

Gender and Differences in School Performance in Reading and in Mathematics in Italian Schools

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Abstract

The paper takes gender into consideration in assessing if and how much this ascribed factor impacts school performance. The effects of gender connected to the type of school attended and to the geographical area of residence are analysed.

Although there are gender gaps in literacy resulting from the OECD PISA - Programme for International Student Assessment' study - with greater female proficiency in text comprehension and greater male ability in conceptual skill in mathematics - it seems, however, that these trends can be significantly mitigated by the type of school attended and by the geographical area of residence. The paper takes into consideration the Italian case.

Keywords: learning and equal opportunity - gender segregation - ranking of performance - reading and mathematics - Italian school.

Foreword

In an egalitarian, meritocratic education system that ensures equal opportunities, any differences in learning, in the choice of training courses and in educational outcomes should be linked solely to the individual's talent, ability, preferences and commitment.

In actual fact, in Italy and in most educational systems in general, some characteristics have a significant impact on successful learning.

In detail, the studies continue to confirm how socio-cultural and geographical provenance, gender and ethnic group significantly correlate with performance and success in school and in training (Schizzerotto, 2002; Schizzerotto & Barone, 2006).

Focusing on gender¹, we see that in Italy, in the last few decades, the process of

¹ At birth, a male or a female is defined by the possession of specific and differentiated sexual attributes. Later on, through socialisation, individuals acquire ways of feeling, of interacting and of communicating, rules of behaviour and roles that interpret the gender they belong to from a social and cultural viewpoint. Gender, therefore, is the social construction of the sex. It is based on the biological characteristics but is not something natural, innate and therefore inevitable. However, it

female emancipation is linked to a growth of education level of women who were once excluded, or almost, from classrooms and above all from university. This transformation has been so strong that today we are faced with a switch: amongst new generations, the percentage of students who achieve their school leaving certificate or a university degree is higher among the females than the males. In addition, in upper secondary schools, compared to their male peers, girls achieve better scores on average, they incur in less irregular paths (Gasperoni, 2007; Argentin, 2007; Argentin & Cavalli, 2007) and are less prone to dropping out. Investment in training and in job careers are the behavioural contexts that have most significantly brought substantial change to the existential opportunities of present day female generations.

On the other hand, this is not linked to a growth in visibility of women inside the labour market, since discrimination against the female segment is still persistent, to the point that in order to achieve career positions (and wages) similar to those of the men, women must acquire higher credentials².

Going back to the educational system, another element of inequality in opportunities is found in the paths followed by the two genders within the upper secondary school system. If female are over-represented in the 'licei' when compared to the technical schools, it is equally true they mainly choose humanistic courses (classic studies, languages, humanities, art) while male students tend more towards scientific and technological contents. Furthermore in education and vocational training girls prefer services while boys choose paths related to the industrial and crafts sectors. (Pisati, 2002; Schizzerotto & Barone, 2006) (Table 1).

does condition and limit the subjects within codified avenues, reducing their opportunity to express intentions, projects, desires, choices, to play roles that may differ from the canons defined by the society they belong to (Ruspini, 2013; Sartori, 2009). Representations of gender through time have undergone continuous changes and appear different in the various cultures and traditions. The basic principles have remained stable, however, to the point of having structured and confirmed the very same perception that individuals have of themselves and of having produced a "sex gender system" (Rubin, 1975) that encompasses all of the existential ambits, situations, places and institutions inside which to be a boy or a girl, man or woman has a different meaning. One cannot but remark, however, that, especially in the western world that in the last decades has seen veritable revolutions as regards sexuality, the role of women in society and the relationship between sexes and between generations, the ways of interpreting gender are becoming less and less fixed and rigid.

² Gender, today, is still an important explicative category – although obviously not the only one and not even univocally interpreted – especially when analysing the imparity persisting in societies and when seeking a political perspective in order to reduce it or even eliminate it. This concept is increasingly being considered an essential variable, possessing a strong heuristic value that cuts across social phenomena. One speaks of gender mainstreaming because we are increasingly realising that equal opportunity must not be considered an issue per se but an integral part of democracy and of social equity.

Table 1 - Students enrolled in the first year of upper secondary school by gender in Italy: composition based on gender (s.y. 2015-2016; values in percentages)

	Italy	
	Males	Females
Liceo (Upper Secondary High-school) type	39	61
- Classic studies	31	69
- Languages	20	80
- Science	53	47
- Humanities	10	90
- Art	30	70
Technical Schools	69	31
- Business	45	55
- Technology	84	16
Vocational Training	57	43
- Professional industry and crafts	75	25
- Professional services	51	49

Source: MIUR Ministero Istruzione, Università e Ricerca 2015

Therefore, if the vertical disparities (relative to the qualifications achieved) have been attenuated until overtaking by the female component, the horizontal ones (relative to the internal paths at the same level of education), remain significantly (Schizzerotto & Barone, 2006)³. This phenomenon, in itself, would not be worthy of evidence if not because it will lead to different allocations in terms of degree courses and / or access to the labor market, as already mentioned (Pisati, 2002).

These are just some of the basic indicators. In this paper we will use the data from the PISA study⁴ ("Programme for International Student Assessment" launched by the OECD - Organisation for Economic Co-operation and Development) regarding the performance of males and females linked, more specifically, to the knowledge levels acquired as regards competences in native language and in mathematics, so as to verify the impact of gender on learning processes.

³ To this end, one must not overlook the social and cultural factors that have an even greater impact on male and female students' choices in the first and the second transition, namely in the transition from primary to secondary and tertiary studies. The feminisation rates of several upper secondary schools and university curricula are proof of this (MIUR 2016). This results today, although less so than in past decades, in significant educational segregation the effects of which are strongly to the detriment of women.

⁴ As everyone knows, the three-yearly PISA study involves young 15-year old students from all of the member states of the OECD (35 nations) plus from many other countries (in 2015, another 34 nations plus several Chinese provinces and regions) amounting to a total of 72 different territorial units. The two subjects analysed in this paper are **Reading literacy** (i.e. the student's capacity to understand, use and reflect on written texts in order to achieve one's goals, to develop one's knowledge and potential, and to participate effectively in society) and **Mathematics literacy** (i.e. the student's capacity to formulate, use and interpret mathematics in a variety of contexts. It includes mathematical reasoning and the use of mathematical concepts, procedures, facts and tools to describe, explain and forecast phenomena. It allows people to recognise the role that mathematics plays in the world and to make well-founded judgements and grounded decisions as constructive, concerned and reflective citizens).

A first look at the PISA results by gender

Several comparative results of the PISA study are shown in Table 2 and Figure 1 below. We have limited ourselves to listing the average scores for Reading literacy and Mathematics literacy in G7 member states, i.e. the group that includes the seven largest advanced economies⁵. In displaying these data by gender, we find that females consistently have better average scores than males in skills related to understanding the text in the mother tongue but worse as regards mathematical skills. This seems to be a universal phenomenon and found to be highly common in all of the geographical areas that participated in the latest edition of the PISA study as well as in those of previous years⁶.

Table 2 - Average scores in the G7 member states by gender

	Reading literacy				Mathematics literacy			
	Average score			Δ M - F	Average score			Δ M - F
	Total	Males	Females		Total	Males	Females	
Italy	485	477	493	-16	490	500	480	+20
USA	497	487	507	-20	470	474	465	+9
Japan	516	509	523	-14	532	539	525	+14
Germany	509	499	520	-21	506	514	498	+16
Canada	527	514	540	-26	516	520	511	+9
UK	498	487	509	-22	492	498	487	+11
France	499	485	514	-29	493	496	490	+6
OECD	487	479	506	-27	490	494	496	+8

Source. OECD, Database PISA 2015

⁵ The G7 nations feature very high scores but except for rare exceptions they do not belong to the group of absolute excellence. In the Reading literacy test, only Canada (average score = 527) ranks among the leading nations, preceded by Singapore (535), on a par with Hong Kong (527) and followed by Finland (526) and Ireland (521). In the Mathematics literacy test, of the G7 nations only Japan (532) is amongst the top performers, preceded by Singapore (564), Hong Kong (548), Macao (544), China Taipei (542) and followed by the Chinese provinces of Beijing, Shanghai, Jiangsu and Guangdong (531), The Republic of Korea (524), Switzerland (521) and Estonia (520).

⁶ In the Reading literacy test, the dominance of girls is total in all 72 territorial units participating in the study, while in the Mathematics literacy test the dominance of boys is very high but not total, since there are 21 nations in which the girls outperform the boys by 2-9 points in the average score given and by 12-18 points in 4 cases (Trinidad Tobago, Georgia, Qatar and Jordan).

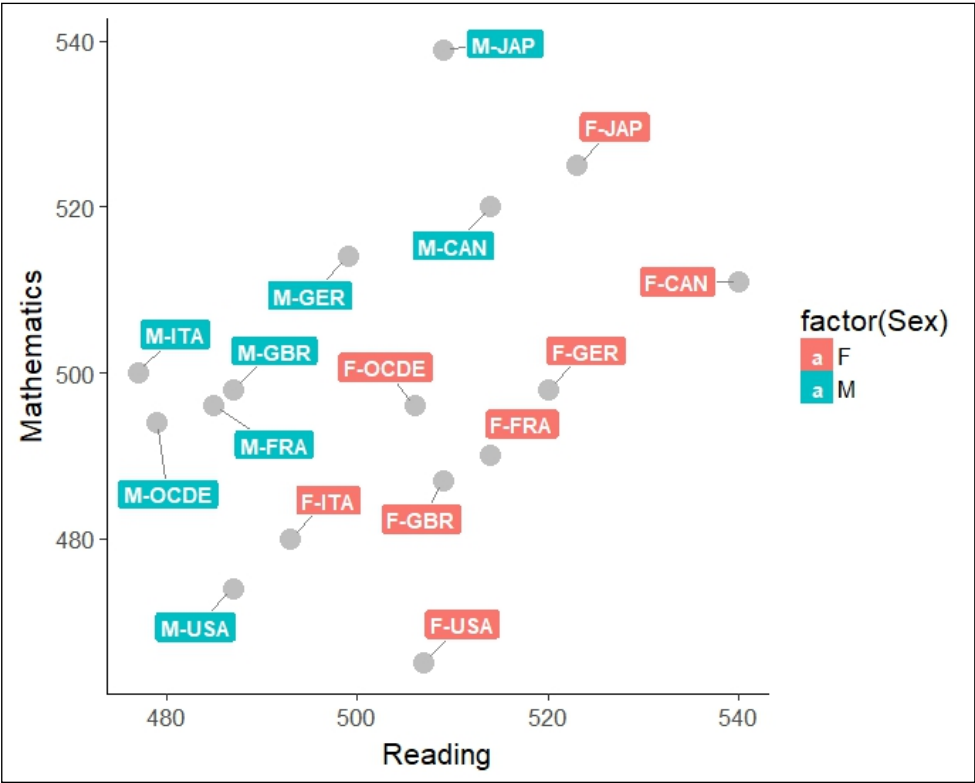


Figure 1 - Average scores in G7 countries and OECD by gender

These scores would be meaningful only if the gender was not influenced by other variables. Therefore let's consider them only as trend evidences with a purely explorative value and try to insert the performances of males and females within a broader context of influences.

Figure 2 shows the influences hypothesised and therefore is the conceptual model on which to base the analysis.

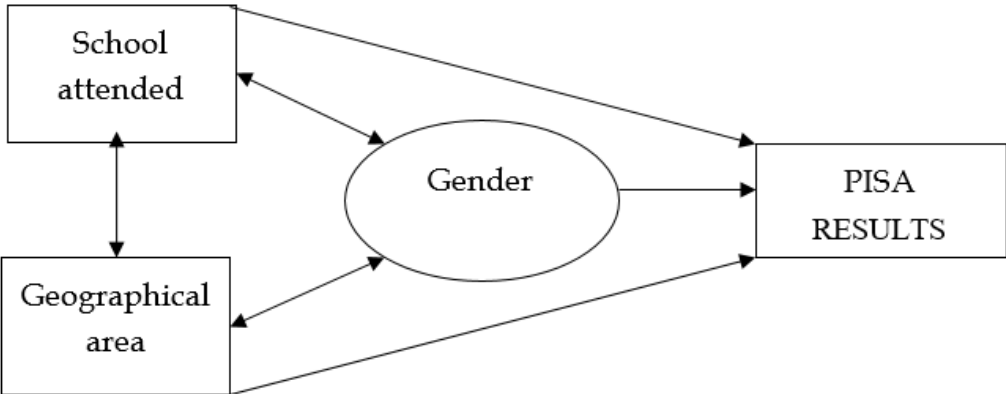


Figure 2 - The gender-based conceptual model

The conceptual model assumes that the results of Reading literacy and Mathematics literacy tests are directly affected by three factors:

- a) gender;
- b) geographical area of residence;
- c) type of school attended;

and also that:

d) the general effect depends in turn on the school attended (and therefore on the different preparation obtained, it being a well-known fact that the post-mandatory school choices in studies of males and females are not homogeneous and differ considerably;

and finally that:

e) the gender effect also depends on the geographical area of residence (and therefore on the school system prevailing in the various territories).

In short, the conceptual model shown in Figure A prove the effect of gender must not be confused with that of the school attended or with that dictated by the area of provenance.

The role of gender in defining the PISA results in the Italian case

Once the overall picture of the analysis has been clarified we can now focus on the Italian case by analysing the scores obtained by boys and girls and using as fixed parameters the geographical area (Italy features very large geographical differences) and the type of school attended (the various types of schools also differ greatly as regards gender-based composition). The latter data can be further analysed considering that the groups of schools considered consist of institutes that prepare their students in highly different ways. In the 'licei' (upper secondary schools), the curricula range from classical studies to scientific studies, from art to humanities. In the technical schools, there is an even larger disparity between economic/commercial and technological/industrial programmes and approaches, and the same applies to vocational training. The four groups are, however, representative of the various scholastic levels existing in Italy. As regards the geographical subdivision, the sectors considered (North-West, North-East, Center, South, Islands) effectively describe the cultural, economic and social reality of Italy.

When analysing the results (Table 3), the following phenomena stand out:

- As regards reading, girls outperform boys in all Italian geographical areas and in almost all kinds of schools; the gap in favour of the girls narrows with the increase in prestige of the type of school, and therefore in the 'licei' the boys outperform girls, albeit by very little, while in the technical and professional schools the difference in favour of the girls is significant and peaks in the vocational training schools;
- As regards Mathematical literacy, boys are always ahead by geographical area, although the gap narrows when we look at school type, and diminishes in parallel with the decrease in level of prestige of the school: the gap is widest in the 'licei', consistent in the technical schools and

limited in the professional schools, shrinking to almost no gap in the vocational training centers.

Gender differences with regard to literacy actually exist and the data show greater female ability in understanding the texts and greater male ability in mathematical conceptualisation. The geographical area, however, that coincides with different levels of school organisation quality, can significantly mitigate these trends. Within the same territory, for example, girls outperform boys in reading, but the boys living in the North-Eastern regions (the area in Italy where the schools are absolutely the best) are just a few points behind the girls of the North-Western regions and far above the girls of the Southern regions and the Islands. This is also true with regard to mathematical skills in which the boys outperform the girls although the girls living in the North-Eastern regions score just a few points below their male peers in the North-Western regions and score above the boys living in Italy's central regions, and definitely outperform the boys living in the South and in the Islands.

Similarly, the type of school attended also has a significant impact in gender dynamics. Even though the girls greatly outperform the boys in Reading literacy in the technical and professional schools and in the vocational training centers, the same cannot be said for the 'licei' where the boys score slightly above the girls (this is most probably due to the greater self-selection operated by the males enrolling in a liceo, to the point where less than two fifths of all students are male). The boys of the technical schools, moreover, outperform the girls of the professional schools and of the vocational training centers. This is also true for Mathematics literacy in which the less performing gender (the girls) anyhow scores higher than the boys attending a lower level school.

These data allow us to conclude that in defining the scores, gender plays a significant role within the same geographical areas (and therefore having the same school quality levels) and when attending the same school type but that, at the same time, geographical area and school type appear to be equally decisive when assessing the performance level achieved beyond gender too.

Table 3 – Average scores by gender (geographical area and type of school attended in Italy being equal)

Geographical area	Reading literacy				Mathematics literacy			
	Average score			Δ M - F	Average score			Δ M - F
	Total	Males	Females		Total	Males	Females	
N-W	503	494	511	-18	505	517	495	+22
N-E	515	509	521	-12	525	535	514	+21
Centre	488	485	492	-7	497	509	486	+23
South	461	452	471	-19	468	476	458	+18
Islands	451	437	462	-25	446	453	440	+13
Italy	485	477	493	-16	490	500	480	+20
School type	Average score			Δ M - F	Average score			Δ M - F
Total	Males	Females	Total		Males	Females		
CFP	417	405	433	-28	416	417	415	+2
Ist.Prof.	410	405	415	-10	424	431	417	+14
Ist.Tecn.	473	471	479	-8	490	497	474	+23
Liceo	526	528	524	+4	521	547	505	+42
Italy	485	477	493	-16	490	500	480	+20

Source: OECD, PISA 2015 Database, INVALSI processing

Note: CFP = Vocational Training Centers; Ist.Prof. = Professional Schools; Ist.Tecn = Technical Schools.

In addition to the awareness that school type and geographical area have a strong impact, it is also interesting to analyse the way in which performance is distributed among the genders by using the scores that define the low and top performers based on the general parameters defined by the whole set of results collected in the PISA study.

The consistency of the groups by competence within genders is not surprising because it confirms all of the trends seen up to this point (Tables 4 and 5).

Table 4 – Percentage of low and top performer students by gender in Reading literacy in Italy

	Males	Females	Total
Low performers (less than 407.47 points)	24.1	17.9	21.0
Average performers (between 407.47 and 625.60 points)	71.0	75.7	73.3
Top performers (more than 625.60 points)	4.9	6.4	5.7
Total	100.0	100.0	100.0

Source: OECD, PISA 2015 Database

Table 5 – Percentage of low and top performer students by gender in Mathematics literacy in Italy

	Males	Females	Total
Low performers (less than 420.07 points)	20.7	25.8	23.3
Average performers (between 420.07 and 606.98 points)	66.1	66.4	66.2
Top performers (more than 606.99 points)	13.2	7.8	10.5
Total	100.0	100.0	100.0

Source: OECD, PISA 2015 Database

Conclusions

The gender perspective in reading social phenomena, now widely accepted by scholars and institutions, leads to the overcoming of the nativism that traditionally assigns skills and competences in different disciplines to males and females and interprets the difference in their choice of school and university – and consequently of job careers (Bettio 2008; Triventi et al. 2015) – as natural and therefore connected to biological factors. Up until the 1990's, there was a shared conviction that girls and women had fewer skills in mathematics compared to boys and men (Hyde, Fennema & Lamon, 1990). The statistics show, instead, that in recent years the scoring gap between male and female students resulting from national and international tests is closing (Hyde & Linn, 2006; Stoet & Geary, 2013).

The increase, albeit slowly growing, in choices outside the stereotypical gender-related secondary and tertiary paths seen among girls (including the enrolment in technical schools and in technical, scientific and statistical university curricula) confirms the prospect of a more balanced distribution of jobs, both horizontally and vertically, among men and women (the MIUR data confirm this for Italy).

The latest studies have shown that the factors acquired have a significant impact on learning and on school performance. The main factors are the culture of belonging (Guiso et al, 2008), the role attributed to women in different societies, and especially in the in the labour market, the education and the social class of parents, the distribution of domestic and care duties within the parental couple, the home learning environment (Melhuish et al., 2008) and the proposals of number-based games and activities more frequently addressed to males. After all, a rigid planned gender division can be seen in every toy store (Jacobs & Eccles, 1992; Jacobs & Bleeker, 2004; Sartori, 2010).

Moreover, as regards the school, a greater focus on overcoming the traditional models of male and female representation in the textbooks at primary school level (Biemmi, 2009; Biemmi, 2010) and the dissemination of teaching methodologies (Cooperative learning and Peer education) aimed at integration and cooperation between all students, are thought to be an important booster in a gender equality oriented school education model.

Special attention is paid to the impact of sexist stereotypes and prejudice against women that are widely common even in the most advanced societies. Particular attention is given to the mothers' endorsement and reproduction of these stereotypes, as mothers usually play a leading role in the development of their children's school performance starting from early childhood and have a significant influence (Bleeker & Jacobs, 2004; Lindberg, Hyde & Hirsch, 2008; González de San Román & De la Rica Goiricelaya, 2012).

The variables interacting with gender are many and not always assessable with similar and neutral tools. This complex analysis and the assessments of learning are therefore not always comparable (DIES, 2007). The results of the studies are therefore contradictory (Tomasetto et al., 2011).

Anyway, the sensitisation of parents about stereotype-free educational models, the training of teacher in gender equality, the new guidance teaching methods sensitive to gender disparity will favour the opening up of prospects for girls towards less typified and not coherent choices with the expectations of the female role. The reinforcement of their self-esteem and the belief in their potential with regard to subjects that are considered more suitable for males will help them choose their educational and occupational future based on their abilities, interests and dreams.

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