PLAN INTERNATIONAL

Università Bocconi
DONDENA
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UniCredit Foundation

CURRENT AND FUTURE CHALLENGES FOR GENDER EQUALITY IN ITALY:

THE GENDER DIGITAL DIVIDE

Plan International and Bocconi University

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A GAP TO OVERCOME IN ORDER TO ACHIEVE EQUALITY

As indicated in the report made by Plan International and Bocconi University, financed by Unicredit, Italy ranks 25th in the gender parity ranking in the use of digital tools, behind Greece, Romania and Bulgaria. Moreover, the latest data from Eurostat indicate that still 19% of Italian women - compared to 15% of men - had never used the Internet in 2019.

These data should put us on alert, because for some time now, and especially since the crisis caused by the COVID19 has moved much of our lives to the online environment, digital skills have proven essential for participation and development of citizenship in all areas, as essential knowledge to continue learning, working and communicating.

Communication and relationship technologies must be, in line with what is set out in Sustainable Development Goal 5 of Agenda 2030, tools that facilitate the empowerment of girls and young women and not the cause of a deeper exclusion. This means that girls and women must have equal access to devices and technologies, must be trained to develop the skills and knowledge necessary to use them, and must also be encouraged to participate in the creation of the digital solutions themselves.

The so-called digital divide, which can be about access, use, or training, is based on a series of stereotypes that continue to reinforce the perception, both of oneself and of others, that the field of technologies is not a space for girls, young women, and women. The men and women who participated in this study highlight different barriers to the use of new technologies: men mainly perceive educational and working barriers, while women disproportionately point to social obstacles. Women reported feelings of “fear” or “anxiety” about technological tools and men noted security or confidence in their use.

That’s why, as also noted in data cited in this study, in the case of Italy, in 2016 only 32% of science graduates were women, compared to 68% of men. This has a direct impact on the professions they choose and, for example, in 2020 only 19% of women were working in the engineering field.

To overcome these gaps, it is necessary to work from the basis of inclusive, quality and equal education, which promotes paths free of biases, prejudices and gender stereotypes, as well as to raise sensitization in society, families and public and private institutions, so that appropriate measures are launched to make technologies tools for equality. In this sense, this study reflects that, although the gap at early ages is not deep, it is increasing as they grow up, precisely because of all these stereotypes, this lack of referents, these social difficulties that women notice in their way to knowledge and use of digital competences.

Faced with this scenario, at Plan International we believe that change can only be promoted by tackling the problem from the root: gender barriers, including in the digital world. From the contents and training itineraries to the work functions, offering, under equal conditions, non-traditional professional opportunities for both women and men. Girls and young women must feel free, capable and empowered to choose and opt for training and employment opportunities in areas of added value and future such as information and communication technologies, as well as entrepreneurship and business development courses.

A very relevant part of the development of girls, adolescents and young women will be marked by their capacity for learning, leadership, decision-making power, and opportunities for employment and entrepreneurship in a world in digital transition, which must also be a fairer and more egalitarian society.

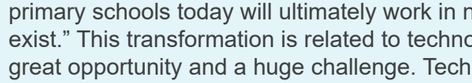
Concha López
CEO Plan International

According to the “Future of Jobs” report of the World Economic Forum, “65% of children entering primary schools today will ultimately work in new job types and functions that currently don’t yet exist.” This transformation is related to technological changes and require new skills. It is both a great opportunity and a huge challenge. Technology enlarges the potential of growth and creation of new jobs, while it also implies disruption of current jobs and the rise of skills instability across all jobs.

If girls are less equipped than boys to access the digital sector, gender equality is seriously challenged. The low presence of girls in STEM (science, technology, engineering, mathematics) disciplines raises concerns on the future gender equality on the labor market. What is needed is an effort from individuals to adapt to the new skills requirement, from firms to manage the transition towards the new technology-driven business and from government to create a favorable environment to support boys and girls in the new scenario.

Italy is characterized by wide gender gaps. The female employment rate in Italy is today lower than 50%. Women risk to suffer more the economic consequences of the COVID-19 pandemic, because they are more vulnerable on the labor market and because they are carrying on most of the burden of housework and childcare which increased substantially during the lockdown. Closing the gender digital divide today is more urgent than ever, in Italy and other similar countries.

This report analyzes the digital gender gap in Italy, it identifies the elements that prevent and promote the access of girls to STEM educations and of women to jobs in digital and new technology sectors, including stereotypes and provides recommendations on how to decrease the digital gender gap. The results of the report enrich our understanding of the gender digital divide and encourage a critical debate on how to act rapidly in the direction of achieving more equality between girls and boys in digital skills and outcomes. This action will have long-term implications.



Paola Profeta,
Coordinator of the Dondena Gender Initiative, Bocconi University

1. INTRODUCTION: RELEVANCE OF THE STUDY; OBJECTIVES AND METHODOLOGY

Despite new technologies are one of the strongest drivers of our society, **women still experience limited access to the digital sector in terms of education, career and opportunities, with consequences not only in terms of gender equality but also of productivity and financial loss**. The European Commission's study "Women in the digital age"[1] shows that in Europe only 24 out of every 1000 female tertiary graduates have an ICT-related subject - of which only six go on to work in the digital sector. There are four times more men than women in Europe with ICT-related studies, and the share of men working in the digital sector is 3.1 times greater than the share of women.

The annual productivity loss for the European economy of women leaving their digital jobs to become inactive is calculated to be about EUR 16.2 billion and, although female owned start-ups are more likely to be successful, there is a decrease in participation, leadership and investment in the entrepreneurial digital sector. A study carried out by Plan International and the PWC Foundation[2] in Spain highlights that, **despite girls being the most numerous users of new technologies, the general perception presents boys being the more involved with them**. At the same time, even though there is no differential impact of gender issues on IT work, boys are usually preferred in the selection process and in terms of career progression. In the same study, girls mention that they received less training and attention towards IT careers in their educational environment, and that the learning they have been able to acquire has been largely "self-taught".

Within this gender-unbalanced scenario, countries like Finland, Sweden, Luxembourg, and Denmark perform better than the average, while some other member states do unfortunately widen their gender gap in the digital sector. That is the case of **Italy** where, together with Bulgaria, Romania and Greece, **women are the least digital**.

Nevertheless, the analysis of the gender digital divide in Italy is still lacking, both in terms of portrayal of the phenomenon and on identification of causes and possible solutions. An examination is necessary to identify key factors that are currently reinforcing the digital gender gap along with potential boosts for the role of women and girls in new technologies.

[1] https://ec.europa.eu/digital-single-market/en/news/increase-gender-gap-digital-sector-study-women-digital-age
[2] https://www.pwc.es/es/fundacion/assets/mujeres-jovenes-empleo.pdf

The main objective of this study is to analyze the situation of the digital gender gap in Italy, identifying obstacles and elements of success in supporting girls access and involvement in STEM (Science, Technology, Engineering and Mathematics) educational and work careers along with possible corrective actions. Indeed, as from 2018 OECD report "Bridging the Digital Gender Divide", a lack of women and girls studying STEM subjects in schools and universities has led to a gender digital divide.

More precisely, we aim at identifying the elements that prevent and promote the access of girls to STEM educations and of women to jobs in digital and new technology sectors; analyzing common perception, biases and stigma related to the role of women and technology; analyzing the current and potential roles of stakeholders in preventing or supporting women representation in technological sectors throughout their journey from education to work and offer recommendations on how to decrease the digital gender gap.

To reach these goals, we first review documentary sources and bibliographic literature and then provide an analysis of data coming from different official sources, along the lines described above. We finally provide recommendations for the stakeholders. This report is descriptive in its nature and the analysis is not meant to be causal. The report is not fully representative of the multifaceted realities of the Italian context.

To complete the study, and to take into account the voice of girls and young women (an essential principle in Plan International), we also provide results of three e-Delphi surveys we conducted on a total of 14 Italian young people aged between 18 and 29. The group is equally balanced among men and women, STEM and non-STEM graduates/ students, who live in 8 different Italian regions spread among Northern, Centre and Southern areas. Their contribution has proven to be an essential reading key of the driving forces behind the gender digital divide, and their voices can be read in dedicated text boxes throughout the lines of this report. Methodologic details on the constructions of our e-Delphi surveys can be found in the Annex to this report.

The final aim of this document will be primarily to raise awareness on the matter of the study and provide evidence-based information for advocacy actions.

Plan International believes that the foundations for an economically empowered generation must be laid at an early age to give young people all the opportunities they need to fulfil their ambitions and realise their rights and potential. In particular, girls and young women must be supported at every stage of their lives to make decisions, access education and training, challenge gender stereotypes, secure decent work with equal pay, or run their own businesses. We are entering a technological revolution that will transform the way we live and work, and we must ensure that it is truly gender-transformative and inclusive for all. Without a specific focus on harmful gender norms and gender discrimination, we risk continuing to perpetuate the economic dependence experienced by many girls and young women.

2. FACTS AND FIGURES

2.1. MAIN DIMENSIONS OF INTERNET USE AMONG THE POPULATION

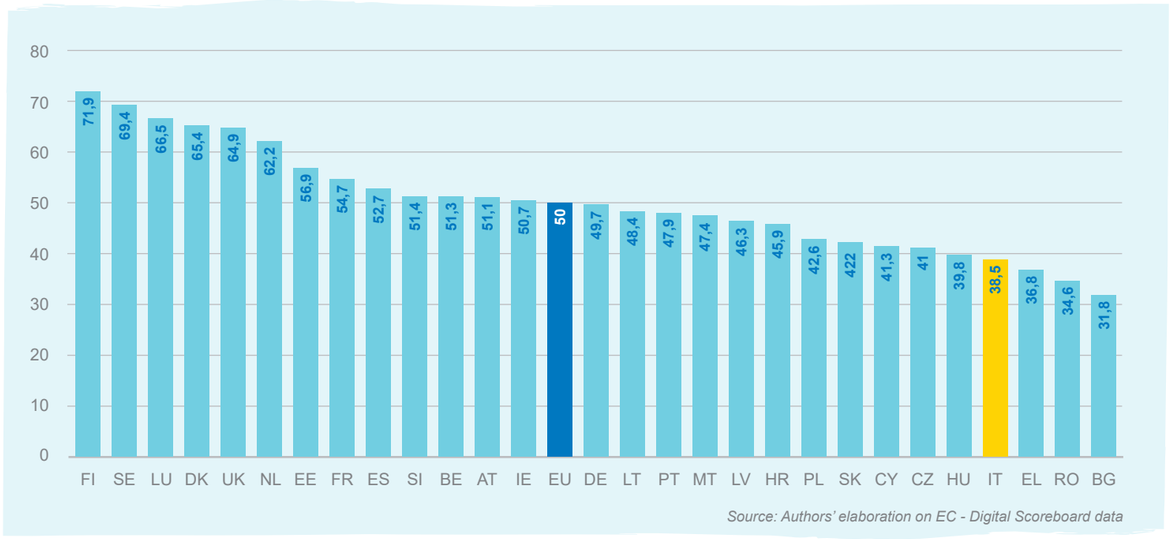
In order to cast light on the current state of the Italian gender digital divide, this section provides data and figures portraying the phenomenon along its main dimensions.

Figure 1 gives a snapshot of the current situation in Italy, as compared to the rest of European countries. Data are gathered from the "Women in Digital (WiD)" 2019 scoreboard and assess Member States' performance in the areas of Internet use, Internet user skills as well as specialist skills and employment, based on 13 indicators.

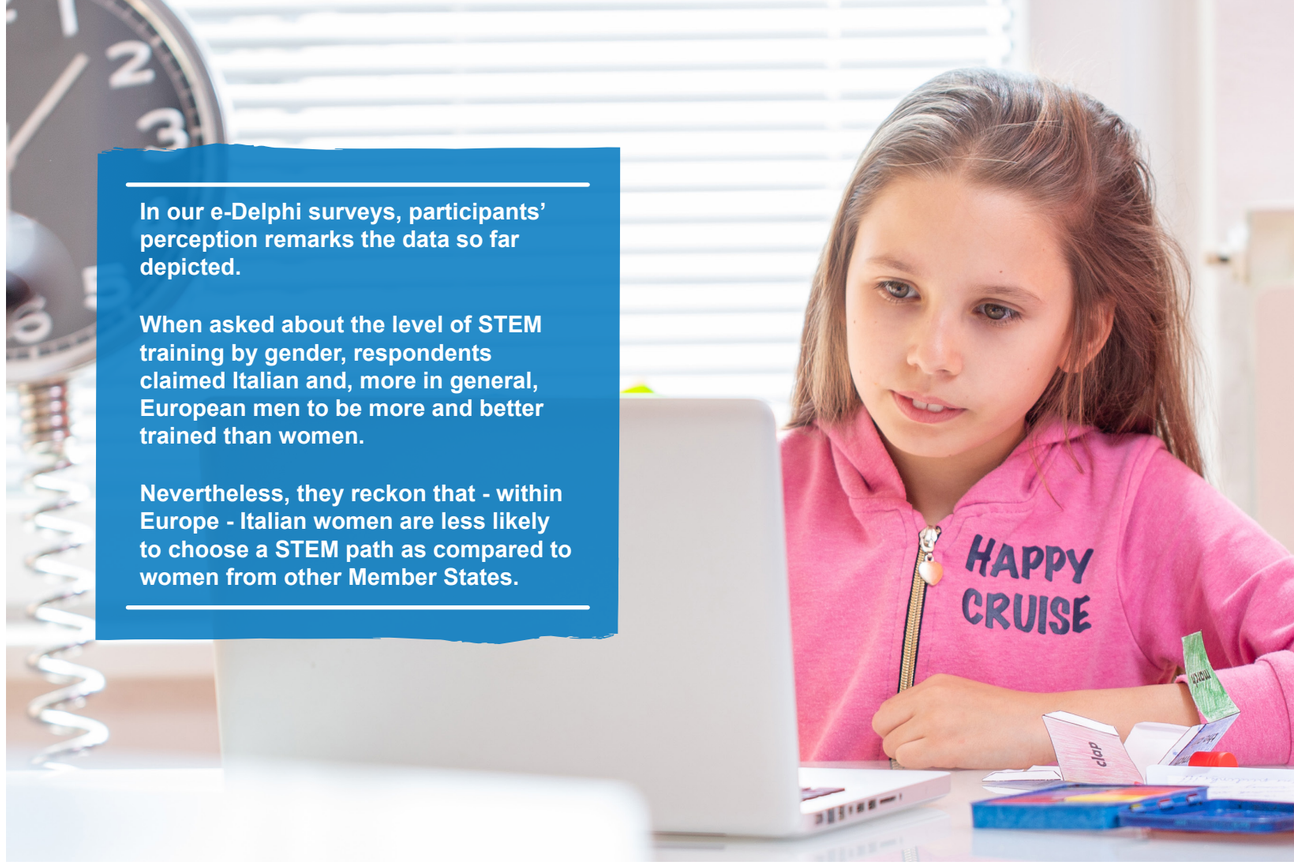
Italy is ranked 25th out 28 Member States in terms of digital gender parity, twelve positions below the European average. Greece, Romania and Bulgaria are the sole countries performing slightly worse than Italy. **But what are the strongest disparities that place Italy so low in this ranking?**

Disentangling each of the three dimensions that make up the WiD score, Italy's worst performance is in the domain of "Internet user skills": 38% of Italian women have basic or above basic digital skills, as compared to 45% of men. The picture slightly improves for "Specialist skills and employment": the gender divide in STEM graduates and ICT specialists is closer but still lower than the European average, which already depicts a far from gender-equal scenario. Namely, gender-parity in STEM graduates is 8 positions below the European average, and 10 positions below for ICT specialists.

Figure 1. Women in Digital (WiD) score, 2019



Source: Authors' elaboration on EC - Digital Scoreboard data



In our e-Delphi surveys, participants' perception remarks the data so far depicted.

When asked about the level of STEM training by gender, respondents claimed Italian and, more in general, European men to be more and better trained than women.

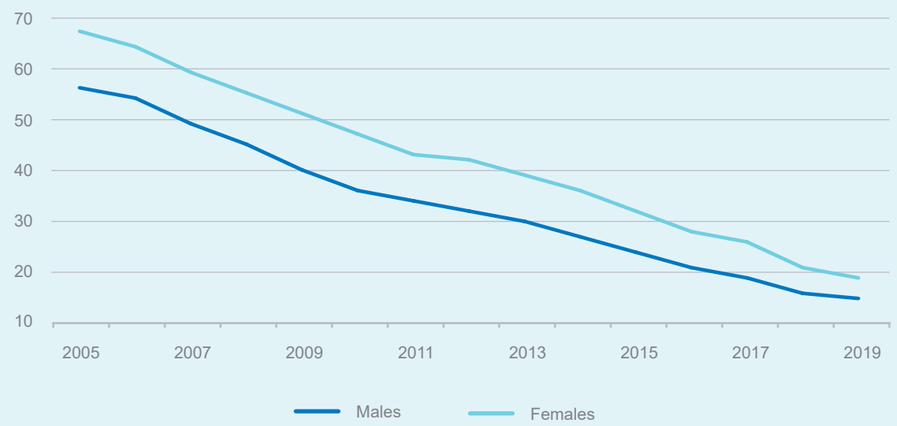
Nevertheless, they reckon that - within Europe - Italian women are less likely to choose a STEM path as compared to women from other Member States.

With respect to the percentage of people who never used the Internet in Italy, though the total number has been remarkably declining over time, the gender gap has not significant improved from year to year, with the percentage of women left out of the web steadily above men (see Figure 2).

Nevertheless, enlarging access to the Internet and offering more digital devices do not straightly translate into gender-equal opportunities (Vaccari, 2009). Bracciale (2010) even warns on thinking of the solution as giving women and men the same access to the Internet[3]. Assessing "how many men and women" surf the web is not sufficient. It is rather necessary to test how men and women implement digital resources: women often exploit ICTs to facilitate interpersonal relations and gather information related to the home management, while men are more likely to exploit the Internet for their personal and professional development (Colley & Maltby, 2008).

[3] If any, providing women with the same technologies as men could work in the first era of Internet diffusion (Bracciale, 2010).

Figure 2. Italians who never used the internet *(% of individuals)*



Source: Authors' elaboration on EC - Digital Scoreboard data

2.2. THE DIGITAL GENDER GAP IN THE WORLD OF WORK

Segregation along these lines ends up reflecting into gender gaps also across professional clusters, most severely across clusters of professions which will be at the forefront of the emerging economy and require highly digital skills. In collaboration with LinkedIn, "The Global Gender Gap Report 2020" (World Economic Forum) identified eight growing professions, spanning People and Culture, Content Production, Marketing, Sales, Product Development, Data and Artificial Intelligence (AI), Engineering and Cloud Computing.

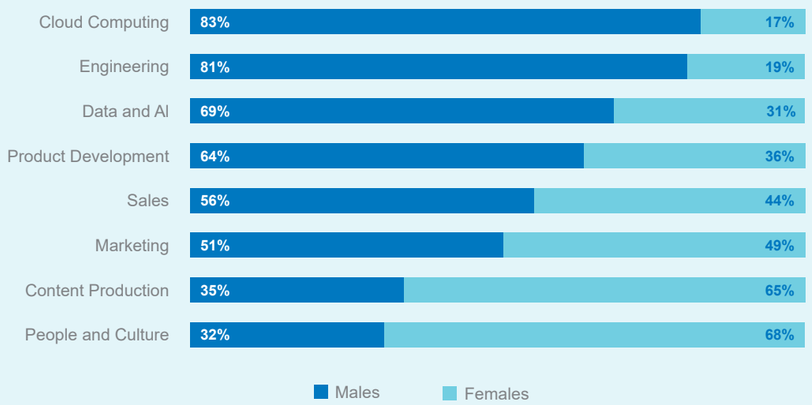
As from Figure 3, in Italy only two out of these eight clusters exhibit greater employment of women as compared to men—People and Culture, Content Production. More importantly for our discussion, the most gender segregated professions, Cloud Computing, Engineering and Data and AI, span clusters which require digital skills and knowledge of latest technologies, casting further light on the importance of closing the digital gender gap.

Along these lines, the 2017 report on digital skills by AgID and MIUR claims that both firms and public entities in Italy crucially need workers like cloud security architects, big data scientists, robotics system engineers, AI software engineers and other job profiles with hard skills as cloud computing, engineering, data management and AI. Bearing these figures in mind, the picture portrayed in Figure 3 is even more alarming in terms of female employment and career prospects.

Plan International recognizes that investing in the economic empowerment of young women, through decent work, is the right and smartest thing to do to promote gender equality and inclusive and sustainable economic growth, particularly within the emerging technological revolution.

Increasing the competitive female workforce requires providing different opportunities for girls and young women - especially in high economic growth sectors such as science, technology, engineering and mathematics (STEM) and sustainable "green" energy.

Figure 3. Share of Italian men and women by professional cluster, 2020



Source: The Global Gender Gap Report, 2020. World Economic Forum

The opinions from the people who participated to our survey do not contrast the positive role ICTs can play for the future of the employment.

Respondents do not think of technology as a possible risk for employment, but rather as a possible opportunity to exploit, and that is even more true for female than for male employment.

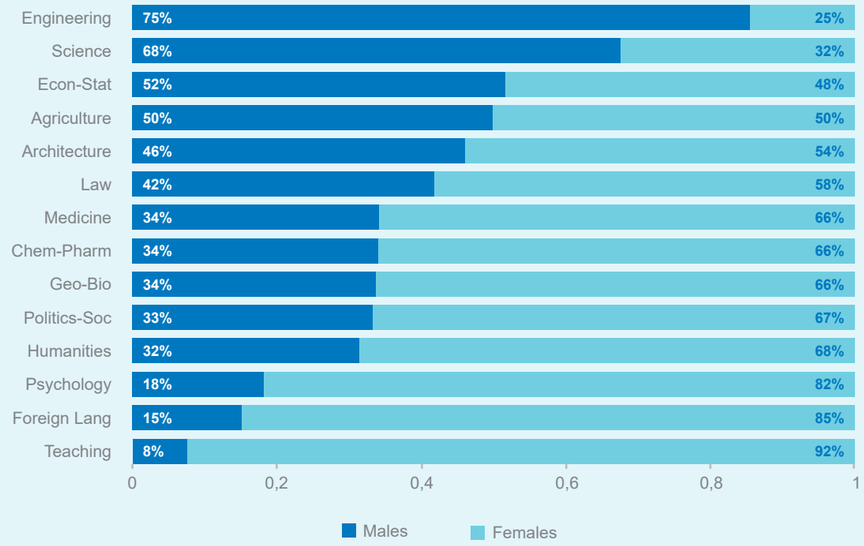
The digital gender gap in education and its impact on employment Education, for Plan International, must also address gender barriers within the content and development of education, and prevent gender segregation in learning and work functions by providing, on equal terms, non-traditional career opportunities for both women and men. Girls and young women must feel empowered to embrace "non-conventional" study topics and training options, such as Information and Communication Technology (ICT), Science, Technology, Engineering, and Mathematics (STEM), and entrepreneurship or business development courses.

Roads start diverging by gender even before entering the job market, when young adults choose their academic path. As we have already seen from Figure 3, the digital revolution is changing the future of the employment at a very fast pace: around 15% of Italians currently employed is at risk of automation[4]. In this realm, STEM subjects get increasingly important for the employment prospects of young Italians, as they increase the chances of quickly finding a job and receive a better pay, as compared to non-STEM degrees.

In 2017, Almalaurea reported that men make up 59% of STEM graduates, and the percentage increases to 74% and 68.4% when focusing on Engineering and scientific fields, respectively. Figure 4 gives a more complete picture of the distribution of Italian graduates by main subjects, showing a disproportionate picture by gender in the most technical and scientific sectors. If we narrow the picture down to the sole bachelor students of ICT-related subjects (Figure 5), we observe that men increasingly choose this path, as opposed to the roughly stable number of women. Consequently, the gender gap in the number of ICTs students has been increasing over time, and as of 2017 four times as many men as women were newly enrolled in ICT bachelor courses.

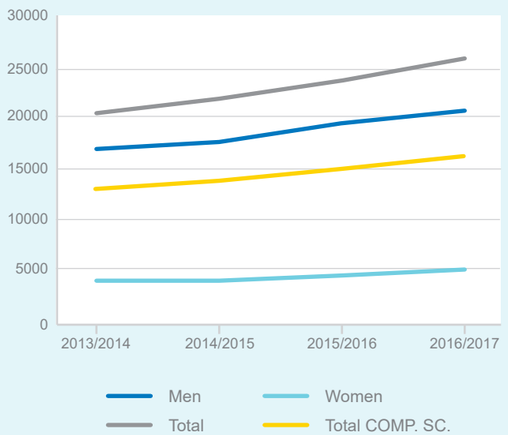
[4] https://www.ambrosetti.eu/wp-content/uploads/Ambrosetti-Club-2017_Ricerca-Tecnologia-e-Lavoro.pdf

Figure 4. Share of Italian graduates by subject and gender, 2016



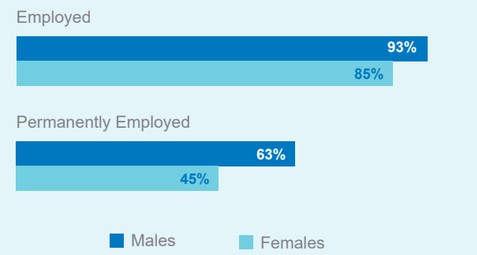
Source: Authors' elaboration on ISTAT data

Figure 5. Italian bachelor students enrolled in ICT-related subjects, by gender



Source: Osservatorio delle Competenze Digitali 2017

Figure 6. STEM students 5 years after graduating, 2017



Source: Rapporto Almalaurea 2018

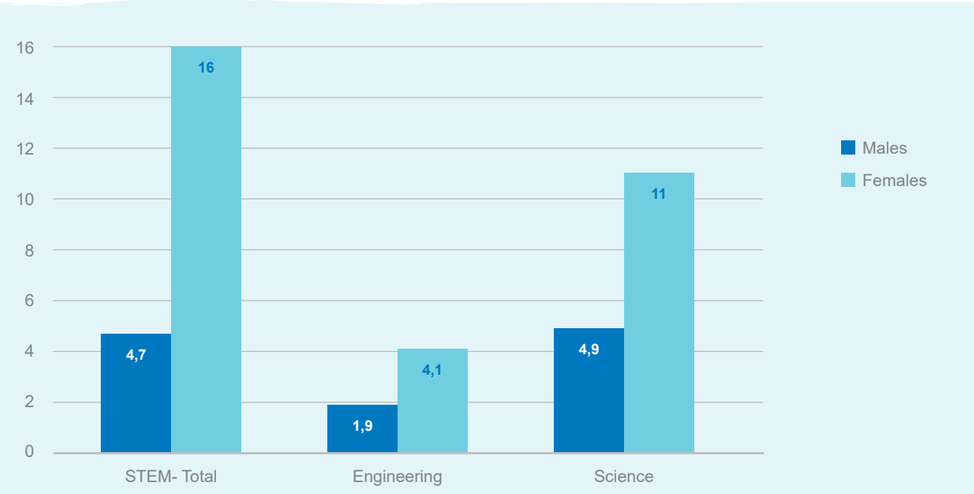
> **"Girls are 5 times less likely to consider a career in tech than boys."**
>
> Digital empowerment of girls, Plan International, 2018

But what about STEM graduates? Even among them, Italian women do not have a great time. Evidence from the 2018 "Almalaurea" report (see Figure 6) shows that, five years after obtaining their STEM master degree, 85% of women are employed, as compared to 92.5% of men. The percentages are alarming for women if we bear in mind that, among non-STEM graduates, employment rates are 88.5 and 83.4% for men and women, respectively. But the gap widens even more if we focus on the percentages of STEM graduates with a stable job: five years after obtaining their master degree, the percentage of women (45.1%) is well below the rate of their male counterparts (62.5%).

Furthermore, five years after obtaining their master degree, STEM male graduates earn on average 23.6% more than their female colleagues. The results are partly due to the fact that women are more likely to work part-time as compared to men (see Figure 7).

These numbers remain surprising if we account for university performance by gender. From Almaurea 2018 Report we know that, as compared to men, women obtain their STEM degree with a higher final grade and in less time, and they are also more likely to leave as exchange students and have a working experience while studying.

Figure 7. Part-time contracts 5 years after graduating, 2018 (%)



Source: Rapporto Almalaurea 2018

2.3. THE AGE-RELATED DIGITAL GENDER GAP

But what about the latest generations, who stand out for their technology use? Figure 8 reports an interesting piece of evidence: when disaggregating by age and gender, the situation reverses for young women aged 16-24, as they hold slightly higher digital skills than their male counterparts and make up the most digital-skilled group.

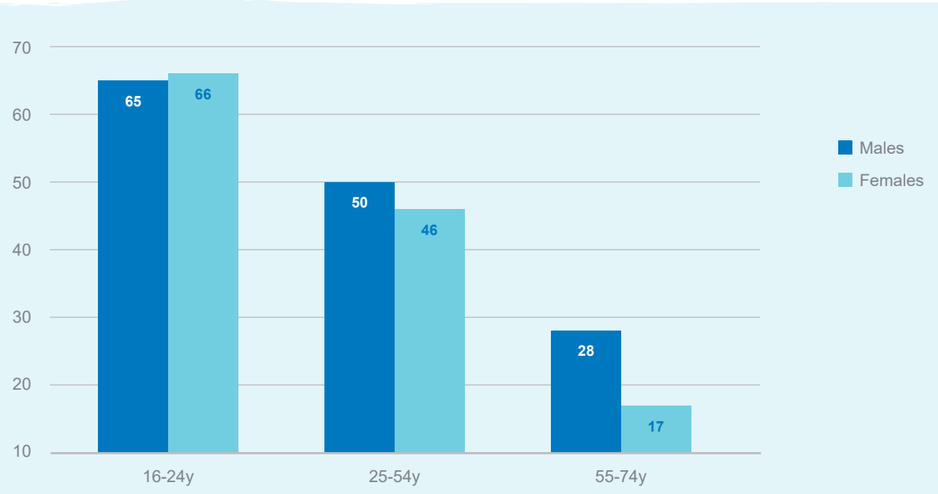
Even among our e-Delphi respondents, the common perception is that no gender digital divide exists among youngest generations. Our respondents maintain that, if any, gender differences in the use of technologies realize for people aged 30 and more, when men are more likely to use ICTs as compared to women.

The evidence from Figure 8 is however far from clear-cut. At a first glance, these data seem to suggest that the youngest cohort in the graph has closed the gender gap: it is tempting to affirm that may be the case, probably because this group encompasses the so-called "Millennials" and (partly) "Z" generations, which are the age groups the most familiar with communication, media and digital technologies. Nevertheless, sticking to this rationale can be risky, as it may downgrade the gender digital divide to a problem belonging to past generations. Young women are surely more digitally skilled than their mothers and grandmothers.

But what if Figure 8 is warning that the gender digital divide can increase with age?

In 2015, in a report from Sodalitas Foundation, a large group of Italians declared it **self-acquired** or learnt digital capabilities from **work**, while just one of three respondents acquired digital skills at school.

Figure 8. Basic or above basic digital skills by age and gender, 2019 (% of individuals)



Source: Authors' elaboration on Eurostat data

The results of our e-Delphi align these data: 93% of our sample declared it self-acquired using ICTs. Solely 36% of the respondents learnt using technology at school/university, with a percentage slightly higher for women than for men.

The use of ICTs develops with “learning by doing” techniques, which can be more easily implemented at home rather than at work, where external pressure and imposed deadlines do not feasibly allow workers to learn by doing mistakes. These results are important for our discourse: as women gets older and create a family, they share a disproportionate amount of informal caregiving at home, and hence have lower time at their disposal to “learn by doing” as compared to men (Bracciale, 2010). That is particularly true for Italy, where 74% of Italian women declare they do not share home duties with their male partners. In this respect, Italian girls may be as digital as boys at young ages (or even more digital), but as they grow up and their spare time declines, they may stop the digital learning process. Conversely, men can still spend their time at home to self-develop their digital skills, with a consequent widening of the gender digital divide.

Moreover, as the group of people aged 16-24 in Figure 8 is mostly made up of young Italians who are not in the labor market[5]. Gender digital divide may well realize and increase with age and job experience, especially in technical-scientific working sectors. In this respect, women make up 31.7% of workers employed in these fields in Italy, well below the European average that is around 40%.

[5] A 2018 report from Almalaurea disclosed how Italians, on average, start working at around 24.8 years old.

3. UNDERLYING CAUSES: CULTURAL AND EDUCATIONAL STEREOTYPES

In developing and emerging economies, structural problems hinder women to use the Internet and other digital devices. First and foremost there are still hurdles to access, women start from a difficult situation regarding the knowledge of technologies and families are often reticent about women owning a mobile phone or surfing the web, because of sexual harassment and safety-related concerns. For example, for women in People’s Republic of China and Mexico, harassment is among top barriers in owning and using a mobile phone (Global System Mobile Association, 2015).

But in the most developed parts of the world as Italy, girls and women face other types of constraints to their full digital empowerment, and these constraints are to be analyzed in a wider and more complex cultural scenario. Digital competence, defined as the capacity to acquire, process and communicate digital information, is affected by socio-cultural background, including the home environment, cultural capital and academic orientation.

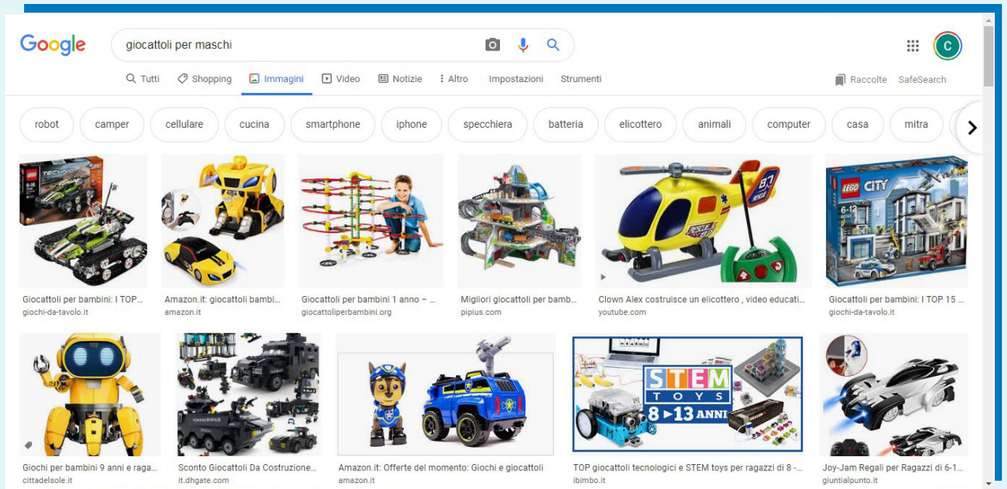
Male and female respondents from our e-Delphi surveys highlight different barriers to the use of new technologies: men mostly perceive educational and working barriers, while women disproportionately point at social obstacles.

In this respect, gender stereotypes strongly afflict Italian culture and portray digital competence as a “boy thing”, even among youngest generations. In a newly published research from Istituto Toniolo and Ipsos, more than one third of the respondents thinks that men are “absolutely” better than women at computer sciences, and the percentage increases even more if we solely focus on male interviewees. Conversely, just 6.5% of the sample believes women to be “generally” better than males at computer science, with a surprising 5.7% among female respondents.

Engendering the digital world is a common practice that takes hold from very young ages, when different types of games are often regarded as appropriate for baby boys and girls. “Feminine” games typically address housework, family care or stereotypical canons of beauty. Conversely, baby boys usually play with adventure games, toys that appeal manual and engineering skills or incite violence, together with a wide range of technology games.

Figure 9 gives a hint on the magnitude of the phenomenon. The screenshot is taken from Google Italy and gives the first results from “toys for boys” and “toys for girls”, respectively. Needless to say, the upper image is devoted to young males, with a wide range of vehicles, often military tanks, mechanic monsters and soldiers, and a track for marbles and for cars. Interestingly, a result is devoted to “STEM toys”, which sends to a page in which there is a whole list of the best games that can help children to explore technologies.

Figure 9.



Source: Google. May 7th, 2020

The picture is quite different when we shift to “toys for girls”, a pink-dominated web page where little babies can choose to acquire cooking skills for each and every kind of food in fully furnished kitchen toys. Also in this case there is a STEM-related result, portraying a wide range of physicians supplies but no hint of technology.

We asked e-Delphi respondents to associate emotions to ICTs.

By and large, women have more negative or less positive sensations than men, while the latter perceive more clearly the positive options offered by new technologies.

In particular, women picked words that describe a path of necessity (86% of them) and dependence (71%, which raises to 100% among non-STEM women), disproportionately more than men do (29% and 14%, respectively).

Around 50% of male respondents associated “tranquility” to technologies, as opposed to a bare 15% among female counterparts.

Nevertheless, women and men equally think of ICTs as a “connecting” tool (46% of women and 54% of men) and an “opportunity” (54% among women and 46% among men).

In this realm, the computer-games industry contributes as well to plan the seeds of the gender digital divide. Computer games are indeed largely designed by men and for men, and thus write programs that would be more entertaining and motivating to boys, rather than girls (Harvey, 2011). The consequent result is that girls develop lower interest, negative attitudes, lowered performance and computer anxiety (Cooper, 2006).

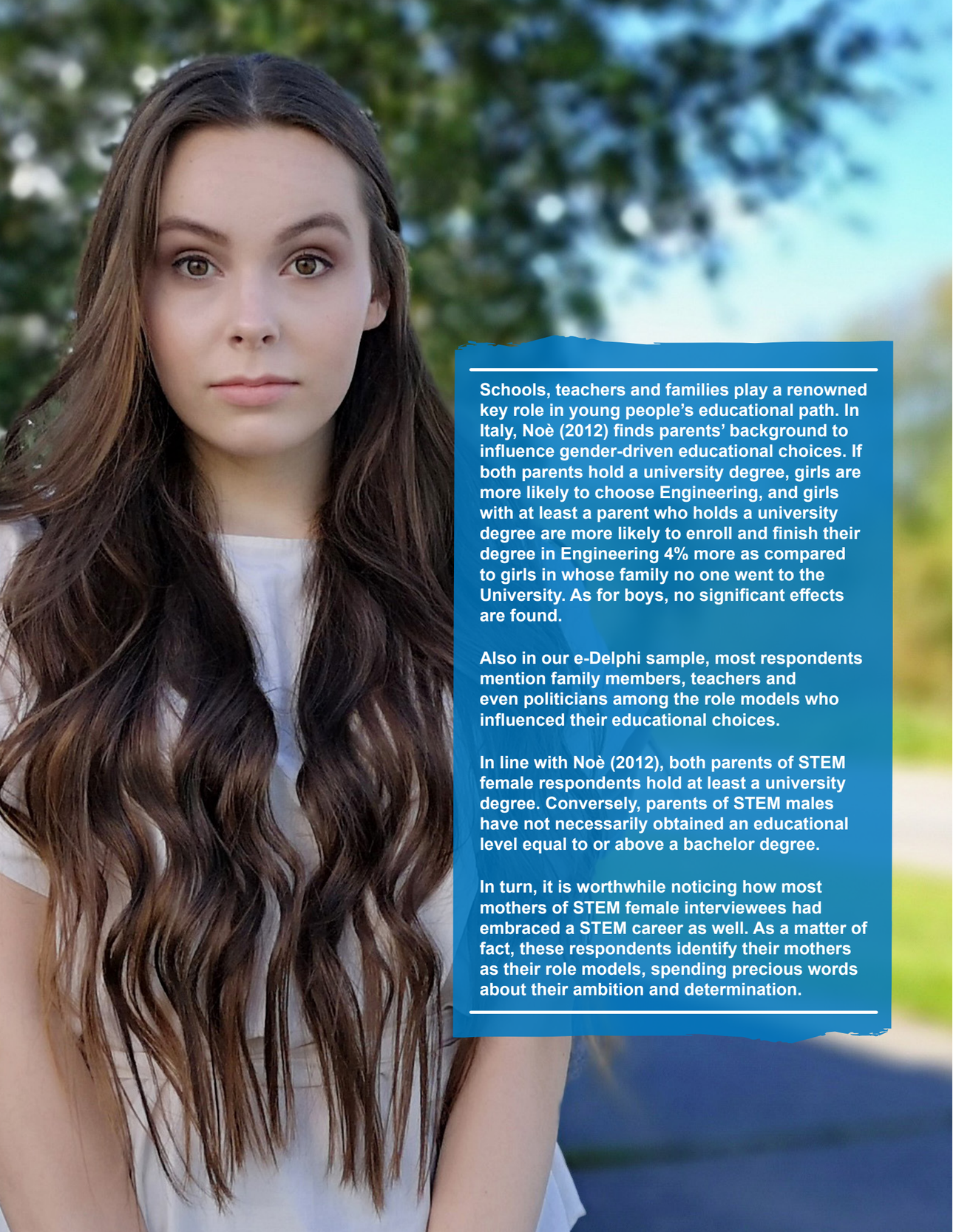
No surprise if 65.8% of Italian boys aged 6-10 loves playing videogames, as opposed to 47.5% of female counterparts[6]. Even in their fifteens, 56% of girls has never used a “one-player” videogame, while among boys the percentage significantly declines to 23%. In addition, 20% of the boys declares to use daily “multiplayer online” videogames, as compared to the sole 2% of female counterparts[7].

The results from our fieldwork corroborate these data. At younger ages, men used to regularly play videogames, and none of them declared he “rarely” or ”never” played videogames. Conversely, female respondents declared they “rarely” played videogames.

In this respect, it is interesting to refer to Marta Mulas’ book “Maschiacci” (Italian slang for tomboys, referred to women who act according to masculine stereotypes). The author interviews 14 Italian women who work as computer scientists and shows that, among others, they all used to play with games they regarded to be typically “masculine”, first and foremost videogames.

But stereotypes do not confine to the childhood and the game sphere. As children grow up, they keep being exposed to gendered social expectations and gender stereotypes, often both at school and within families, feeding the myth of science and technology as a “men thing”.

[6] https://www.istat.it/it/files//2011/11/report-infanzia-2011.pdf
[7] https://oa.inapp.org/bitstream/handle/123456789/165/INAPP_SINAPPSI_Di%20Castro_2_3_2017.pdf?sequence=1



Schools, teachers and families play a renowned key role in young people's educational path. In Italy, Noè (2012) finds parents' background to influence gender-driven educational choices. If both parents hold a university degree, girls are more likely to choose Engineering, and girls with at least a parent who holds a university degree are more likely to enroll and finish their degree in Engineering 4% more as compared to girls in whose family no one went to the University. As for boys, no significant effects are found.

Also in our e-Delphi sample, most respondents mention family members, teachers and even politicians among the role models who influenced their educational choices.

In line with Noè (2012), both parents of STEM female respondents hold at least a university degree. Conversely, parents of STEM males have not necessarily obtained an educational level equal to or above a bachelor degree.

In turn, it is worthwhile noticing how most mothers of STEM female interviewees had embraced a STEM career as well. As a matter of fact, these respondents identify their mothers as their role models, spending precious words about their ambition and determination.

At school age, parents are more likely to think that their sons, rather than their daughters, will pursue a career in STEM fields, and that holds true even when their daughters are as good as their sons in mathematics and science, subjects that highly interrelate with technology. By the same token, male and female teachers at all grade levels are routinely found to have gender-biases when grading students, with lower expectations in math for females than for males (Correll, 2001). These misconceptions make girls anxious and negatively affect their self-confidence in solving mathematics or science-related problems, even among top-performing students.

Results from our e-Delphi survey mirror this gender-unbalanced scenario.

We asked respondents to associate emotions to mathematics: one in two female respondents is afraid of or feels anxious about mathematics, and no woman thinks of this subject as "fun" or "relaxing". Namely, young women who chose to study STEM are not afraid of mathematics, but they still feel anxious about it.

Conversely, no man chooses to associate "anxiety" or "fear" to mathematics, regardless of whether they chose a STEM or non-STEM career.

Moreover, women point to commitment and teachers' skills as the driving force behind their good math performance, disproportionately more than men do. Conversely, 80% of male respondents thinks of its own skills as the key to its math success.

Nevertheless, women and men equally share "interest" and "satisfaction" for the subject. Moreover, we found no striking gender-differences when we asked them about their performance and how much they like mathematics.

All in all, male and female respondents seem to solely differ in their self-confidence, other than in their quantitative capabilities or taste of the subject.

These are the main reasons OECD[8] gives to explain why female students regularly underperform male counterparts in mathematics PISA (*Programme for International Student Assessment*) results, notwithstanding their better performance in other subjects. In a vicious cycle, worse results undermine even more girls' self-efficacy in both mathematics and science. The validity of this rationale is strengthen by the fact that the gender gap in math scores vanishes when assessing boys and girls who share similar levels of self-confidence and anxiety about mathematics.

In Guiso et al. (2008), authors classified OECD countries according to several measures of gender equality, finding a positive correlation between this index and gender gaps in 2003 PISA mathematics scores. In more gender-equal cultures, such as Norway and Sweden, the math gender gap disappears, with results robust to both levels of economic development and country-specific unobserved heterogeneity.

In this context, Italy presents particularly alarming numbers, as shown in Figure 10. The gender disparity in math scores averages 20 points, well below the mean gap (8 points) of the other countries subject to PISA surveys. Science scores are not reassuring neither, recording a gender gap of 17 points, as opposed to the OECD average of 4 points.

[8] https://www.oecd.org/pisa/pisaproducts/pisainfocus/PIF-49%20(ital).pdf

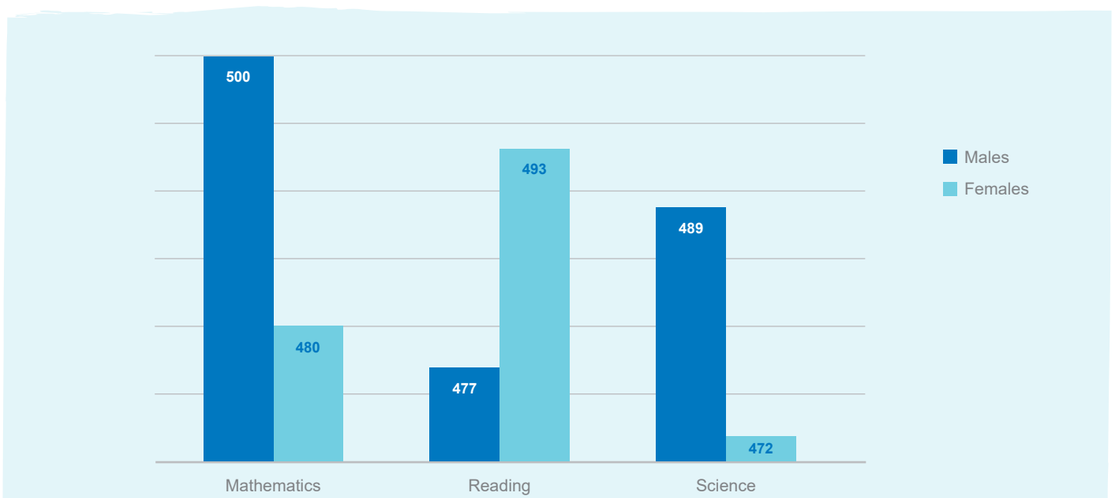
Italy performs poorly in terms of gender parity. As from 2015 Gender Equality Index, a composite indicator that measures gender equality in different domains across EU, Italy was ranked 8.5 points lower EU's average score. In 2019 Italy improved its ranking, but still placing itself below the European average.

Altogether, the data on girls' math and science performance fulfill the myth by which girls and women are not good neither at exploiting mathematical language nor at interpreting phenomena under a scientific approach, further lowering girls' interest toward STEM subjects (Huang & Brainard, 2001; Blickenstaff, 2006; Nosek et al., 2009). These gendered social expectations and stereotypes may well contribute to women opting out of STEM training (exception made for medicine and likes subjects) and explain the gender-different educational choices depicted in the previous section.

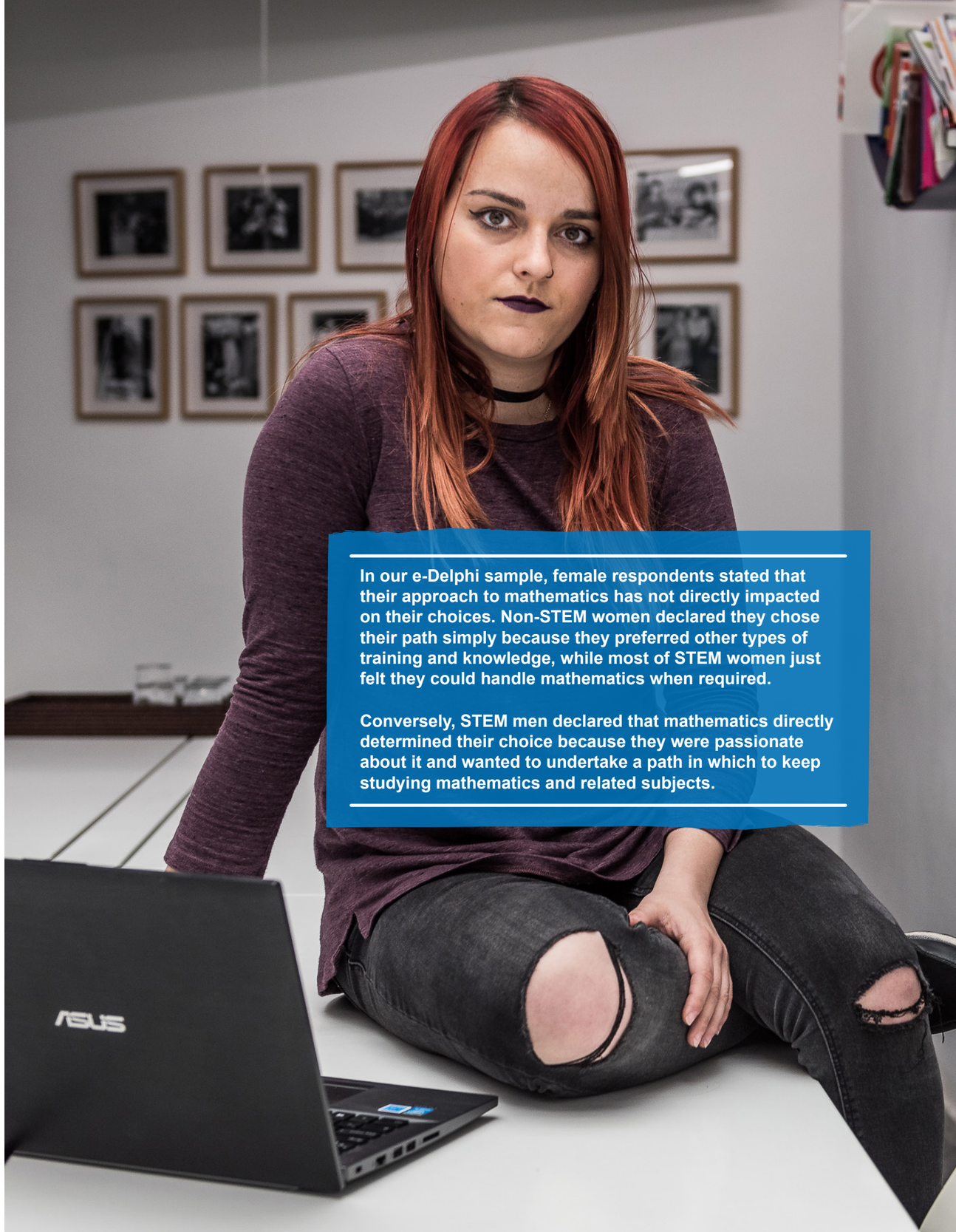
But even in their workplace STEM graduates are not free from social conditioning.

On one side, the digital revolution can get more women into work and boost women's empowerment, on the other side, it may represent a barrier to women, who are less involved in STEM (science, technology, engineering, mathematic) educational disciplines, and thus risk to be less involved as primary actors in these transformations.

Figure 10. Average scores by subject and gender (PISA 2015)



Source: INAPP elaborations on 2015 OECD-PISA data



In our e-Delphi sample, female respondents stated that their approach to mathematics has not directly impacted on their choices. Non-STEM women declared they chose their path simply because they preferred other types of training and knowledge, while most of STEM women just felt they could handle mathematics when required.

Conversely, STEM men declared that mathematics directly determined their choice because they were passionate about it and wanted to undertake a path in which to keep studying mathematics and related subjects.

4. DIGITAL WOMEN IN THE TIME OF COVID-19

As from late February, COVID-19 quickly spread throughout the world, rendering Italy among the worst affected countries in Europe. The battle to contain this serious outbreak has forced Italians to live under a national stay-at-home order since March 9th 2020. The state of emergence has inevitably changed daily lives, making technology more essential than ever. As cities has shut down and people have engaged in social distancing, ICTs have helped us not only to connect with others at a time of isolation, but also to keep many businesses alive.

Most companies have been forced to close their doors and limit their operations to what can be done remotely, extensively implementing smart working practices that allow people to safely work from home. The measures adopted to contain the pandemic have allowed to rethink about traditional working schedules, experiencing and introducing new working arrangements In 2018, Eurostat data disclosed how barely 2% of Italian employees exploited some forms of “agile working”, recording the lowest percentage among European countries. On the contrary, the European average of workers benefitting from flexible arrangements was 12%, with the most virtuous examples from Northern Europe (30%).

Henceforth, in Italy more than in other countries, the newly introduced working arrangements have significantly altered the traditional organization, with a virtually long-lasting impact. In this scenario, these new digital models are a double-hedged sword that can either widen or ameliorate existing gender gaps.

In 2016, ISTAT reported that Italian women aged 25-64 spend on average 21.7% of their daily time doing family work, as opposed to their male counterparts who solely spend 7.6% of their time in these tasks. The gap is partly due to the different occupational status by gender, with female employment significantly below male one. But Italian women share a disproportionate amount of family workload even when the employment status cannot justify the phenomenon. Within families where both partners are regularly employed, women still bear on average 67.3% of the family work, and the percentage increases with the number of newborns, when the female partner does not hold a degree and in Southern regions. In particular, women spend disproportionately more time than men washing and ironing clothes (94% of the load is on them), cleaning (77%) and preparing meals (76.6%).

Before the spread of COVID-19, families could outsource care services to domestic and care workers and to grandparents, who often provide babysitting to their grandkids (40% of Italian grandparents regularly watch over them, and the percentage raises to 85% if we account for those who, at least occasionally, provide some babysitting[9]). During the outbreak, even when not formally forbidden, many families have decided

[9] https://osservatoriosenior.it/2016/05/nonni-e-nonne-nella-cura-dei-nipoti-2/

not to recur neither to maids nor to grandparents to limit social contacts and safeguard the health, especially of elderly, who are at highest risk of COVID-19. In addition, in the battle against the spread of the virus, Italian government has shut all schools and childcare down, locking sons in their house. Unavoidably, the family workload has ended up increasing, with more family members steadily present in the house and children who need help, from basic care and gaming for the youngest to distance learning for the oldest.

In this scenario, if women keep bearing a disproportionate amount of family work as compared to men, domestic care responsibilities may increase and render impossible for women to balance work and family. The consequences could negatively impact female employment and exacerbate pre-existing gender pay gaps, and that is particularly true if we bear in mind that, even when easing restrictions, Italian men are more likely to physically go back to work than women, as they are more employed in manufacturing and building industries.

Nevertheless, the digital challenges COVID-19 imposed on workers may represent a precious opportunity to favor female employment and working women. In this respect, Angelici and Profeta (2020) provide causal evidence on the impact smart-working has on labor market outcomes, well-being and work-life balance. The authors develop a randomized field experiment conducted on a sample of workers in a large Italian company, which had not practiced smart-working before. Smart-working was introduced for a randomly selected group of workers in the sample: in agreement with their supervisors, for 9 months, these workers had the possibility to work “smart” (i.e. with no constraints to the place and time) one day per week. The rest of the workers continue to work traditionally. Other than increased productivity and well-being, the experiment shows how men spend significantly more time in household work and care activities after the introduction of smart-working. By the same token, smart-working women are more satisfied with working hours and the impact of work on women’s private life. More flexible working arrangements thus contribute to the reduction of gender gaps through both a better work-life balance for women and greater participation of men in housework and care activities.

The first evidence in this respect[10] outlines how more than one Italian working woman out of three has increased the time spent in domestic care during the pandemic, but this outcome is not confined to women only. Among male partners with no children, 40% of them has dedicated more time to family work, and the percentage increases to 51% if we look at male partners with children. These data disclose how Italy is still far from achieving full gender balance in domestic work, but highlight how flexible work arrangements can be an effective way to erode traditional models who penalize female employment and gender wage gaps.

Moreover, even before the outbreak of the coronavirus, flexible working arrangements were found to facilitate women’s greater participation in the labor market, retaining full-time jobs or striking an improved work-life balance because they better match working hours to private life needs[11]. As such, forced remote work can provide an opportunity for business to test if they can maintain their productivity and their responsiveness from home, and virtually consider more flexible working arrangements even after the pandemic. A precious opportunity that can benefit not only women, but the entire economy.

[10] https://www.ingenere.it/articoli/prima-durante-dopo-covid-disuguaglianze-famiglia
[11] https://eige.europa.eu/publications/gender-equality-index-2019-report/flexible-working-arrangements

5. CONCLUSIONS AND RECOMMENDATIONS

Despite slight improvement in women's and girls' digital inclusion, gender differences in Italy are still very pronounced in each and every aspect of the digital world: from Internet use to specialist skills and employment, Italian women have been lagging behind, at the tail end of "Women in Digital Index" in Europe.

The root cause is mostly cultural, with entrenched stereotypes hindering women from embracing their digital potential. As of today, most people still hold the common misconception by which technology is a "man thing". The impact of the myth is huge in proportion and takes hold from very young ages: entertainment industries offer gender-differentiated products, with a marked preference of technology games for boys other than for girls. At school age, teachers are found to be routinely biased in the assessment of boys' and girls' math and science performance, subjects that mostly effective enhance digital capabilities. By the same token, families still tend to undervalue their daughters' capabilities at quantitative subjects. Inevitably, girls may end up developing anxiety and panic toward mathematics and technology. When choosing their professional training, numbers speak for themselves: Italian women choosing a STEM training are regularly below their male counterparts: they make up around 40% of STEM graduates, and the percentage decreases even further if we do not take medical degrees into account.

Bridging the gender digital gap comes at the benefit of the society and the economy as a whole, and it is of the outmost importance for women to fully reap the opportunities created by the ICT and digital sectors, especially at a time in which Covid-19 exogenously casted even more light on the importance of ICT in the labor market.

Education and training are powerful tools in reaching gender digital parity. Yet, measures shall extend to adult women as well: lifelong learning is instrumental in women's digital inclusion, especially in light of the fact that the gender digital divide tends to broaden with age. In order to break down the barriers that keeps women away from ICT, many stakeholders are called upon to provide answers: government, firms, educators and civil society shall cooperate to achieve this goal.

Based on the findings of this report, a series of **policy recommendations** can prove to be useful in achieving gender digital parity.

1. Schools and families are to be regarded as priority stakeholders:

- Educational curricula at all school levels shall adapt to the increasing demand for digital skills and train students to acquire digital capabilities, in order to guarantee equal training regardless of students' socio-economic background;
- In view of the increasingly important role of new technologies, it`s interesant to offer workshops, teacher training, cyber-security classes and similar initiatives to provide children with the knowledge and skills they need to stay safe online.
- Equipping teachers with digital knowledge and skills. Across all educational levels, Italy is ranked 72nd out of 79 OECD countries for its teachers' digital capabilities[12];
- Train teachers to avoid unconscious gender-bias in the assessment of their students' performance in STEM subjects;
- Before choosing texts books, schools shall screen and check whether content reports gendered stereotypes;
- Support mentoring programs that manage to find out students' real potential, freed from cultural and social conditioning, and accompany them to the achievement of their professional career.
- Raise awareness among students and their families about career opportunities ICT and – more in general STEM – training can offer, promoting mentoring events with female role models;
- Develop a career guidance model free from gender bias that incorporates work on transversal skills.It is interesting to show women references in the use of new technologies, which can serve as a model and inspiration for young women.
- Strengthen the link between the education system and the labour system with brief practices, which could take different forms, depending on the educational level of and the complexity of the activity and the skills for which it is does the training.

Our e-Delphi sample declared that, in its school ages, teachers held only basic digital skills. Despite being equipped with digital labs, technological tools and school websites, our respondents' teachers rarely and roughly disposed of them, disregarding the full potential in their hands.

Plus, most of our interviewees have never experienced coding classes at school, and only few managed to acquire some coding skills at university.

[12] https://www.oecd.org/pisa/PISA%202018%20Insights%20and%20Interpretations%20FINAL%20PDF.pdf

2. Governments should integrate ICT and digital technology education into national curricula and actively support and promote girls' participation in these issues to ensure that they have equal access to future employment opportunities.

Public institutions shall promote manoeuvres that can improve women's work-life balance. As the development of digital capabilities is often "self-taught", unbalanced family load shall not deprive women of the same time men can devote to the improvement of their digital skills.

3. In relation to companies, it is important that private sector actors, through social dialogue with governments and labour sector representatives, support cohesive social protection schemes that help boost the economic development and productivity of workers also in the STEM sector, especially among young people.

- Increasing the competitive female workforce requires providing different opportunities for girls and young women - especially in high economic growth sectors such as Science, Technology, Engineering, and Mathematics (STEM) and sustainable "green" energy; addressing the gender pay gap; and providing flexible working conditions combined with adequate labour protection. Such protection should include, in particular, paid maternity and paternity leave for both parents.
- The private sector should promote role models and mentors in the ICT for girls There would be something missing about funding, scholarships - support programmes - internship system for girls studying STEM/ICT
- Telecommunication companies and Internet providers should develop creative strategies to reduce the cost of airtime, mobile data and the internet for broadband for girls and women.

4. Give more room to gender perspective into the initiatives that have been launched in the last years to promote a more digital school.

- Recognize and support the role of women and girls not only as users of technology, but also as developers and creators of it.
- Celebrate the contributions of girls and women to technology and encourage mentoring and building community among women in the area of technology.
- Information technology must be integrated into education systems to ensure that the digital revolution does not intensify inequalities and exclusion. Resources and training should be available for teachers and learners to develop digital literacy skills and to ensure that all technology is used effectively and equitably to contribute to learning and to close the gender digital divide
- Technology and the internet must become an enabler for the empowerment of girls and young women rather than a cause of deeper economic exclusion. This means that girls and women must have equal access to new technologies, the development of the skills and knowledge needed to use them, and be involved in creating digital tools and solutions. Without this, digital tools will be alien to the needs, desires, and rights of girls and women - and unable to help them become the leaders and agents of change of tomorrow. Without the effective participation of girls in ICT, the digital economies of the future will only reproduce existing gender disparities in the possession, use, and representation in the technology workforce.
- It is crucial to make investments aimed at improving the quality and effectiveness of education in general and of Technical and Vocational Education and Training (TVET).
- To this end, it is essential that investments in TVET are gender-transformative and youth-sensitive, and that they bring together partners from the public and private sectors (especially employers).

6. ANNEX - METHODOLOGY

Throughout our report, we have included the voices of young Italian girls and boys to gather a more comprehensive and in-depth approach to our research. The main results are reported in ad-hoc boxes that you can find through the lines of the report.

The survey was conducted online through e-Delphi technique, a method broadly employed in social science research to enable participants to anonymously post participants to post their opinions and accrue their ideas online, in order to allow individual panelists not to worry about repercussions for their opinions. We constructed the e-Delphi as a survey made up of three stages assessed in a period of three months, among an independent panel of 14 independent participants. Respondents are equally split among men and women, who have chosen STEM (Physics, Engineering, Biology, Physics, Medicine) and non-STEM training (Humanities, Law, Economics), and are aged between 18 and 29. In order to account from regional heterogeneity, we selected interviewees from different Italian regions, from Northern to Southern areas. They are mostly university students or young workers recently graduated, together with a music producer who embraced the career shortly after high-school diploma.

Each of the three stages builds on the previous one, in order to build a continuous and ongoing debate and grasp the dynamics behind possible differences that arise from each of the previous round. Starting from their main results of the literature review on gender digital divide in Italy, each member of the group was sent a questionnaire with instructions to comment on each topic based on their personal opinion and experience. In the first round, we mostly investigated their digital habits, both for personal and working purposes, and their opinions about the digital world, also asking about their personal viewpoints on gender gap in the use of technology.

From the very first stage, the main ideas brought forth by respondents differed by gender and by STEM training. Building on the first round, we thus constructed the second survey in order to grasp the roots of the differences stemming from the first questionnaire. The online interview pivoted around familiar background, role models, use of videogames during childhood and relationship with mathematics. The cultural norms embedded in participants, even when not outspoken, became clear in the analysis of the second questionnaire. Henceforth, we decided to devote the last and third wave of our e-Delphi to gather respondents' schooling experience with technology, together with a section dedicated to Covid-19 and the digital challenges it posed in Italy from March 2020.

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Plan International is an independent development and humanitarian organisation that advances children's rights and equality for girls. We strive for a just world, working together with children, young people, supporters and partners. Using our reach, experience and knowledge, Plan International drives changes in practice and policy at local, national and global levels. We are independent of governments, religions and political parties. For over 80 years we have been building powerful partnerships for children and we are active in more than 75 countries.

Girls Get Equal: Plan International has been campaigning for girls' rights for over a decade. The Girls Get Equal campaign, created with youth activists around the world, aims to ensure girls and young women have equal power over their own lives and can shape the world around them. Promoting leadership and amplifying girls' voices is central to the campaign. They have a right to speak up and take part in public life, but online abuse is disempowering girls: shutting them out of a space which plays a huge part in young people's lives, is limiting their potential to thrive and become leaders. In order to achieve gender equality in an increasingly digital world, online spaces must be made safe, accessible and affordable for everyone. Girls and young women, in all their diversity, must be free to be themselves: to campaign, debate and make decisions about the issues that affect their lives without fear of harassment and violence, wherever they are.

ABOUT CARLO F. DONDENA CENTRE FOR RESEARCH ON SOCIAL DYNAMICS AND PUBLIC POLICY

The Carlo F. Dondena Centre for Research on Social Dynamics and Public Policy (Dondena), established at Università Bocconi in 2006, is an international, interdisciplinary centre for social science research relevant to individuals, societies, businesses, institutions, and economies. Its members come from different fields of the social sciences, including demography and epidemiology, economic and social history, political science, public economics, and sociology.

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