requires a shift from viewing diversity as a problem to be solved toward embracing it as an asset that enriches learning. The moderate scores in the cognitive misconceptions subscale suggest that many teachers struggle with this conceptual shift, highlighting the need for targeted training programs to bridge gaps in understanding and application.

The affective dimension of inclusion revealed additional barriers, particularly related to emotional challenges faced by teachers. Frustrations about

inadequate collaboration with colleagues and the perceived low recognition of their professional roles were prominent. Previous studies have identified similar concerns, with Ainscow and Sandill (2010) noting that a lack of collaborative practices among educators often impedes the successful implementation of inclusive strategies. The reported frustration suggests an urgent need to foster a more collaborative culture within schools, where shared planning and teamwork are prioritized.

Despite these challenges, teachers expressed a strong sense of efficacy in their interactions with students with SENs, as reflected in the affective subscale's scores related to relationships with students. This finding resonates with Bandura's (1997) self-efficacy theory, which posits that teachers' belief in their ability to positively influence student outcomes is a critical determinant of their effectiveness. The confidence demonstrated by participants in building relationships and providing individualized support indicates that these teachers possess foundational skills for fostering inclusivity, even as systemic barriers persist.

Behaviorally, teachers exhibited a high level of commitment to promoting inclusion in their classrooms, with strong scores for encouraging SEN students' participation and fostering an environment of respect for diversity. These findings align with the European Agency for Special Needs and Inclusive Education's *Profile of Inclusive Teachers* (2012), which highlights the importance of creating equitable and accessible learning environments. However, the gap between these positive behaviors and the cognitive and emotional challenges identified suggests that while teachers are willing to act inclusively, they require additional resources and institutional support to sustain these efforts effectively.

The findings of this study also highlight the importance of evidence-based education (Slavin, 2002) in addressing these challenges. By integrating empirical research with professional expertise, schools can develop practical strategies to support teachers in overcoming barriers to inclusion. This approach is especially critical in fostering collaborative practices and equipping educators with the skills needed to manage the complexities of diverse classrooms effectively.

9. Implications and future directions

To enhance the practical application of inclusive education, professional development programs must address the misconceptions identified in this study and provide teachers with concrete strategies for managing diversity.

Moreover, fostering a culture of collaboration within schools is essential to reduce the frustrations linked to inadequate teamwork. Policymakers and educational leaders must prioritize the provision of resources and structural support that enable teachers to translate their inclusive beliefs into actionable practices.

Further research is needed to explore the long-term impact of these interventions and to examine how teacher training programs can better prepare educators for the realities of inclusive classrooms. Expanding the sample to include teachers from different educational levels and contexts, particularly early childhood and primary education, would provide a more comprehensive understanding of the challenges and opportunities in inclusive education.

10. Conclusions

This study underscores the complexity of fostering inclusion in education, revealing both strengths and challenges in teachers' attitudes and practices. Teachers demonstrate a strong theoretical commitment to inclusive principles, aligning with findings that highlight the growing acceptance of inclusion as a core value in education (Bhroin and King, 2019). Furthermore, teachers express confidence in their ability to build relationships with students with SENs, reflecting Bandura's (1997) theory of self-efficacy, which emphasizes the importance of educators' confidence in their ability to positively influence student outcomes.

Despite these strengths, significant barriers remain. Misconceptions about inclusion, particularly in the context of managing heterogeneous classrooms and designing personalized learning pathways, persist as critical challenges. Such gaps align with Florian and Black-Hawkins' (2011) assertion that inclusive education requires a paradigm shift, where diversity is viewed as an asset rather than a problem to be solved. Addressing these misconceptions through targeted professional development can help teachers better understand and implement inclusive practices (Calvani and Menichetti, 2013).

Emotional challenges also play a pivotal role in shaping teachers' experiences. The frustration caused by inadequate collaboration with colleagues and the lack of professional recognition for support teachers, as noted in this study, echoes findings by Ainscow and Sandill (2010). A more collaborative culture within schools, supported by evidence-based frameworks, is crucial to reducing these barriers and enhancing the effectiveness of inclusion strategies (Menzin, Bar Nir and Kimhi, 2024; Vergani and Kielblock, 2021).

Behavioral efforts to promote inclusion, such as fostering student participation and valuing diversity, indicate a strong willingness among teachers

to translate inclusive principles into practice. However, these efforts must be supported by systemic interventions, including structured training programs and institutional resources (Ianes, Demo and Zambotti, 2022; Nebraska Department of Education, 2024). Evidence-Based Education (EBE) offers a valuable tool for bridging the gap between theory and practice, empowering teachers with research-driven strategies to address the diverse needs of students effectively (Slavin, 2002).

Looking forward, advancing inclusive education as a practical and sustainable reality requires a multifaceted approach. Policymakers must prioritize the development of robust support systems, including mentoring programs and opportunities for professional collaboration, to foster a culture of continuous learning and teamwork. Further research should explore how evidence-based interventions influence long-term teacher efficacy and student outcomes across diverse educational settings. Additionally, expanding studies to include early childhood and primary educators could provide a more comprehensive understanding of inclusion across the educational spectrum.

In conclusion, while teachers possess foundational strengths in promoting inclusivity, addressing the cognitive, emotional, and collaborative challenges identified in this study is imperative. Through evidence-based strategies and systemic support, schools can cultivate inclusive environments that not only accommodate diversity but celebrate it as an integral part of the educational experience.

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5. Observing and enhancing talent: the first results from the SOPI tool

by Sara Mori, Jessica Niewint, Michela Zambelli, Alessia Rosa*

This study explores the importance of personalizing education to support talent development while ensuring inclusion. The research focuses on SOPI, an observational tool designed to help teachers identify students' potential based on Gardner's multiple intelligences. Through a study involving 69 teachers, the results highlight the need for structured, research-based tools in education. While a large part of teachers previously created their own observation methods, SOPI was well received for its usability and differentiation between ability and engagement. The findings indicate that systematic observation help to enhance personalized learning strategies, contributing to equity in education. Future research will refine SOPI's psychometric properties and explore its impact on reducing school dropout rates. The study underscores the need for accessible, scientifically validated tools to aid teachers in fostering students' strengths, ensuring a balanced approach between merit and inclusion.

Questo studio esplora l'importanza di personalizzare l'istruzione per sostenere lo sviluppo dei talenti, garantendo al contempo l'inclusione. La ricerca si concentra sul SOPI, uno strumento di osservazione progettato per aiutare gli insegnanti a identificare il potenziale degli studenti sulla base delle intelligenze multiple di Gardner. Attraverso uno studio che ha coinvolto 69 insegnanti, i risultati evidenziano la necessità di strumenti strutturati e basati sulla ricerca nel campo dell'istruzione. Mentre in precedenza gran parte degli insegnanti creava i propri metodi di osservazione, SOPI è stato ben accolto per la sua usabilità e la differenziazione tra abilità e impegno. I

* The chapter was jointly designed by all the authors. More specifically, the introduction and Sections 4 and 8 are to be attributed to Sara Mori; Sections 2, 5.2 and 5.3 to Alessia Rosa; Sections 3, 5.1 and 7 to Jessica Niewint; and Sections 5.4 and 6 to Michela Zambelli.

risultati indicano che l'osservazione sistematica aiuta a migliorare le strategie di apprendimento personalizzate, contribuendo all'equità nell'istruzione. La ricerca futura perfezionerà le proprietà psicometriche di SOPI ed esplorerà il suo impatto sulla riduzione dei tassi di abbandono scolastico. Lo studio sottolinea la necessità di strumenti accessibili e scientificamente validati per aiutare gli insegnanti a promuovere i punti di forza degli studenti, garantendo un approccio equilibrato tra merito e inclusione.

1. Introduction

Creating an education system that successfully balances merit and inclusion, that promotes excellence while ensuring that no student is left behind, and that, at the same time, nurtures talent and supports those in need, is a key challenge for contemporary education. The National Recovery and Resilience Plan (PNRR) has placed significant emphasis on addressing these issues, recognising the need for systemic reforms that promote equality of opportunity while enhancing individual potential. The Guidelines for School Guidance emphasise the importance of guiding students towards conscious and considered educational choices that maximise their talents and potential. This approach seeks to create greater continuity between lower and upper secondary education and vocational training and to contribute to the reduction of school drop-out rates. Improving the development of everyone's potential also implies being able to observe and recognise potential: «the equity of an education system cannot be considered only in terms of equal opportunities, but it is also necessary to monitor whether learning opportunities are good and effective for everyone» (INVALSI, 2023, p. 108).

Consistently with these objectives, the research project "Neuroeducation and Technologies for the Personalization of Teaching Pathways and the Development of Students' Potential" proposes the development of a free tool available to teachers and students for identifying students' potential and aptitudes and the co-design and experimentation of personalized teaching pathways, facilitated also by technological and AI-based tools.

This contribution aims to present the expectations of the teachers participating in the project regarding the need for a tool to support them in observing students' potential; the initial results of the experimentation; and the first impressions of teachers concerning the quality and usefulness of the tool.

The hypothesis is that the possibility of equipping teachers with more structured instruments to observe students' abilities, interests, and motivations can significantly contribute to the personalization of teaching ap-

proaches and educational objectives (Mori *et al.*, 2021). Such customization is essential for mitigating school dropout rates and fostering greater equity within the education system (Benadusi and Giancola, 2021). Being able to provide teachers with tools that meet their needs and that they are satisfied with can contribute to this broader goal.

2. Observation practices in educational processes

Every day we look with more or less attention at the world around us. Generally, younger children are excellent observers, as imitation represents an important source of information for them. It is fascinating to see how a preschool-aged child looks at the reality around them and tries to imitate it, through slow periods of trial and error.

In this regard, it is interesting what Malaguzzi stated about the importance of observing processes and not just the products or final performances (Gariboldi and Pugnaghi, 2020). In this regard, Malaguzzi (1994) states: «What the child does not desire is an observation made by an adult who is not really there, who is distracted. The child wants to know that they are being observed, scrupulously, with full attention. The child wants to be observed in action. They want the teacher to see the process of their work, before the product. The teacher asks the child to carry a bucket full of water from one place to another. For the child, it is not important that the teacher only sees them arrive at the end with the bucket of water. What is important to them is that the teacher sees them while they are struggling to carry out that task: the processes are important, how much effort the child is making, and how much merit there is in completing the task. What children desire is to be observed while they are busy; they do not want the focus of observation to be the final product. When we adults are able to see children while they are doing something, it is as if we open a window and gain a new perspective on things» (p. 55).

The literature review indicates that observation can be divided into two categories: routine/natural observations and systematic/scientific observations (Çetin, 2024). Most of the observations we make in our daily lives fall under the category of routine observations. These are typically performed unconsciously and without a structured approach to help us understand events in our environment (Merriam, 2009), and their objectives are often unclear. On the other hand, systematic/scientific observation is characterized by a methodological approach. These classifications, along with the application of observation across various fields, lead to different interpretations

of what observation means. Observation, as defined by Lederman (2007), involves understanding the world through our senses or their extensions. It is a comprehensive process that entails receiving and processing information from the environment, utilizing not just our eyesight but all of our sensory organs. This method is employed to provide a detailed description of behaviors occurring in various settings or institutions (Bailey, 1994). Observation is characterized as the act of collecting data for research by concentrating on specific subjects, elements or aspects directly or with the aid of tools. In the context of education and training, observation refers to the intentional and systematic assessment of resources and events in their natural settings. More specifically, in the educational context, observation serves teachers to get to know their students individually and to verify the effectiveness of their educational practices, both in relation to cognitive content and the well-being climate of the group (Baumgartner, 2004). In this regard, Braga and Tosi describe observation as a form of assessment «aimed at the exploration/understanding of a specific phenomenon that consists of the most faithful and complete description of the characteristics of a particular event, behavior, or situation and the conditions in which it occurs» (Braga, Tosi, in Mantovani, 1995, p. 84). Observation in the educational field does not invoke a strategy aimed at reducing the complexity that characterizes educational situations and the subjects (children and teachers involved), but rather a mode that allows recognizing everyone's peculiarities, abilities, and specificities (Rosa, 2024). In addiction, observation is an important tool that educators have to bring intentionality and rationality to teachers'choices and actions; it is a professional instrument to give a more rigorous shape to their work, in its connection with thought, theory, and theories. The definition of the term reflects the importance of this action in educational dynamics, as the concept of nurturing strongly evokes the image of «care […] a practice made of gestures and words, accompanied by precise thoughts and desires, that a person puts into action to cultivate their own life and that of others» (Mortari, 2015, p. 26). Thus, observation, care, and education appear as pieces of the same puzzle. In the definition of the term observation proposed in this paragraph, the necessity of identifying appropriate tools and techniques for observation is clear, as teachers «must be enabled to use scientifically correct procedures that are fully adequate each time, both to understand the situation in which they are called to operate and the subjects on whom they are about to intervene, and to subsequently verify the adequacy of such interventions. In each of these two moments, the completeness of observation and interpretative caution must go hand in hand». The tools for observation are multiple and of different nature, structuring, and space of subjectivity.

Using a test that is rigorously constructed and validated to observe and define a situation that presents elements of criticality or, in any case, a need for interpretation has become synonymous with scientific rigor, which is difficult to dispute. Consequently, the outcomes of this operation lead, in cascade, to the indication of the interventions to be implemented. The talent detection tools currently available are mainly paid and often designed for use by experts and professionals outside of the school. INDIRE's work in defining observation tools intended for use by teachers thus represents a powerful support tool for teaching and learning processes.

3. Talent development and personalisation

The school aims to create inclusive environments through appropriate methods and attitudes, promoting pathways that support talent and well-being for all students. Personalizing learning based on each student's educational needs is essential to enhance individual potential (Wang *et al.*, 2011), while also paying attention to cognitive processes and learning difficulties without limiting them to rigid classifications (Zanniello, 2016, p.65). The concept of potential, talent or giftedness is described through terms such as creativity, intelligence, and divergent thinking, but lacks a uniform definition, resulting in a wide variety of models and theories (McBee and Makel, 2019). Renzulli (1996) raises fundamental questions: Is talent an absolute or relative concept? Is it static or dynamic? Research has produced many different, often irreconcilable, responses (Ambrose *et al.*, 2010), with little synergy between theory and practice. To address this fragmentation, to support every student's potential education needs to be grounded in the complexity of the real world, adopting a concrete definition that includes cognitive, psychosocial, and motivational aspects (Davidson, 2021, p.43). In the ongoing debate regarding the nature of talent – whether it is an absolute or relative concept, and whether it is static or dynamic – the issue remains unresolved (Renzulli, 1998). Theoretical perspectives on talent development diverge between those who conceptualize talent as an inherent trait and those who view it as a dynamic construct shaped by contextual factors and opportunities. Subotnik, Olszewski-Kubilius, and Worrell (2021) propose a model of talent development that accounts for the role of context, opportunity, and mentorship. Their framework describes talent development as a progression from high potential to competence, then to expertise, and ultimately to eminence, highlighting the importance of domain-specific skills and sustained commitment. Dai's (2021) *Evolving Complexity Theory of Talent Development* (ECT) further supports a

dynamic view, framing talent as an adaptive response to environmental challenges and as part of an individualized developmental trajectory as Gagné's (2011) *Differentiated Model of Giftedness and Talent* (DMGT) emphasizes the role of environmental influences in transforming innate abilities into talents through structured learning and practice. In the end Gardner's (1999) theory of multiple intelligences extends the traditional notion of intelligence beyond IQ-based metrics, identifying nine distinct forms of intelligence. This perspective reinforces the importance of recognizing and fostering diverse capacities and potential, advocating for educational approaches that accommodate individual strengths and learning preferences.

Despite theoretical differences, experts (Sternberg and Ambrose, 2021, pp. 513-518) agree on key points: potential or giftedness is more than just IQ and good school grades, it is specific to certain domains, involves more than academic abilities, and requires motivation and passion. Borland (2021) critiques the traditional idea of giftedness as a fixed trait and suggests shifting the focus to educational interventions that address the potential of all students through differentiation and personalized teaching approaches. Gagné (2021, p. 15) also proposes replacing the term "gifted education" with "academic talent development" to better reflect current educational goals and garantee the success of all students.

From this perspective, inclusion in education necessitates a focus on individual learning needs and the personalization of educational processes. The focus should therefore be on understanding students and personalizing the curriculum to meet their needs (Sala and Zampieri, 2019). To move beyond the traditional paradigm of giftedness or talent, it is important to focusing instead on designing effective teaching interventions that respond to specific educational needs (d'Alonzo, 2019, p. 19; Borland, 2021). A pedagogical approach that integrates systematic observation and tailored instruction can contribute to optimizing students' potential and fostering an equitable learning environment that accommodates diverse abilities and talents.

Recognizing the classroom as a collection of talents means being able to observe each student's potential without the need for classifications. Students' potential can be developed through educational interventions (Sternberg and Ambrose, 2021) that engage motivation (Dweck, 2006), self-regulation (Duckworth, 2016), and metacognition (Novello, 2021). Equally important are teachers' expectations and the classroom climate. Talent development is, therefore, a complex and multifaceted process influenced by multiple genetic and environmental factors (Subotnik *et al.*, 2021; Gagné, 2021).

Personalized teaching can help develop these aspects by reconsidering key elements (Fitzgerald *et al.*, 2018): using teaching and learning strategies

that actively engage students to develop skills, competencies, and confidence in each of them while leveraging the potential of technology; employing formative assessment methods, including targeted approaches to identify each student's learning needs; ensuring that every student has the right to a broad curriculum that includes diverse disciplinary content tailored to their interests and aptitudes; adopting a student-centered approach to school organization, with school leaders and teachers thinking creatively about ways to support high-quality teaching and learning; and fostering strong collaboration with the surrounding community to enhance classroom progress and support students' well-being.

4. The project and research questions

This study presents the initial findings from the experimentation of the SOPI (Instrument for Observing Potential – INDIRE), a tool designed to observe students' potential across the domains outlined in Gardner's theory of multiple intelligences. The proposed instrument enables the observation of students' potential across nine domains: verbal-linguistic, logical-mathematical, visual-spatial, bodily-kinesthetic, musical, naturalistic, interpersonal, intrapersonal, and existential. The primary aim of SOPI is to support teachers in recognizing students' potential by examining two key dimensions: ability and engagement in activities related to specific domain of potential. The SOPI provides a detailed description for each of the nine domainis accompanied by a curated list of activities designed to facilitate the observation of students. The SOPI is intended to support teachers in nurturing students' potential from early childhood through adolescence, through three different versions: childhood – early years of primary school; 8-13 years; from 14 years onwards.

The present contribution presents the results of a preliminar experimentation of the SOPI measure in a sample of Italian teachers. Specifically, results will be presented regarding: a) the teachers' expectations on the SOPI measure; b) item analysis of the SOPI's items; c) teachers' evaluation of the quality of the SOPI measure in terms of usability and applicability. The study hypothesizes that providing teachers with specifically designed tools to support the observation of students' potential can enhance their ability to develop a comprehensive and holistic understanding of each learner. This, in turn, can foster more inclusive educational practices and facilitate the development of students' individual strengths.

5. Methodology

5.1. Participants

A total of 69 teachers participated in the study. Regarding the school level of work, 14 teachers worked in pre-school, 23 of them in primary school, 14 in lower secondary school, and 16 in upper secondary school. Finally, 2 teachers worked in differently classified contexts (e.g., PCAE, Provincial Centres for Adult Education). The teachers, including both curricular and support roles (N = 16) came from 24 institutions from the whole national Italian territory, with most of respondents come from Puglia (N= 11) Lombardy (N = 8) and Tuscany (N = 6).

The total of teachers completed an initial questionnaire to assess their interest in the study and their expectations for using the SOPI tool, while 56 teachers used the SOPI tool to observe with at least one student, resulting in 172 individual assessments, with an average of 3,1 (DS = 4,21; range = 1-19) observations conducted by each teacher. Subsequently, 49 teachers provided feedback via a final questionnaire on the tool's effectiveness, usability, and ease of use. Teachers who complete the final questionnaire received a graphical representation of the scores assigned to each observed student.

5.2. Tools

This study is part of a broader research and training project (Magnoler, 2012; Asquini, 2018) aimed at advancing the personalization of educational pathways through the integration of innovative tools and methodologies. The overarching objectives of this initiative are twofold: to develop and provide teachers with a structured tool for identifying and assessing students' potential, fostering a more nuanced understanding of individual strengths and learning profiles.

To collaboratively design and evaluate personalized educational pathways, leveraging a range of pedagogical tools, with a particular emphasis on technology and artificial intelligence to enhance instructional adaptability and student engagement.

This study specifically focuses on the analysis of self-reported data collected through online surveys, including the administration of the SOPI tool.

The SOPI (INDIRE tool for observing students' potential) tool allows you to observe the potential shown by the student in nine domains, namely verbal domain, logical domain, visual domain, motor-kinesthetic domain,

musical domain, naturalistic domain, interpersonal domain, intrapersonal domain, and existential domain. The SOPI tool provides a detailed description for each of the nine defined domains, accompanied by a list of activities during which it is possible to observe the student's potential in each specific domain. The activities listed for each domain do not exhaust the variety of situations and contexts in which the student can be observed, but are examples that can help to place the definitions of the dimensions in the context of student observation. In fact, it is likely that in the daily experience of a teacher there are other situations and activities relevant to observing the student's potential. For this reason, observing teachers are invited to observe students during the activities they deem appropriate.

The SOPI tool is available in three versions in which the definition of the domain and activities are adapted to different age groups of pupils, namely 4-7 years, 8-13 years and 14 years and above.

Teachers used a paper version of the SOPI.

At the end of the classroom trial of SOPI, they were given an online questionnaire to assess its effectiveness from their point of view. This final assessment explores their overall satisfaction with SOPI, its perceived usefulness in enhancing student observation, and its effectiveness in supporting the development of more personalized teaching strategies. The questionnaire included both closed-ended and open-ended questions.

5.3. Procedures

The study follows a structured, three-phase process designed to assess the impact of the SOPI tool on personalized teaching practices.

It begins with the Baseline Assessment, where teachers complete an initial questionnaire aimed at capturing their expectations, prior experiences with personalized teaching, and familiarity with student observation instruments. This phase provides a foundational understanding of educators' perspectives before the introduction of SOPI.

In the next phase, Implementation of SOPI, teachers actively integrate the tool into their instructional practice, using it to assess students' potential. This experimental stage allows for direct engagement with SOPI, offering insights into its practical application and effectiveness in real classroom settings.

Finally, the study concludes with the Post-Implementation Evaluation, where teachers complete a follow-up questionnaire.

Through this phased approach, the study seeks to provide a comprehensive analysis of how SOPI can contribute to refining educators' ability to

recognize students' potential and tailor learning experiences to individual needs.

5.4. Data analysis

Teachers' answers to open-ended questions in the initial questionnaire has been analyzed qualitatively and synthetized to derive first insights into teachers' background in using observation tools and their expectations for using the SOPI tool (paragraph 6.1).

Descriptive statistics were conducted with the software R (version 4.4.2) to derive first evidence of the psychometric properties of the SOPI measures (paragraph 6.2). Specifically, each of the 18 items of the SOPI measure (one item assessign ability and one item assessing engagementfor each of the nine dimensions) was described in terms of mean, standard deviation, range, and skewness and kurtosis, with values lower than |1.5| indicating that the item's distribution follows a normal distribution (Muthén and Kaplan, 1985).

Teachers' answers to questions related to the SOPI's effectiveness, usability, and ease of use (paragraph 6.3) included in the final questionnaire has been described both quatitatively (i.e., frequencies), and qualitatively, by syntethizing their answers to open-ended questions.

6. Results

6.1. Teachers' expectations on the SOPI tool

With respect to previous experience that teachers had with observation tools to assess students' skills, competences or attitudes, the 58,6% (N = 41) reported to have used validated or standardised observation tools, while the 65,7% (N = 46) stated that they personally designed tools to be used in their teaching practice.

Among the expectations for the SOPI tool highlighted in the initial questionnaire by teachers, the most notable included: a) enhancing the ability for systematic observation of students' potential; b) providing support for educational and teaching initiatives through the design of personalized interventions; c) offering a flexible and user-friendly tool; and d) ensuring applicability across various contexts.

6.2. Item analysis of the SOPI measure

The ability and engagement scales on all nine domains showed a normal distribution of scores (skewness and kurtosis values < |1.2| for all scales, Muthén and Kaplan, 1985). The aggregate mean for the ability dimension is 4.72 (SD = 1.23), while the mean for the dimension of engagement is 4.81 (SD = 1.30). In all nine domains, we registered higher scores for the engagement scale than for the ability scale (Tab. 1). These results are first evidence of the potential of the SOPI tool to differentiate students based on the level of ability and engagement shown on different domains of potential.

Tab. 1 – Descriptive statistics of items of the SOPI measure

Item	*N*	*Mean*	*Sd*	*Min*	*Max*	*Skewness*	*Kurtosis*
Verbal ability	164	4.46	1.68	1.00	7.00	-0.17	-1.22
Verbal engagement	164	4.59	1.73	1.00	7.00	-0.23	-1.12
Logic ability	127	4.49	1.57	1.00	7.00	-0.21	-0.77
Logic engagement	127	4.61	1.61	1.00	7.00	-0.25	-0.87
Visual ability	131	4.82	1.43	1.00	7.00	-0.34	-0.58
Visual engagement	131	5.03	1.40	2.00	7.00	-0.53	-0.58
Kinesthetic ability	121	4.89	1.38	2.00	7.00	-0.56	-0.41
Kinesthetic engagement	121	4.93	1.52	1.00	7.00	-0.61	-0.50
Musical ability	108	4.70	1.49	1.00	7.00	-0.32	-0.50
Musical engagement	108	4.83	1.66	1.00	7.00	-0.37	-0.86
Naturalistic ability	105	5.00	1.50	2.00	7.00	-0.46	-0.64
Naturalistic engagement	105	5.12	1.47	2.00	7.00	-0.41	-0.91
Interpersonal ability	155	4.46	1.66	1.00	7.00	-0.15	-0.99
Interpersonal engagement	155	4.54	1.67	1.00	7.00	-0.31	-0.79
Intrapersonal ability	131	4.37	1.76	1.00	7.00	-0.08	-1.12
Intrapersonal engagement	131	4.42	1.78	1.00	7.00	-0.11	-1.20
Existential ability	114	4.84	1.61	1.00	7.00	-0.33	-0.77
Existential engagement	114	4.91	1.69	1.00	7.00	-0.39	-0.84
Average score ability	167	4.72	1.23	1.62	7.00	-0.29	-0.58
Average score engagement	167	4.81	1.30	1.75	7.00	-0.33	-0.64

Sd = standard deviation.

6.3. Teachers' evaluation of the SOPI tool

After completing the SOPI tool for each observed student, the teachers completed a final questionnaire to provide their evaluation of the goodness of the SOPI measure to assess student potential. 88% of teachers (N = 43) expressed overall satisfaction with the SOPI tool, by considering themselves between fairly to completely satisfied with the instrument (Fig. 1). The SOPI was considered by most teachers (94%, N = 46) as a user-friendly tool (Fig. 2), and the totality of them appreciated the clarity and completeness of the instructions given (Fig. 3). Furthermore, 92% (N = 45) of teachers recognized the SOPI as an effective tool for identifying student potential (Fig. 4), and 88% (N = 43) confirmed that the SOPI met their expectations (Fig. 5). Lastly, 92% (N = 45) of teachers expressed an interest in integrating the SOPI tool into their teaching practices.

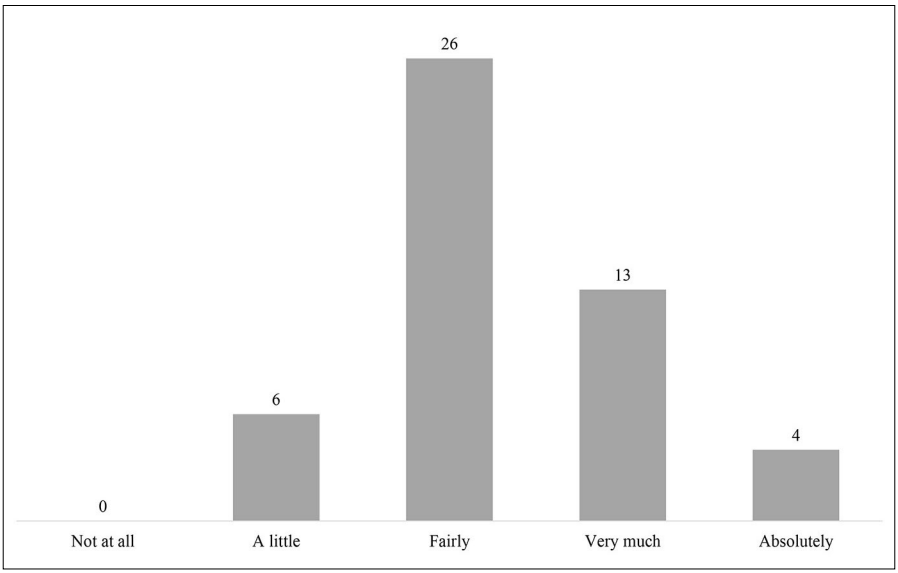

Fig. 1 – Overall satisfaction with the SOPI measure

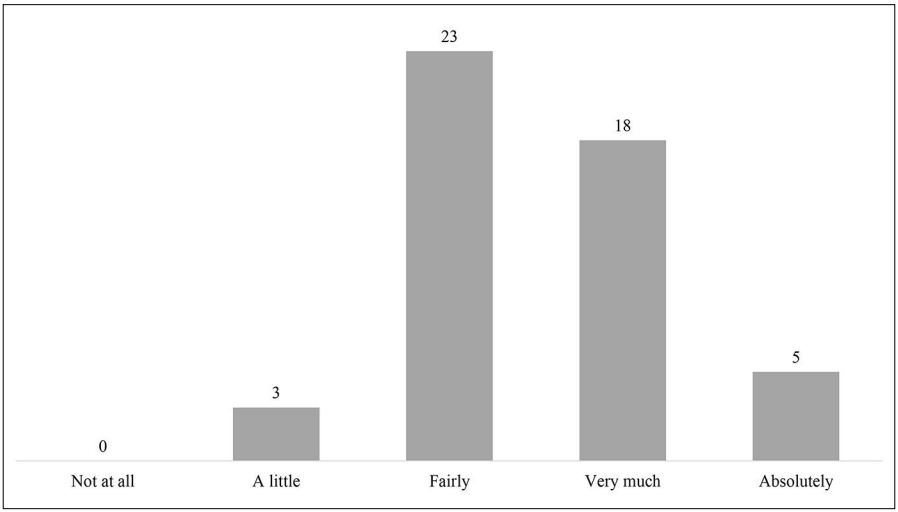

Fig. 2 – Easiness of use of the SOPI measure

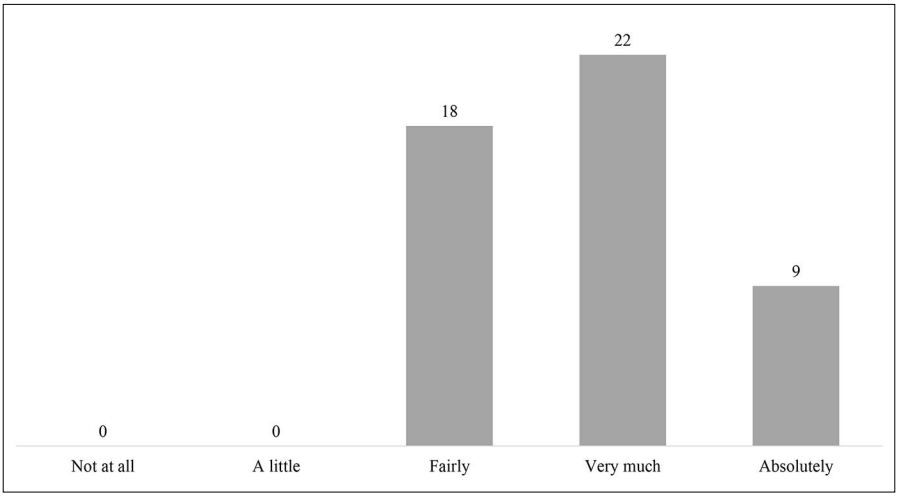

Fig. 3 – Clarity and completeness of the SOPI measure

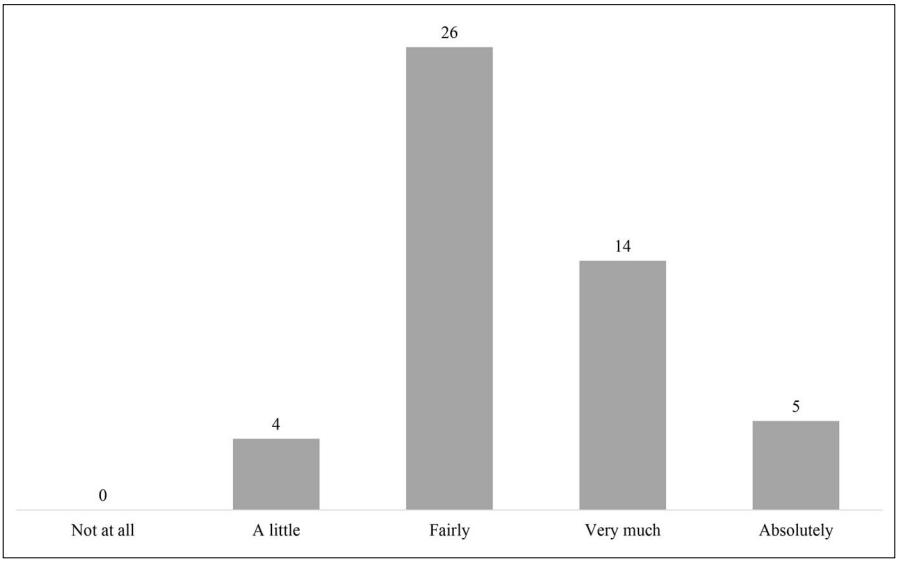

Fig. 4 – Efficacy of the SOPI measure to assess students' potential

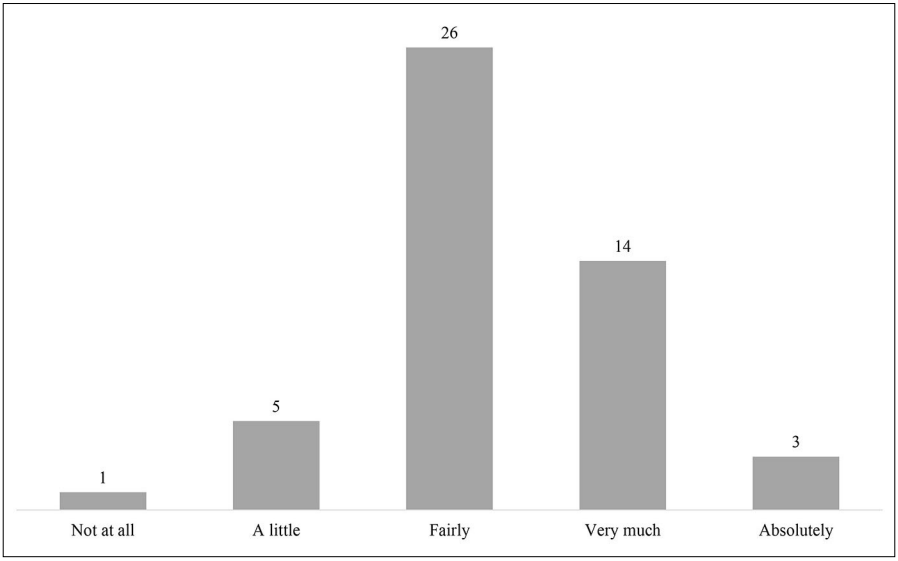

Fig. 5 – Alignment of the SOPI measure with initial expectations

Overall, the characteristics of the SOPI which were appreciated the most by the teachers were: the possibility of distinguishing between ability and engagement in the expression of students' potential; the inclusion of exam-

ples of both structured and unstructured activities to observe students' potential combined with a clear and detailed description of each domain; and the tool's adaptability and applicability to different contexts and situations. The few teachers who were not completely satisfied with the SOPI measure reported some suggestions for improvement, which included: complementing the teacher version of the SOPI with a self-report measure dedicated to the self-evaluation of students' potential, adapting the formulation of activities and domains descriptions for pre-school children, more detailed instructions about how to conduct observations before completing the SOPI tool.

7. Discussion

The collected data allows for an interesting framework of the perception of the involved teachers, both regarding their awareness of the importance of observation practices and concerning the educational implications of the acquired data. In relation to the latter aspect, it is noteworthy that there is a concrete commitment both in identifying standardized tests and in the preparation of tools designed by them (with no significant difference in these perspectives). The fact that 65% felt the need to create tools from scratch to observe students in terms of competencies and attitudes highlights the lack of adequate and customizable tools. Similarly, more than 40% have never used standardized tools (even though they exist in the literature). This further emphasizes the need to equip the teaching staff with self-report observational tools that can be personalized and flexible according to their educational needs (not just for research).

The expectations for the SOPI tool highlighted in the initial questionnaire reflect a broad awareness of the importance of observation in personalization processes. In other words, observation represents the first essential step in educational personalization processes, through the identification of students' potential, the design of specific interventions, and the possibility of using a flexible, easy-to-use tool applicable in multiple contexts.

The data collected regarding the "Item analysis of the SOPI measure" are preliminary results, so only descriptive analyses could be performed; however, it is interesting to note the variability in score distribution despite the relatively small sample size. Therefore, these results suggest a positive approach towards the development of the tool. It is still necessary to conduct a structured validation study to verify the psychometric properties of the SOPI tool, including evidence of validity (convergent, divergent, criterion) and reliability (inter-rater agreement among different teachers' observa-

tions of the same student). Regarding teachers' evaluation of the SOPI tool, a fundamental aspect for the research, an overall satisfaction was reported by the teachers.

The characteristics of the SOPI appreciated by the teachers indicate the opportunity for its use in multiple contexts. Although the trial received positive evaluations, it is fair to consider that the teachers were extensively supported and guided in using the tool. In fact, the teachers were supported by researchers through theoretical training meetings on the constructs and theories behind it, as well as on the use of the SOPI tool and with help desks. For these reasons, the evaluations may have been positively influenced. At the same time, the implementation suggestions were interesting and will be carefully considered by the research group. The SOPI tool has seen a multi-year design and experimentation effort that underscores the centrality of the theme of personalization in educational processes.

8. Conclusion and future developments

The training-research project presented here proposes the use of the SOPI tool for teachers. This tool has the potential for widespread implementation, extending from early childhood to late adolescence, and supporting personalized learning at all educational levels. Providing teachers with such tools aligns with the goal of promoting academic excellence without fostering an elitist or selective education system. This approach contributes to the broader debate on the development and support of human capital within the educational system (Barabanti, 2018).

Both the teachers' initial expectations and the preliminary findings from the SOPI tool experiment suggest that this type of intervention effectively addresses teachers' need for reliable instruments to observe and support students' potential. The fact that, before beginning the experimentation, a significant proportion of teachers felt the need to develop their own tools from scratch to observe students' abilities and aptitudes highlights the lack of adequate and customizable instruments. These further underscores the necessity of equipping educators with self-report observational tools that are both adaptable and flexible, catering not only to research purposes but also to their specific teaching needs.

The tool's cross-disciplinary approach also enables the exploration of domains that are often underappreciated, fostering discussions among teachers themselves.

The initial descriptive results indicate a good level of variability in the instrument's ability to identify the proposed domains. A broader experimenta-

tion is currently underway to conduct a structured validation study aimed at assessing the psychometric properties of the SOPI tool. This includes gathering evidence of validity (convergent, divergent, and criterion validity) as well as reliability, particularly inter-rater agreement among different teachers' observations of the same student.

Furthermore, the fact that the teachers eventually declare satisfaction with the instrument and request a similar instrument for the students is for us food for thought for further development of the study. Obviously, the fact that the research involves the participation of a voluntary and interested sample is a limitation in the generalisation of the results.

This contribution aligns with the objective of developing an educational system that is mindful and responsive to various forms of diversity, ensuring their recognition and appropriate support. By acknowledging the specificities and needs of individuals in learning processes, it aims to foster the implementation of personalized and differentiated learning pathways (Besozzi, 2006).

These insights contribute to the ongoing seminar debate on defining effective strategies to enhance the equity of the educational system. As a potential avenue for future research, it would be valuable to integrate observations derived from the SOPI tool with data from other assessment instruments or students' learning outcomes, where possible.

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6. Money, time and effort. Does financial aid improve university performance?

by Loris Vergolini, Nadir Zanini

There is a wide debate about the effectiveness of financial incentives on university performances (i.e., drop-out risk, credits, grade point average grade, and timely graduation) and on possible mediators like time use (i.e., time allocation between study and work). This paper investigates the impact of a generous need- and merit-based financial aid made available to students from low-income families introduced in the province of Trento (North-East of Italy). Exploiting data from a unique dataset resulting from administrative data and a longitudinal survey, we implement a Regression Discontinuity Design in order to disentangle the causal effect of the financial aid from other confounding factors. We provide evidence that different students react very differently to monetary transfers, thus reconciling different theories. For some students need- and merit-based financial aid can have a positive impact on students' performance at university, especially in terms of timely graduation. Students undertaking more demanding degree courses, however, appeared to be performing less well, despite spending more hours studying rather than working.

Esiste un ampio dibattito sull'efficacia degli incentivi finanziari sui risultati universitari (rischio di abbandono, crediti, media dei voti e laurea tempestiva) e su possibili mediatori come l'uso del tempo (allocazione del tempo tra studio e lavoro). Il presente lavoro indaga l'impatto di un generoso strumento di aiuto finanziario basato sul bisogno e sul merito, messo a disposizione degli studenti provenienti da famiglie a basso reddito, introdotto nella provincia di Trento (Italia Nord-orientale). Sfruttando i dati di una serie unica di dati amministrativi e di un'indagine longitudinale, implementiamo un Regression discontinuity design *per stimare l'effetto dell'aiuto finanziario. I risultati mostrano evidenza di come studenti diversi siano influenzati*

in maniera diversa dall'incentivo finanziario. Per studenti dei corsi di laurea triennale sembra esserci un impatto positivo, specialmente in termini di completamento del percorso universitario dentro ai tempi previsti. Studenti che intraprendono corsi di studio più lunghi, tuttavia, sembrano ottenere risultati meno positivi, nonostante trascorrano più tempo studiando.

1. Introduction

The disadvantage of students from low-income families does not only affect their chances of progressing to Higher Education (HE), it also affects their experience while at university. Students from low-income families are at greater risk of not completing their studies (Argentin and Triventi, 2011; OECD, 2019), and they typically perform worse than their better-off counterparts (Credé *et al.*, 2010; Vidal Rodeiro and Zanini, 2015). One possible reason for the lower achievements of socio-economically disadvantaged students is that they have to devote time and effort to paid employment in order to support themselves during their studies (Triventi, 2014).

In an attempt to level the playing field, policy makers have introduced various forms of support for undergraduate students from less privileged backgrounds, such as financial aid, loans, tax deductions and tuition fee waivers (for a review, see Page and Scott-Clayton, 2016). The underlying idea of these measures is that these students and their families face liquidity constraints that prevent them from investing in HE and, for those who progress to university, from fully focussing on their studies. According to this premise, any kind of policy aimed at reducing the direct and indirect costs associated with university participation could be successful in reducing the inequality of educational opportunities and outcomes (Dynarski *et al.*, 2023). Whereas there is a vast literature on the impact of financial aid on university participation (for a systematic review, see Herbaut and Geven, 2020), much less is known about the effect of these programmes on academic performance, especially in Europe (among the few studies available, see, for Italy, Facchini *et al.*, 2020; for England, Murphy and Wyness, 2023).

The aim of this paper is to provide evidence on the impact of financial aid to undergraduates by studying the case of the Grant 5B, a generous scholarship available in the province of Trento (Northeast of Italy) from 2009 to 2012. Our main focus is to consider its effects on students' university performance, measured by drop-out probability, grade point average (GPA), number of credits, and timely graduation. In addition, we study its impact on students' use of time while at university, both in terms of hours of study and work.

The prior evaluation of this programme, which focused on the first cohort of recipients (Vergolini and Zanini, 2015), found that the Grant 5B had no effect on university enrolment but redirected students outside the province of Trento, to take degree courses not offered by the local University of Trento (such as Medicine or Veterinary Science). Whilst this means that the Grant 5B was not linked to a change in the composition of students going to university, it does suggest that the recipients of the Grant 5B might have been somewhat affected by the financial aid.

Building on previous findings and exploiting a unique combination of administrative and longitudinal survey data, we evaluate the effect of this scholarship on how students spend their time at university and on their academic performance. The paper, therefore, does not only provide policy-relevant empirical results on the impact of a need- and merit-based financial aid. It also contributes to the scant literature on the role of financial aid on undergraduates' academic performance, using information on their use of time while at university to interpret these results.

The rest of the paper is organised as follows. The next section outlines the main features of the programme under scrutiny and the system within which it was introduced. Section 3 introduces some hypotheses about its possible effects. In Section 4 we describe the data used in the analyses, while in Section 5 we discuss the identification strategy adopted in order to estimate the causal effect of the grant on academic performance. We report our main findings in Section 6 and discuss their implications and limitations in Section 7.

2. The introduction of the Grant 5B

2.1. Contextual facts and figures

In the Italian educational system, to progress to HE students have to pass the secondary school leaving exam (*esame di maturità*), usually taken when they are 19. Regardless of the secondary school track chosen[1], the *esame di maturità* is scored out of 100, with 60 being the pass score. Most university courses in Italy comprise a 3-year Bachelor's (*laurea*) degree and a 2-year

[1] At the age of 14, when entering the upper secondary school, students have to choose which track to attend: academic (*liceo*), technical (*istituto tecnico*), or vocational (*istituto professionale*). Each track lasts five years. In addition to these three tracks, students can enrol also in some vocational training programs that are managed by local governments. These programmes, however, are shorter, usually last no more than three years, and they do not allow access to university.

Master's (*laurea magistrale*) degree. The exceptions are degrees that still follow a single-cycle 5/6-year course. These are: Medicine, Veterinary Science, Dentistry, Pharmacy, Architecture and Law.

The main programme designed to provide financial aid to students in HE is *diritto allo studio* (Right to Education), a national scheme co-financed by local governments. Students can apply for this programme once enrolled at university and it is awarded based on family income for the first year and on the basis of merit and income for the following years. It offers support up to a complete tuition fee waiver, a scholarship whose amount depends on family income, and privileged access and discounts for university accommodation and subsistence.

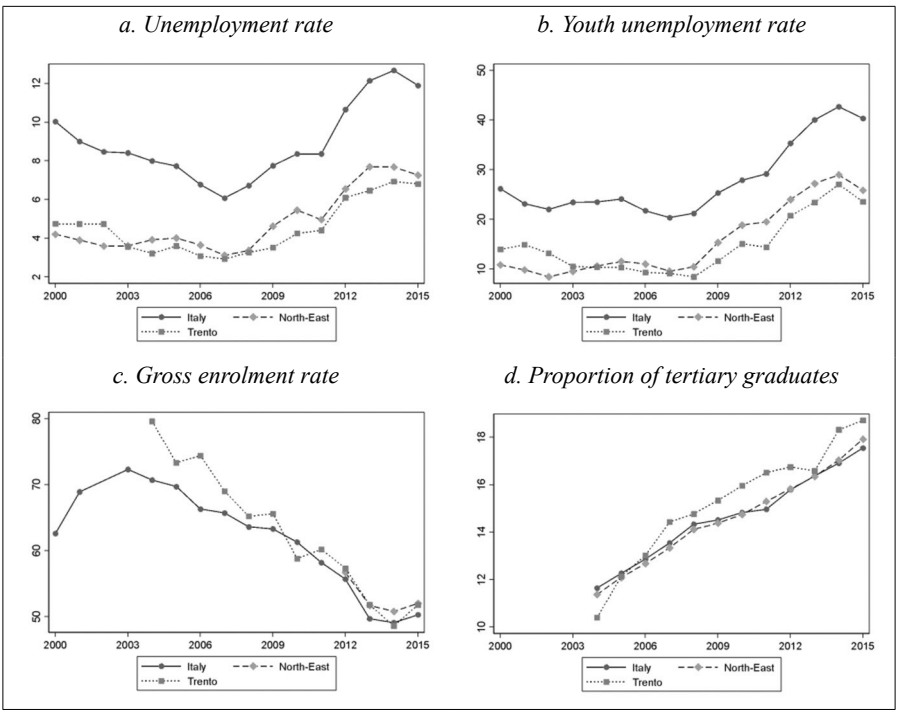

Fig. 1 – Italy, North-East and province of Trento at a glance

Note: Panel a reports the general unemployment rate; panel b shows the unemployment rates for people aged 15-24; in panel c, gross enrolment rates are calculated as the ratio between students enrolled at the university in year t/t+1 – independently of the year in which they obtained a high-school diploma – and high school graduates in year t-1/t. Panel d reports the proportion of tertiary graduates for people aged 25-64.

Source: unemployment rate, youth unemployment rate and the proportion of tertiary graduates have been retrieved using the ISTAT data warehouse supplied by the Italian Statistical Office. The gross enrolment rate comes from the Annuario statistico italiano (Italian Statistical Yearbook).

Prompted by the Great Recession, in autumn 2009 the local government of the autonomous Province of Trento (*Provincia autonoma di Trento*, PaT henceforth), a small area in the North-East of Italy, took a more active role in encouraging students from low-income families to complete a university degree course. Although PaT can rely on a relatively good economic situation, with lower unemployment rate than the rest of the country[2], in the years after the Great Recession it experienced a large decline in university enrolment even though the proportion of tertiary graduates follows a substantially linear growth (Fig. 1).

2.2. The Grant 5B

To reverse this negative trend, a generous financial incentive known as the Grant 5B was introduced to assign need- and merit-based monetary aid to students from low-income families. Specifically, this scholarship was awarded to those students who successfully completed the last year of secondary school (*diploma di maturità*) obtaining a final score greater than or equal to 93/100, and whose family income was below a predetermined income threshold. It is worth noting that the 93/100 threshold was set to allow the best 10 percent (approximately) of students to be eligible for merit. The financial need of students and their families is measured by a mixture of family income and assets. The threshold was set at € 30,000 of equivalent income[3].

The annual amount of the scholarship varies between € 1,200 and € 6,000, depending on family income and the geographic location of the chosen university. However, more than 80% of Grant 5B recipients received at least € 4,500 per year, which corresponds to a monthly scholarship in the range of € 375-500. This monetary transfer must be considered a top-up to the coverage of the direct costs of university attendance provided by the Right to Education. It should be noted, in fact, that the merit and income thresholds for the Grant 5B are different, resulting in the Grant 5B eligible population being a subset of those eligible for the Right to Education.

[2] Our main results would reasonably generalise to most of Northern and Central Italy, which shows similar economic conditions and educational levels.

[3] The financial need is measured by an *ad hoc* index called ICEF (Indicator of the Family Economic Condition) which summarises the income and assets of each family using a scale of equivalence that is similar to that used by the OECD. However, since it considers family members' assets as well as income, the interpretation of this indicator is far from straightforward. Since sixty percent of the median income in the Province of Trento is around € 8,300. A family with an ICEF of € 30,000 is therefore well above the poverty line.

The underlying idea of policymakers in setting the Grant 5B was to provide financial support to deserving students who are willing to attend university but unable to do so because of liquidity constraints. Therefore, the Grant 5B was aimed at covering the opportunity cost of going to university (i.e., what they would have earned if they worked instead of studying), rather than the direct costs (i.e., accommodation, tuition fees) that were meant to be covered by the Right to Education.

Once awarded for the first year, the scholarship can be renewed for the two subsequent years for Bachelor's, or five in the case of single-cycle courses, thus covering the entire expected duration of the course, but no longer than that. To be eligible for each renewal, students must demonstrate that family income is still below the threshold and that they have achieved a minimum of ECTS credits[4], usually at least 85% of those expected for that course, amounting to more than 50 credits per year. In terms of renewal, there is no requirement regarding the grades achieved by students during the course.

3. Prior research and implications for the impact of the Grant 5B

3.1. Theoretical framework

The classical theoretical framework for analysing the impact of financial aid on university participation and performance is the model of human capital investment (Becker, 1964). According to this theory, students decide to invest in themselves through education which can generate future returns. This leads students to enrol at university if the perceived benefit of HE participation is greater than the associated (direct and indirect) costs. By reducing these costs, financial aid should, therefore, boost university participation.

To ensure the returns on the investment made in education, students may also put more time and effort into their studies throughout the duration of their degrees. If this is the case, financial aid should have a positive effect on students' time allocation, especially for those from low-income families. The monetary transfer could save them from financing their studies through

[4] A credit system is in place in Italy to facilitate mutual recognition of degrees. The credits represent the student's total workload (class time, individual study, exam preparation, practical work, etc.) and are earned once the student has passed each individual exam, assignment, or activity required by their programme of study. The average full-time workload for one academic year is usually 60 credits, which is equivalent to 1,500 hours of work. However, the teaching regulations of each university can provide for regular reassessment of credit allocation and indicate the minimum number of credits that must be achieved each year.

occasional or part-time jobs and allow them to spend more time studying (Broton *et al.*, 2016). Hence, they could perform better at university: reducing the risk of drop-out (particularly high during the first year), improving their grades, and progressing smoothly towards graduation.

As stressed by Castleman and Long (2016), however, there is also another potential mechanism through which a reduction in the costs associated with university attendance could impact academic performance. According to the dynamics of capital accumulation (Heckman, 2006), financial aid may incentivise progression to university for students with lower academic readiness. These students may not be well-suited to pursue a university education, resulting in lower average university performance, such as higher drop-out rates, lower performance throughout the course, and delays in completing their studies.

3.2. Empirical studies

The empirical literature does not provide a definitive answer on which of these contrasting theories on the impact of financial aid on performance at university prevails. Most of the literature is, in fact, aimed at evaluating the effect of financial aid on university participation (Herbaut and Geven, 2020). It is only in recent years that, as Bettinger (2015) notes, the increase in drop-out rates has shifted policymakers' and researchers' attention, from participation to performance and completion. The road to completion is, indeed, paved with many challenges. For example, the transition from upper secondary school to university implies a substantial change in workload, in the organisation of study and in relationships with peers and lecturers that may lead to poor performance and drop-out.

The first generation studies assessing the role played by financial aid in shaping academic performance date back to the early 2000s. In the US context, there is a wider consensus about the positive and remarkable effects of financial aid on academic performance. Using data from thirteen US states, Dynarski (2005) found that merit programmes increase college completion by 3 to 4 percentage points. This result is quite remarkable, given that the share of the affected population with a college degree was about 26%. Cornwell *et al.* (2003) analysed the case of the HOPE programme in Georgia (US) and found that the shift from need- to merit-based aid increased the probability of withdrawing and reduced the average completed credits. Richburg-Hayes *et al.* (2009) studied a programme implemented in the New Orleans area showing how financial aid increases both the number of credits

earned and reduces the drop-out. A similar result was found by Miller *et al.* (2011) who showed preliminary results from a new programme established by the University of New Mexico. More precisely, they found that the intervention encouraged students to earn more credits, and that they were nearly 9 percentage points more likely to have gained 30 or more credits by the end of the first year. Using data from West Virginia, Scott-Clayton (2011) stressed how financial aid can also have a slight effect on GPA, but she did not find any influence on drop-out rates. These positive effects are confirmed by more recent findings focusing on the cases of Ohio (Bettinger, 2015) and Florida (Castleman and Long, 2016).

A different and more complex picture emerges from the empirical literature on European countries. Analysing the case of the University of Amsterdam, Leuven *et al.* (2010) found that financial aid had no effect on the number of credits earned or on the drop-out rate. Belot et al. (2007) exploited a major reform in the Dutch HE system to identify the effect of student support on academic performance and students' time allocation. They found that there is a small positive effect on grades (1.3%), but drop-out and time allocation (hours spent studying and working, and incidence of jobs on the side) remain basically unchanged. More recent papers argue that need-based scholarships exert a positive effect on reducing drop-out rates and on timely graduation in various European countries such as Germany (Glocker, 2011), France (Fack and Grenet, 2015) and Italy (Mealli and Rampichini, 2012; Facchini *et al.*, 2020; Modena, Rettore and Tanzi, 2020). A recent study on nine universities in England (Murphy and Wyness, 2023) also found a positive impact of financial aid on the probability of graduating with a good degree outcome.

3.3. Implications for our study

From the theoretical and empirical literature, it is, therefore, difficult to anticipate whether financial aid and, more specifically, the Grant 5B can impact university performance and timely completion and, if so, how.

Following the human capital investment theory (Becker, 1964; Castleman and Long, 2016) it could be argued that generous financial aid aimed at covering indirect costs of studying rather than working could make students less likely to do occasional and part-time jobs during their degrees, so that they would have more time devote to studying. In turn, this would translate into better performance and, especially, greater likelihood of graduating within the expected duration of the course, beyond which the monetary aid would

no longer be provided. Hence, a potential scenario is that the leading effect of the Grant 5B is timely progression towards the completion of the course, translating into a larger number of credits earned throughout the course to ensure timely graduation. This would not necessarily lead to an impact on students' grade point average throughout the course, given that this is not linked to eligibility, but it may reduce the risk of drop-out. An effect could also be found on the number of hours worked if most students eligible for the Grant 5B were from low-income families, but this is not obvious given that not only very low-income families are eligible.

Previous findings on the impact of the Grant 5B showed that it had no effect on boosting enrolment rates, but it crucially had an impact on changing students' choices regarding the chosen field of study and its location (Vergolini and Zanini, 2015). Students tended to move further away from home and to enrol in degrees such as Medicine, Dentistry, Veterinary Science, and Architecture. These are usually connected to higher labour market outcomes and considered more demanding courses, some of which are single-cycle and last 5 or 6 years. As per the dynamic of capital accumulation (Heckman, 2006), an alternative potential scenario could, therefore, be that generous financial aid prompts students to take higher risks. This would translate into choosing fields of study for which they could be potentially less suited, leading them to struggle academically. This would possibly force them to study longer hours, thus reducing the need to have an occasional or part-time job, whose earnings could be covered by the scholarship anyway. The additional effort may, in any case, not be enough to compensate for the higher risk associated with studying for a more demanding degree, leading them to perform less well throughout the course and to achieve lower academic results. In turn, this could lead to a higher risk of drop-out, as well as to taking longer to graduate.

4. Empirical strategy

To identify and estimate the impact of the Grant 5B on university performance it is possible to exploit its eligibility criteria. The Grant 5B is awarded on the basis of merit and financial need. The ICEF indicator of financial need is not available for all students, but only for those who applied for some form of means-tested benefits. This means that well-off students tend to be under-represented among those with an available ICEF. We therefore condition the analysis on the subpopulation of students falling below the income threshold. This allows us to exploit the discontinuity around the merit threshold using a *Regression Discontinuity Design* (RDD).

The assumption underlying RDD is that, since small changes in the assignment variable (i.e., final score in this case) do not have any significant impact on students' behaviour, it is possible to compare those immediately below and just above a given threshold. Those with a final score of 93/100 are essentially the same as those with a final score of 92, except for being eligible for the Grant 5B. In this sense, RDD can be considered a local randomised experiment.

To estimate the effect of the grant, we adopt a flexible specification of OLS regression (Lee and Lemieux, 2010):

$$E(Y|Z,X) = \alpha + \beta \cdot Z + f(\gamma \cdot X + \delta \cdot [Z \cdot X])$$

where Y represents the outcomes (drop-out status, GPA, etc.); Z is the eligibility status; X is the final score at the *esame di maturità* that has been centred around the threshold (to set the threshold at 0); and f is a polynomial function of X.

Although adding covariates could improve the precision of the estimates, we decided not to include other covariates in the specification to avoid losing cases due to listwise selection. It should be stressed that, although potentially useful to capture variability in the observed data, in a RDD setting covariates are not needed for the identification of the causal impact. We opted for a second-degree polynomial after an inspection of the relationship between the final score and the various outcomes. We also restricted the window of observation to consider only those students with a final score above 85 to have a symmetric observation window around the threshold.

In the sharp RDD set out above, the policy parameter of interest is given by β, which represents the intention-to-treat effect (ITT). In the case at hand, however, β is not the true effect we are after, namely, being a recipient of the Grant 5B. This is because there is a sizeable fraction of eligible students who did not apply for the Grant 5B. The proportion of students eligible for the Grant 5B who we were not in receipt of it was nearly 25% for the first cohort and 16% for the second. To take this into account, the true effect of the Grant 5B on the recipients can be estimated via instrumental variables. Here we use a two-stage least-squares which returns an estimate for the so-called local average treatment effect (LATE), which is the average impact of the treatment on the compliers. In the case at hand, LATE is the impact of being a recipient of the Grant 5B for at least one year and can be interpreted as the ratio between ITT and the proportion of eligible students who were actually in receipt of the Grant 5B:

$$LATE = \frac{E(Y|Z=1,X) - E(Y|Z=0,X)}{E(D|Z=1,X) - E(D|Z=0,X)}$$

where D is a dummy variable denoting the recipient status indicator (D = 1 for recipients of the Grant 5B for at least one year, and D = 0 otherwise). LATE is estimated via instrumental variables, using Z as an instrument for D.

The underlying assumption for the RDD estimates to be valid is that the final score was not manipulated, that is, students being awarded a final score of 93 to allow them to become eligible. We implemented the so-called McCrary test (McCrary 2008) and found that the grade distribution is smooth around the merit threshold, without any discontinuity at 93. This suggests that there is no manipulation of the final score (results are available upon request).

It is worth mentioning that a possible threat to the identification strategy arises when the Grant 5B affects the probability of enrolment at university. Indeed, as pointed out by Bettinger (2004) relying on outcomes conditional on enrolment would lead to a parameter that combines two different effects: i) the effect of the Grant 5B on the performance of students who would have attended university in the absence of the Grant 5b and ii) the effect of the Grant 5B on the performance of students who would not have attended university without the Grant 5B. This is not a threat to our identification strategy, given that it was shown that there was no impact on enrolment rates for the first cohorts eligible for the Grant 5B (Vergolini and Zanini, 2015).

5. Data and descriptive evidence

The data used in this paper is the result of the linkage between administrative records and survey data. The information about the eligibility criteria of the Grant 5B's recipients comes from administrative archives. More precisely, the final mark at the *esame di maturità* has been supplied by the local school authority; the income and asset indicator (ICEF) comes from Clesius, the agency in charge of the computation of this index for all means-tested programmes implemented by the local government; information about Grant 5B's recipients has been supplied by the Opera universitaria, the agency in charge of the administration of the programme[5]. We rely on survey data to collect information about the outcomes and socio-demographic characteristics.

[5] Unfortunately, we do not have access to information regarding the renewal of the grant. This means that we do not know whether some students lose the grant during their studies. For this reason, we analyse is the impact of having received the grant at least for one year.

We administered a baseline survey in November to all students who had successfully completed high school in July of the same year: the prospective freshmen in the following academic year. Since in Italy the deadline for university enrolment is in late September, we were able to know whether each student was enrolled at university or not, as well as collect information about socio-demographic characteristics, social origins, and prior schooling.

Tab. 1 – Data collection plan, sample size and response rates

	2009	*2010*	*2011*	*2012*	*2013*
First cohort	Baseline survey	1st FUS	2nd FUS	3rd FUS	
	2,733 (84%)	1,784 (93%)	1,657 (87%)	1,575 (82%)	
Second cohort		Baseline survey	1st FUS	2nd FUS	3rd FUS
		2,656 (81%)	1,790 (94%)	1,714 (90%)	1,627 (86%)

After the end of the first, second and third academic years, in October, we contacted all respondents who had enrolled at university for three follow-up surveys (FUS). This allowed us to collect information on time allocation, whether they were still attending university (meaning that only for those studying for a three-year degrees it was possible to know if they had completed their course), their GPA, and the number of credits earned. Table 1 displays the data collection plan and reports the number of respondents in each survey and the corresponding response rate.

In this way we built a rich panel dataset that allows us to study the effects of the Grant 5B on self-reported drop-out rates, GPA[6] and number of credits earned at the end of the first, second, and third years as well as the number of hours dedicated to study and work, and timely graduation (for Bachelor's only). Descriptive statistics for the outcome variables are reported in Table 2, for students with an equivalent income below € 30,000.

In reflecting on the potential impact of the Grant 5B (section 3), we discussed how eligibility for the financial aid may influence some students to take more risks and choose a more demanding course, with potential consequences for their university performance. The data available doesn't allow us to determine students' suitability for the degree course chosen, nor its demand. It does, however, allow us to distinguish students studying towards

[6] GPA in the Italian Higher Education system ranges from 18 to 30; scores below 18 indicate a failed exam. Different exams may earn students a different number of credits. GPA has been weighted by the number of credits awarded by each passed exam.

a 3-year degree (Bachelor's) from those enrolled in a single-cycle degree (duration of 5/6 years). We conduct the evaluation analysis separately by degree duration to try and capture (some of the) differences between the two groups of students. It should be noted that the number of students enrolled in a single-cycle degree is relatively small (155 in 2009 and 129 in 2010), limiting the statistical power of our analysis. This also means that in interpreting the findings of our study, we have to carefully consider the size of the effect and not only its statistical significance.

Tab. 2 – Descriptive statistics for outcome variable, by group of students

	Below income & below grade		*Below income & above grade (eligible non-compliers)*		*Below income & above grade (treated)*	
	Mean	*SE*	*Mean*	*SE*	*Mean*	*SE*
Drop-out (1st year)	0.176	0.010	0.158	0.049	0.086	0.020
Drop-out (2nd year)	0.145	0.009	0.076	0.037	0.045	0.017
Drop-out (3rd year)	0.249	0.013	0.159	0.056	0.122	0.030
Credits (1st year)	35.300	0.551	43.180	2.739	48.780	1.213
Credits (2nd year)	82.430	1.021	93.740	4.910	104.900	2.032
Credits (3rd year)	134.40	1.415	151.400	6.195	161.300	2.643
GPA (1st year)	24.140	0.102	25.720	0.590	25.840	0.311
GPA (2nd year)	24.620	0.083	26.650	0.264	26.800	0.169
GPA (3rd year)	24.900	0.082	26.360	0.613	26.960	0.158
Avg. hours studied	32.000	0.408	36.320	2.321	36.820	1.161
Avg. hours worked	5.100	0.277	3.000	1.203	2.270	0.520
Timely graduation*	0.190	0.013	0.240	0.072	0.440	0.048

* Timely graduation is only available for Bachelor's students.

6. Empirical results

The main results of our study are summarised in Tables 3 and 4, for Bachelor's and single-cycle degrees respectively. The impact of the Grant 5B on the two groups of students is presented in turn, reporting both ITT and LATE, although focusing on the latter.

Starting from Bachelor's students, the most striking finding pertains the positive, fairly large, and statistically significant (at the 0.10 level) effect on timely graduation. Grant 5B recipients were, on average, 44 percentage points more likely to complete their university course than their counterparts who were not entitled to the financial aid. This result is consistent with the

large, albeit not statistically significant, findings related to the number of credits earned throughout the course. Students in receipt of the Grant 5B earned 12 and 25 additional credits in the first and third years respectively, amounting to 20% and 40% more exams taken.

Tab. 3 – Sharp (ITT) and fuzzy (LATE) RDD parametric estimates of the treatment effect on academic performances, time use and timely graduation – Bachelor's degrees

	ITT	*SE*	*LATE*	*SE*	*N*
Average hours studied	-5.926	(5.591)	-7.681	(7.325)	341
Average hours worked	1.923	(3.842)	2.487	(5.001)	340
Drop-out – 1st year	-0.234	(0.155)	-0.307	(0.208)	389
Drop-out – 2nd year	0.0763	(0.132)	0.0961	(0.168)	336
Drop-out – 3rd year	0.0908	(0.173)	0.0984	(0.186)	247
GPA – 1st year	-0.171	(1.040)	-0.221	(1.329)	360
GPA – 2nd year	0.866	(1.156)	1.125	(1.518)	319
GPA – 3rd year	2.283	(2.564)	2.740	(3.060)	307
Credits – 1st year	9.144	(8.885)	12.00	(11.641)	387
Credits – 2nd year	-5.034	(16.777)	-6.526	(21.706)	320
Credits – 3rd year	20.75	(23.417)	24.81	(27.830)	306
Timely graduation	0.426*	(0.233)	0.440*	(0.241)	212

Note: ITT estimates have been obtained through OLS estimator, while LATE estimates by means of instrumental variables through a 2SLS estimator. All the models have been restricted to the subsample of students with final score ≥ 85. Levels of significance are reported as follows: * $p < 0.10$.

This is an important finding: it suggests that financial aid may incentivise smooth progress towards the completion of the course. The impact of the Grant 5B started from the beginning of the course and continued throughout, leading Bachelor's students to complete their exams during the third year, as expected. Ultimately, this significantly increased the likelihood of graduating on time, thereby avoiding the possibility of remaining at university after losing entitlement to financial aid.

The findings on credits earned and timely graduation are in line with those on drop-out rates. Table 3 shows that Grant 5B recipients had a 30-percentage-point decrease in the probability of leaving university by the end of the first year, though this was partly compensated by an increase in the second and third years. The findings on GPA are very small and not statistically significant, ranging from -0.2/30 in the first year to 2.7/30 in the third year. This could be interpreted as indicating that the positive impact on progression through the course and its completion does not negatively

affect the quality of learning and, therefore, the exams results achieved throughout the course.

The final set of outcomes on Bachelor's students concerns the time spent studying and working during the course. For both dimensions, the estimates of the ITT and LATE show that there is no significant impact of the Grant 5B.

Moving to single-cycle students, findings are somewhat different from those presented above for Bachelor's. The most relevant result was found for the number of credits earned. The impact of the Grant 5B in this case is negative and fairly large, especially from the second year, although only the ITT is statistically significant. This could be an indication that students eligible for the Grant 5B and taking longer (hence more challenging) degrees might not have been able to cope with the demand of the course they chose.

This could be coherent with the impact on drop-out rate. Despite being not statistically significant, our results show that the financial aid had a negative and sizeable impact on the probability of leaving university for single-cycle students, at least in the third year. Recipients of the Grant 5B were 34 percentage points more likely to drop out than their counterparts who were not eligible. Findings for GPA are not statistically significant and small in size.

Tab. 4 – Sharp (ITT) and fuzzy (LATE) RDD parametric estimates of the treatment effect on academic performances, time use and timely graduation – Single-cycle degrees

	ITT	*SE*	*LATE*	*SE*	*N*
Average hours studied	8.943	(8.102)	15.77	(15.826)	107
Average hours worked	-5.634	(4.987)	-9.932	(9.306)	107
Drop-out – 1st year	-0.003	(0.042)	-0.004	(0.071)	125
Drop-out – 2nd year	-0.038	(0.040)	-0.123	(0.165)	103
Drop-out – 3rd year	0.129	(0.310)	0.341	(0.762)	99
GPA – 1st year	1.407	(1.695)	2.432	(2.970)	121
GPA – 2nd year	0.379	(1.735)	1.170	(5.041)	101
GPA – 3rd year	-0.615	(1.183)	-1.624	(3.658)	98
Credits – 1st year	-12.44	(9.054)	-21.73	(15.866)	124
Credits – 2nd year	-55.60***	(17.324)	-161.9	(105.470)	99
Credits – 3rd year	-37.22*	(22.058)	-143.9	(172.774)	92

Note: ITT estimates have been obtained through OLS estimator, while LATE estimates by means of instrumental variables through a 2SLS estimator. All the models have been restricted to the subsample of students with final score ≥ 85. Levels of significance are reported as follows: *** $p < 0.01$; * $p < 0.10$.

Students enrolled in a single-cycle degree (see sub-section 2.1) are excluded from the timely graduation outcome, because graduating in three years is impossible for them.

Interesting results are those pertaining to the behaviour of students during their time at university. Even if the estimates are not statistically significant, for single-cycle students there is an increase in the time devoted to study of about 9 hours per week and a reduction in the amount of time spent working of 5.6 hours per week.

This may suggest that students taking single-cycle degrees put more effort into their studies, something that can be facilitated by the monetary transfer that lessens the need for an occasional/part-time job. However, this was not enough to enable them to cope with the additional learning required. It may be that we are observing the misplacement discussed in the theoretical section. Students eligible for the Grant 5B may be more inclined to take risks in relation to the choice of their degree, leading them to take on more demanding and longer courses. As a result, however, those taking this risk may end up struggling academically.

It should be stressed that with our data we were able to observe students only for the first three years of degrees that require five or six years to complete. It is, therefore, possible that these students caught up with their studies later on, although the amount of credits lost at the beginning of their courses might have hindered their eligibility to receive the monetary aid. In any case, it has to be noted how the impact of the Grant 5B may vary, depending on the type of degree undertaken.

7. Conclusions

The aim of our empirical evaluation of the Grant 5B on students' academic performance based on a fuzzy RDD was twofold. On the one hand, to contribute to the literature on the impact of financial aid to students. On the other, to provide evidence-based policy recommendations on the design of this kind of interventions.

There are two main findings from our study. First, the positive and fairly large impact of the Grant 5B on students' progression towards completion of their Bachelor's, ultimately increasing the likelihood of graduating on time. Secondly, among students taking single-cycle degrees, lasting longer and therefore more challenging, Grant 5B recipients earned substantially fewer credits and displayed a higher risk of drop out, despite spending more hours studying rather than working. These results show that need- and merit-based financial aid can have the intended effect, i.e. providing students with the support needed to enable them to focus on their studies rather than working.

For some students, those taking a Bachelor's degree, this translates into better performance at university, at least in terms of progression throughout the course and timely graduation. In Italy, large delays in graduation have been well documented in the past (Aina *et al.*, 2011), therefore the impact of the Grant 5B on timely graduation should be considered a successful result. This is likely because the entitlement to the cash transfer was only set to last for the expected duration of the course. This suggests that aspects of the policy design, in this case its duration, are key in influencing the behaviour of its recipients and in achieving the intended aims.

For students taking a single-cycle degree, however, findings are quite different. Although financial aid may yield an impact on how they spend their time and effort, this does not necessarily lead to better academic results. Rather, these students seem to struggle academically, hence suggesting that the Grant 5B may have had a counterproductive impact. Prior evidence on the impact of the Grant 5B on progression to university (Vergolini and Zanini, 2015) showed that there was no effect on enrolment rate, but that students were more inclined to move away from the local university and enrol in longer and more challenging courses. It is possible that these students who were enabled by the financial aid to take riskier choices when choosing their courses, did so at the expense of their performance at university.

In interpreting these findings, we have to consider the limitations of our study. These are mostly linked to data availability. We have used the duration of the degree course chosen as a proxy for the level of demand and workload placed on students. Although this proved to be a simple yet effective approach, it remains a rough categorisation that may confound some of the findings. Having followed students only for three years, we do not know how students taking single-cycle degrees performed in the last part of their courses and, crucially, whether they graduated on time. Furthermore, the Grant 5B was targeted to a relatively small number of students. This has implications for the statistical power of our analysis, which may result in flagging as statistically significant only very large effects. Finally, the Grant 5B was introduced for the residents of the province of Trento, a relatively small and relatively well-off area in the north-east of Italy. Our findings should, therefore, be interpreted and generalised with a degree of caution.

Although our study does not offer a definitive response on the causal link between financial aid and students' academic performance, it does provide evidence that different students may react very differently to monetary transfers, thus proving that different theories can co-exist. Those students who are not influenced by financial aid in their choice of university course react according to the human capital investment theory (Becker, 1964; Castleman

and Long, 2016). For those students who make riskier choices in terms of course of study, it is the dynamic of capital accumulation (Heckman, 2006) that seems to prevail.

This could explain why previous studies found very mixed results. Crucially, it shows that the study of the impact of financial aid on academic performance cannot be completely disentangled from its impact on enrolment choices. It also points in the direction of a potential trade-off between the positive effects on enrolment choices and on performance, which should be investigated further, both from a policy development and research perspective. To mitigate the risks of negative unintended consequences of financial aid, even if only on some groups of students, controls should be put in place. This may entail pairing interventions like the Grant 5B with other initiatives, such as guidance programmes or clear communication campaigns that explain the intended and unintended consequences of financial aid based on robust empirical evidence.

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In recent decades, educational inequalities have emerged as a central issue in scientific and political debate. Educational systems are now expected to do more than guarantee access to education; they must also promote equity in educational outcomes and learning opportunities. Factors such as gender, social background, migrant status, and economic conditions have a significant impact on educational pathways, creating cumulative advantages and disadvantages throughout students' lives.

This volume is situated within this analytical framework, bringing together six papers presented at the ninth edition of the INVALSI Seminar "Data from and for educational systems: tools for research and teaching", which was held in Rome from 17 to 19 October 2024.

Taken together, the contributions provide a detailed, multi-level picture of educational inequalities in Italy. They show that the observed gaps do not result from isolated individual factors, but emerge from the interplay between social contexts, institutional frameworks, public policies, and educational practices. Understanding these mechanisms is essential for constructing a more equitable and inclusive education system that can realise the potential of all students in an increasingly diverse society.

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