Digital skills gaps: A pending subject for gender digital inclusion in the European Union

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Abstract

This article thoroughly analyses the Eurostat database on Digital Economy and Society to explore the evolution of the digital skills gaps by gender in the European Union between years 2007 and 2014. It finds that differences between women and men are slight in the most basic and widespread skills, but they are very significant in the more complex and less generalized tasks. The disparities in this regard have generally decreased but very few points, so they are rather stable over the period. Additionally, those gender gaps are even more marked in the high-educated groups and also relevant among younger cohorts. Contrary to the statements made by the European Commission in its reports, these findings indicate that digital skills gaps by gender are still significant and likely to persist at many levels of society, while 'ICT specialist' profiles are becoming more important for future employment opportunities.

Keywords

Digital skills, gender gaps, European Union, Digital Agenda, digital natives

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Introduction

European populations' access to digital devices and services has grown significantly in the last years (European Commission, 2016). However, regular access is not sufficient to get an effective and successful use of the new information and communication technologies (ICTs), among other reasons, because several skills –apart from 'traditional literacy'– are required to manage these multifunctional technologies (Bonfadelli, 2002; Hargittai, 2002; Van Dijk, 2005; Warschauer, 2002). An increasing body of literature has emphasized the social relevance of these so-called 'digital skills' or 'ICT skills', since the disparities between social groups in this dimension have a non-negligible impact on the emergence of unequal opportunities and risks in the Information Society (Hargittai and Shaw, 2013; Helsper and Eynon, 2013; Livingstone and Helsper, 2010; OECD, 2016b; Van Deursen and Van Dijk, 2011, 2015).

In this domain and from a gender perspective, performance tests have found that men and women do not differ greatly in their actual computer and on-line abilities (Hargittai, 2002; Van Deursen and Van Dijk, 2011; Van Deursen et al., 2011), but women's self-assessment of their digital know-how is usually lower than men's (Hargittai and Shafer, 2006; Helsper and Eynon, 2013; Van Deursen and Van Dijk, 2015; Whitley, 1997). This is important because, as observed in successive studies, women's tendency to undervalue their self-perceived skills affects negatively the extent of their digital engagement (Helsper and Eynon, 2013; Wasserman and Richmond-Abbott, 2005), information-seeking activities (Hargittai, 2010), content sharing (Hargittai and Walejko, 2008) or contributions to free/open collaborative platforms such as Wikipedia (Hargittai and Shaw, 2015).

While most of the abovementioned studies have been limited to specific regions or to only one country, wider geographical research are still scarce in this field (e.g. Ono and Zavodny, 2005; Zhong, 2011). In view of this gap in the literature, this paper aims to extend the scope of data analysis to the whole European Union (EU), also opening the debate on the approach of the official institutions regarding these concerns. First, it should be noted that the authorities of the EU –in line with academic research and other political institutions around the world– have considered that 'digital literacy and competences' play a key role in the development of the Information Society, becoming a priority in

their initiatives for social inclusion and human capital. That concern has been even more visible in the last years as the most recent EU's strategy, the Digital Agenda/Digital Single Market, dedicates one of its basic pillars to 'Enhancing digital literacy, skills and inclusion' (European Commission, 2010a). Secondly, it should also be said that there has been room for gender issues within the policies for digital inclusion in the EU. To get a detailed view on the EU authorities' perspective on digital skills gaps by gender, in the next section we review the strategies and official reports regarding these issues, establishing some relevant research questions as well.

Later, to answer to those emerging questions, we will thoroughly explore the Eurostat's Digital economy and society database. The main contribution of this study is an in-depth analysis of the digital skills gaps by gender, comparing different levels of skills and different demographic groups in the EU-28 between years 2007 and 2014.

Digital skills gaps by gender in the strategies and reports of the EU

At the early stages of the European strategies for 'e-inclusion', women were considered as a 'disadvantaged' group that needed support to reach a level of ICT access and usage similar to the average of the EU population (European Commission, 2007; Weerakkody et al., 2012). Later, the *Digital Agenda* initiative aimed to increase the participation of women in the ICT workforce through measures to enhance their digital skills (European Commission, 2010a: 26). More recently, institutional actions such as Digital Skills and Jobs Coalition[1] keep considering digital skills as a key driver for women's inclusion in Digital Economy and Society, particularly in the ICT sector. Throughout the implementation of these plans, the progress of women's digital skills have been monitored and reported in some official documents, but to a limited extent as it is shown in the following review.

The Europe's Digital Competitiveness reports (European Commission, 2009, 2010b) were the two former documents to mention explicitly the progress in the reduction of 'digital literacy' disparities. The results for the period 2006-2009 regarding computer skills showed that, among the 'disadvantaged' groups in the EU, women had the closer level to the average of the total population (showing a ratio of 0.95 in the case of women, when 1.00 would be the perfect equality reference).

The indicator only distinguished those who had not carried out any of the computer tasks from those who had carried out at least one, however, as the latter of the reports itself claimed: 'higher digital skills may facilitate more sophisticated and intensive internet use. Hence, it is interesting to look at different levels of digital skills in more detail' (European Commission, 2010b: 77). So, breaking down skills into different levels, the report showed that women had 7 percentage points (pp) less than the average in the higher skills[2]. As gender disparities were wider in that top level than in the lower ones, the first research question arises:

RQ1: Are gender gaps still larger in the higher levels of digital skills within the EU?

Among the following annual reports made by the EU authorities, the Digital Agenda Scoreboard 2012 (European Commission, 2012) has been the last one to date covering indicators on digital skills gaps by gender. The report showed that, in 2011, those disparities were still more marked at the highest levels of skills. In particular, between 2007 and 2011, the percentage of men in the EU-27 with 'high computer skills' was invariably around 14-15 points larger than the women's percentage, while the difference regarding the 'high Internet skills' remained close to 6 pp. Despite these little changes in the figures (no more than one point of variation in a four years interval), the document asserted that the male-female gaps were decreasing steadily/gradually at all skill levels. Since this conclusion of the European Commission is not so clear and some longitudinal studies (e.g. Van Deursen and Van Dijk, 2015) have demonstrated that the progressive reduction of these disparities should not be taken for granted, the second research question arises:

RQ2: Have digital skills gaps by gender been steadily reduced in the EU?

Finally, analysis on gender issues also require to control for other variables, avoiding inaccurate generalizations and reaching as much detail on causality and diversity as possible (Hilbert, 2011; Spierings, 2012). In this sense, the Digital Agenda Scoreboard 2012 itself said that the male-female gaps for high levels of skills were bigger in younger age groups (European Commission, 2012). This reference indicates that gender disparities at certain levels of digital skills might be even more pronounced among some 'advantaged' groups, including young people –who have occasionally been conceived as a uniform group of savvy 'digital natives' but rather seem to be a heterogeneous group in which gender differences may play a relevant role (Gui and Argentin, 2011; Hargittai, 2010; Helsper

and Eynon, 2010). To go beyond the analysis of the official reports and look more into this kind of interactions between gender and other characteristics or conditions, we should keep asking the following question:

RQ3: What have been the patterns regarding digital skills gaps by gender among different sociodemographic groups?

Data and methods

Data source

The present study is an exploratory analysis of the recently called Digital economy and society database[3]. Annually, Eurostat compiles the main aggregated results from the standardized national surveys and adds them to this database. The survey samples are representative of the population aged 16 to 74 years old from each country. In this paper, the analysis is focused on the data for the EU-28 aggregates along the period 2007-2014. More recent data are available for the year 2015, but the survey items in the e-skills or Digital skills module have changed to such an extent that there is an unsolvable break in series (Eurostat, 2015: 128–131).

Digital skills indicators

The database contains information on the percentages of individuals who have ever carried out the computer and Internet related tasks listed, respectively, in Table 1 and Table 2. These self-reported measures of digital skills allow analysing their pervasiveness in the EU population. Additionally, indications from the Digital Agenda Scoreboard 2012 report (European Commission, 2012) and the Eurostat methodological manuals (Eurostat, 2007, 2011) provide some orientations about the difficulty of each task, so we have a source to analyse them in relation to their –supposed– complexity.

[Insert Table 1]

[Insert Table 2]

In Table 1 and Table 2, the first six variables are the more stable over time. These activities are used by Eurostat to make another kind of indicators, already mentioned in the previous review of the official reports, which are represented in the last three rows of each table: ‘low’, ‘medium’ or ‘high

level of skills' which refer to the percentage of population (in the corresponding year and sociodemographic group) who have carried out, respectively, '1 or 2', '3 or 4' or '5 or 6' of those tasks. These amplitude indicators are very useful as they inform about the breadth of digital skills reached by different social groups and this is an important aspect to better understand the complexity and gradual levels of the digital divide (Hargittai, 2002; Van Deursen et al., 2011). However, they are originally formulated as exclusive categories: for example, the variable 'i_csk_lo' tells the proportion of people who have carried out one or two of the six reference computer activities and no more; people who have carried out three to six are not included in the calculation, despite they surpass the threshold marked in the previous category. On the contrary, it is more interesting and understandable to analyse levels of amplitude as cumulative steps, in the sense of assigning to each level the individuals who have already reached it plus the people who have surpassed it. For that purpose, new indicators have been constructed adding the percentages of the 'higher' levels to the 'lower' ones and obtaining the proportion of people who have achieved at least certain level of amplitude, as it can be seen in Table 3.

[Insert Table 3]

For a perspective on the evolution over time, the analysis in this paper is focused on years 2007, 2011, 2013 and 2014. On one hand, because in 2008 there was no e-skills module and in 2006, 2009 and 2010 the extra activities apart from the 'more stable' ones were not included. On the other hand, because 2007 and 2011 have been the only years with a special survey module on e-skills, including both computer- and Internet- related tasks, while 2013 and 2014 are the last years covering computer and Internet skills, respectively. This selection allows making a consistent and complete, but easy to present, analysis of the evolution of digital skills.

Gender gap indicators and sociodemographic variables

The database also provides information on sociodemographic variables, so-called breakdowns[4]. Those variables include (self-reported) sex of respondents, so gender gaps can be calculated as differences in percentage points: the proportion of women who have carried out a task or reached an amplitude level, minus the corresponding proportion of men. This formulation implies two main things: first, the maximum value the gender gap can take is 100 pp, the minimum is -100 pp and zero falls in the

middle, meaning perfect balance; second, the sign of the gender gap indicates the direction of the disparity, in such a way that the gender gap is negative when the percentage of men with the considered skill level is greater than the corresponding percentage of women.

In addition, some interactions of gender with other sociodemographic variables are available in the database, but the options are limited: the age cohorts for the period 2007-2014 are 16-24, 25-54 and 55-74 years old; the breakdowns by level of formal education in that period are low (ISCED 0 to 2), medium (ISCED 3 to 4) and high level (ISCED 5 to 8). Unfortunately, interacting all the three variables at once is not possible, only 'sex with age' or 'sex with level of education' are available. To explore the third research question, the gender gaps will be calculated, as previously explained, for each sociodemographic group.

Results

Characteristics and evolution of digital skills gaps by gender in the EU

We begin the analysis looking at the proportions of women and men in the EU-28 who have carried out each of the computer and Internet related tasks (Table 4 and Table 5, respectively). First, it should be noted that, for both 'sexes', the percentages have increased over time in practically all the indicators, so we have a general growing trend[5]. Secondly, those proportions vary gradually across the lists in both tables, from the more generalized (at the top) to the less generalized (at the bottom); the order corresponds to the females' values in the last year, but it is reasonably coherent across the tables[6].

[Insert Table 4]

In Table 4, the resulting scheme agrees fairly well with the classifications from the manuals and reports by the European Commission: the three first places are for tasks which require 'low level of skills', the following four are for those which require 'medium level of skills', and the last five are for activities which require 'high level of skills' or explicitly considered as 'more complex'. However, in Table 5, the scheme does not agree so well with the official references: the first and second places are for Internet tasks that require 'low level of skills', but the third and fifth are for skills considered as 'complex'; additionally, the fourth, sixth and seventh places are for 'medium skills', but in the last

three positions there are also one ‘medium skill’ –‘peer-to-peer file sharing’– between two ‘complex’/’high level’ ones[7]. As the hierarchy of tasks is not so clear in this latter case, the analysis of gender disparities is less straightforward for the Internet skills than for the computer related ones.

Looking specifically at the gender gaps, all the tasks show figures with negative sign since the men’s values are always higher than the women’s values. The gaps are smaller in the case of the Internet related skills. Additionally, very little changes are observed over the years, generally with decreasing variations but never falling more than 2 or 3 pp, so the structure of gender gaps described below remains very stable within this time interval.

In Table 4, the widest gaps (between 10 and 20 pp) can be found in the less generalized, ‘high difficulty’ or ‘more complex’ computer skills –except ‘write a program’– and also in two of the ‘medium level’ skills: ‘connect and install new devices’ and ‘compress files’. The smaller differences (less than 6 pp) are located in the ‘more generalized’/‘low level’ tasks, except ‘transfer files between computer and other devices’. The gaps in the rest of the computer skills, included the aforementioned exceptions, fall between 6 and 10 pp.

Looking at the indicators of the amplitude of computer tasks (last three rows in Table 4), we have the smaller gender differences (around 6 pp) in ‘individuals who have carried out at least 1’ and the wider ones (14-15 pp) in ‘individuals who have carried out at least 5’. This fact shows a kind of progressive disparity: the gaps between percentages of men and women get larger as they accumulate more computer tasks.

In the case of Internet skills, Table 5, the widest gaps (around 14-16 pp) are located in the three skills considered as ‘complex’. The smaller differences (less than 6 pp in 2013) are located in the ‘low’ and ‘medium level’ tasks, except ‘peer-to-peer file sharing’. The gaps in the rest of the Internet related skills –the less generalized ones– fall between 6 and 10 pp. Additionally, the gender differences in amplitude indicators are not as marked as in the table of computer skills and do not follow the same steady pattern across levels: the gap was a bit wider in ‘individuals who have carried out at least 5 of the 6 Internet related activities’ only in the last year, 2013, while in 2007 the disparities were greater in ‘individuals who have carried out at least 3’.

Digital skills gaps by gender among different age and education-level groups

In this section, we explore the digital skills and gender gaps among different sociodemographic groups within the EU-28[8].

[Insert Figure 1]

Figure 1 shows, in the horizontal axes, the percentages of people in each group who have ever carried out the corresponding levels of amplitude of computer skills. First, it can be seen that the more laggard groups are usually the elders (standing triangles) and the lower educated people (quarter-filled circles). Second, the middle aged (rhombuses) and the medium-educated (half-filled circles) groups fall around their respective averages; but sometimes those groups are a little more advanced. Finally, the most advanced groups are usually the younger (inverted triangles) and high level educated (three quarters-filled circles) ones.

Regarding the gender gaps, represented in the vertical axes, a pattern across the levels of computer skills can be seen. On the one hand, the disparities are generally smaller and almost non-significant in the lowest level of skills, with only some gaps of not much more than 10 pp in the older and less educated groups. On the other hand, the differences get larger in the medium level of amplitude, finding some gaps of 10-15 pp among the elderly and low-educated individuals. Finally, the widest disparities appear in the highest level of skills and this time they get larger among the younger cohort and especially among the more educated group, even surpassing the 20 pp of difference in the latter.

[Insert Figure 2]

Figure 2 shows the same information as in Figure 1 but for the indicators of amplitude of the Internet related skills. The elders and the low educated people are again the more laggard groups in the EU-28, while on the opposite side the younger and high level educated groups are again the most advanced groups; additionally, the middle aged and medium educated people usually fall around their respective averages. Regarding the gender gaps, the patterns are also very similar to those seen in Figure 1. First, the disparities are generally smaller and almost non-significant in the lowest level of amplitude, with only some gaps of not much more than 10 pp among the older and less educated individuals. Second, in the medium level of Internet skills the disparities remained smaller than 10 pp and more uniform across groups, except in 2007, when there were found some gaps slightly over 10 pp in the average

and more educated cohorts. Finally, the disparities at the highest level of Internet skills are larger in the '16-24 years old' group and the 'high-educated' group, reaching magnitudes of 10 pp as well.

The analysis for the specific computer and Internet tasks yields similar results for the last years of the period. In Table 6 and Table 7, it can be seen that, when considering more generalized, 'less complex' or 'lower difficulty' tasks, the gender gaps are usually wider among less educated and older groups; on the contrary, in the less generalized, 'more complex' or 'higher difficulty' tasks, the female-male disparities are greater among the high-educated group, and also significant among the middle-aged and younger cohorts.

[Insert Table 6]

[Insert Table 7]

Discussion and future research

RQ1. Are gender gaps still larger in the higher levels of digital skills within the EU? We have found higher percentages of men than women in every indicator and year but the greatest differences, between 10 and 20 pp, appear mostly in the less generalized/more complex tasks and at the highest amplitudes of digital skills; additionally, this pattern is more pronounced in the computer activities and a little more nuanced in the Internet related ones. These results broadly agree with previous official reports (European Commission, 2010b, 2012) and confirm that gender gaps in the EU are still –up to 2014– larger in the higher and more specialized levels of skills, which are broadly considered as key factors for future digital inclusion and employment (Van Dijk, 2005; OECD, 2016b). This is an estimable contribution to the existing literature, because disparities have been usually analysed in terms of average points for overall scales of skills or of average percentages for a specific level of skills but not comparing them across tasks with different degrees of generalization/complexity or across different thresholds of amplitude.

RQ2. Have the digital skills gaps by gender been steadily reduced in the EU? The findings show that the gender differences have persisted fairly stable along these years as there is no change greater than 2-3 pp in any of the gap indicators over the period 2007-2014. Therefore, it seems hard to firmly say that the male-female disparities in the EU have decreased steadily at all skill levels, as the European

authorities have stated in their past reports (European Commission, 2012). Furthermore, these findings are in line with other longitudinal studies from particular contexts such as the Netherlands, where the gender differences regarding digital skills have remained consistent in recent years (Van Deursen and Van Dijk, 2015).

RQ3. What have been the patterns regarding digital skills gaps by gender among different sociodemographic groups? The empirical evidence indicates that gender gaps are widespread across all the considered sociodemographic intersections, but they vary depending on the levels of digital skills. When focusing on the lower levels of digital skills, the gender gaps are usually significant in the older and less educated groups, yet not so relevant in the rest of the population. However, when looking at the higher levels of digital skills, the gender disparities usually become greater, especially among the higher-educated people but also among the middle-aged and younger strata. This is an important contribution to the existing literature on digital skills for two reasons: 1) although the vast majority of studies have analysed the overall effect of gender controlling for other women's unfavourable conditions which can explain their disadvantage in this area, they have usually accounted only for main effects and not compared the gender gaps across intersections of those variables; 2) as far as we know, no other study to date has combined sociodemographic interactions with different levels of skills in this way in a single article.

All these findings suggest that digital skills gaps by gender are not automatically reduced as the ICT penetration increases. It may happen at the basic levels of skills, as happened with basic levels of access to computers or Internet, but not necessarily at the higher and more specialized ones. Additionally, these latter disparities are still significant among younger cohorts, what might indicate a reproduction of relative and contextualized gender gaps. While these results come from the analysis of the Eurostat statistics themselves, none of the EU official reports have addressed these data showing figures on these issues since 2012, not even the last of them that was specifically focused on women and the ICT sector (Iclaves, 2013). Consequently, it would be advisable for the authorities of the EU to pay more attention to their own data sources and keep these facts in mind when designing their actions.

Despite the findings of this study are themselves valuable contributions for research and policy-making, the analysis is mainly descriptive and has some limitations that should be addressed in future work:

- To get a better knowledge of the actual effect of gender on digital skills gaps, other possible 'confounding' variables, such as employment situation, should be controlled (Hilbert, 2011), as well as more detailed categories and interactions should be incorporated (Helsper, 2010; Spierings, 2012). For that purpose, there is another interesting option recently provided by Eurostat: access to detailed microdata from the national statistics offices has been opened for recognized research institutions[9]. Microdata potentialities exceed the limitations of the pre-elaborated aggregates from the database and extend the options of applicable methods.
- If, even after controlling for other socioeconomic variables, some gaps between men and women still emerge or remain, we should look at gender specific factors. In this sense, we think that two aspects derived from gendered socialization should be seriously considered: 1) lack of self-confidence and anxiety towards technology are likely to be relevant, because they are still more prevalent among females, especially regarding advanced ICT skills, and may affect significantly the extent of their ICT knowledge and usage (Fraillon et al., 2014; Hargittai and Shafer, 2006; Sáinz and Eccles, 2012); 2) gender stereotypes and differentiated expectations about the ICT fields –both in education and work– are also likely to play an important role, making women less interested in subjects or activities related to technologies and less trained in digital tasks (OECD, 2015, 2016a; Sáinz et al., 2016). These widely generalized patterns may explain to a large extent the persistence of gender gaps in digital skills and their relative reproduction among younger generations.
- Likewise, differences among countries or regions should be incorporated into the analysis. Future research should not just include geographical variables but also explore the relationship between the digital skills gaps by gender and other context factors at national or regional level, such as legal frameworks and equality policies (Spierings, 2012), gendered ideologies in education (McDaniel, 2010) or segregation in labour markets, particularly regarding the infra-representation of women

among ICT specialized occupations (OECD, 2016b). Incorporating these variables to multilevel analysis will contribute to better understand the processes that shape these differences.

Conclusion

This study aimed to fill relevant gaps in the literature and the political debate on digital skills. Even at the relatively aggregated level of the analysis, mainly due to limitations of the data source, its findings take to reconsider the recurring statements that assume a gradual reduction of gender disparities in this domain, specifically those held by the EU authorities in their reports. The main conclusion of this article is that digital skills gaps by gender are still significant, especially at the higher levels of expertise, and likely to persist even among young people or high-educated groups. The European Commission should become aware of this, because its most recent actions keep considering digital skills as a key driver for women's inclusion in Digital Economy and Society, but its reports seem to ignore these relevant findings instead.

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Declaration of Conflicting Interests

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Notes

1. Official website: https://ec.europa.eu/digital-single-market/en//digital-skills-jobs-coalition.

2. As it is going to be explained below, ‘high level of skills’ refers to the percentage of people who declare they have carried out five or six (computer related or Internet related) activities of the six listed in the Eurostat survey questionnaire.
3. The database is accessible via on-line queries at: http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database. It is also downloadable as a Microsoft Access file at: http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/comprehensive-database.
4. The list of breakdowns collected by the Eurostat database is available on-line: http://ec.europa.eu/eurostat/documents/341889/725159/20151210+Breakdowns+summary+HH+incl+2015/7ac7f5ad-fc05-4c15-94d1-d9e537163121.
5. We find very few exceptions to this trend: only ‘use peer-to-peer file sharing’ and ‘create a Web page’ have not increased between 2011 and 2013, but neither have they decreased a lot (no more than 1 pp).
6. For the computer tasks, only ‘connect and install new devices’ would be in a different place (one row up) in the case of sorting by males’ values. For the Internet related tasks, the order would be slightly different according to women’s data from 2011, moving ‘upload text, games, images, films or music to website’ one row up; this is because the percentages have increased over time in all the indicators, but some items have grown more than others, changing their positions as a result. On the other hand, none of the Internet skills would be in a different place sorting by men’s values in 2013; although it would be a little bit different in 2011, with ‘modify security settings of Internet browsers’ positioned two rows up.
7. Divergent legislations on file sharing software and websites across the European countries may explain the issues with the ‘peer-to-peer’ related task (European Commission, 2012).
8. Further results for the specific European countries included in the database are available upon request.
9. For more on-line information about the microdata: http://ec.europa.eu/eurostat/web/microdata/community-statistics-on-information-society.

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Table 1. Main computer skills variables from the Eurostat database

Variables	Variable Captions 'Individuals who have…'	Years included in the survey	Level of difficulty according to	
			Scoreboard 2012[a]	Methodological manuals[b]
i_ccpy*	Copied or moved a file or folder	2006, 2007, 2009, 2011, 2012, 2014	Low difficulty	-
i_ccpps*	Used copy or cut and paste tools to duplicate or move information on screen	2006, 2007, 2009, 2011, 2012, 2014	Low difficulty	-
i_csum*	Used basic arithmetic formulae to add, subtract, multiply or divide figures in a spreadsheet	2006, 2007, 2009, 2011, 2012, 2014	Medium difficulty	-
i_czip*	Compressed files	2006, 2007, 2009, 2011, 2012, 2014	Medium difficulty	-
i_cins*	Connected and installed new devices, e.g. a printer or a modem	2006, 2007, 2009, 2011, 2012, 2014	Medium difficulty	-
i_cprg*	Written a computer program using a specialised programming language	2006, 2007, 2009, 2011, 2012, 2014	High difficulty	-
i_clan	Connected computers to a local area network	2007	-	Complex task
i_csolv	Detected and solved computer problems (e.g. computer runs slowly)	2007	-	Complex task
i_cxfer	Transferred files between computer and other devices	2011, 2012, 2014	Low difficulty	-
i_cgconf	Modified or verified the configuration parameters of software applications (except Internet browsers)	2011, 2012, 2014	Med/high difficulty	Complex task
i_cpres	Created electronic presentations with presentation software (e.g. slides), including e.g. images, sound, video or charts	2011, 2012, 2014	Medium difficulty	-
i_cinsos	Installed a new or replaced an old operating system	2011, 2012, 2014	High difficulty	Complex task
i_csk_lo**	Carried out 1 or 2 of the 6 computer related activities	2006, 2007, 2009, 2011, 2012, 2014	Low level	-
i_csk_me**	Carried out 3 or 4 of the 6 computer related activities	2006, 2007, 2009, 2011, 2012, 2014	Medium Level	-
i_csk_hi**	Carried out 5 or 6 of the 6 computer related activities	2006, 2007, 2009, 2011, 2012, 2014	High level	-

*These are the more stable tasks over the period. **These are the amplitude of computer skills indicators (used by EU authorities to determine the low, medium and high levels of computer skills) and their calculation is based on the six more stable activities. [a]European Commission, 2012. [b]Eurostat, 2007, 2011.

Table 2. Main Internet skills variables from the Eurostat database

Variables	Variable Captions 'Individuals who have…'	Years included in the survey	Level of difficulty according to	
			Scoreboard 2012[a]	Methodological manuals[b]
i_isrch*	Used a search engine to find information	2006, 2007, 2010, 2011, 2013	Low difficulty	-
i_cem*	Sent an email with attached files	2006, 2007, 2010, 2011, 2013	Low difficulty	-
i_ichat*	Posted messages to chat rooms, newsgroups or an online discussion forum	2006, 2007, 2010, 2011, 2013	Medium difficulty	-
i_iphone*	Used the Internet to make phone calls	2006, 2007, 2010, 2011, 2013	Medium difficulty	-
i_iexch*	Used peer-to-peer file sharing for exchanging movies, music, etc.	2006, 2007, 2010, 2011, 2013	Medium difficulty	-
i_cweb*	Created a Web page	2006, 2007, 2010, 2011, 2013	High difficulty	-
i_fdisoft	Found, downloaded and installed software	2007	-	Complex task
i_virspyx	Kept viruses, spyware and adware off their computer	2007	-	Complex task
i_iupload	Uploaded text, games, images, films or music to websites (e.g. to websites for social networking)	2011, 2013	Medium difficulty	-
i_ibconf	Modified the security settings of Internet browsers	2011, 2013	High difficulty	-
i_isk_lo**	Carried out 1 or 2 of the 6 Internet related activities	2006, 2007, 2010, 2011, 2013	Low level	-
i_isk_me**	Carried out 3 or 4 of the 6 Internet related activities	2006, 2007, 2010, 2011, 2013	Medium Level	-
i_isk_hi**	Carried out 5 or 6 of the 6 Internet related activities	2006, 2007, 2010, 2011, 2013	High level	-

*These are the more stable tasks over the period. **These are the amplitude of Internet skills indicators (used by EU authorities to determine the low, medium and high levels of Internet skills) and their calculation is based on the six more stable activities. [a]European Commission, 2012. [b]Eurostat, 2007, 2011.

Table 3. Own elaborated amplitude of skills indicators

Constructed Variable Captions	Composition of Variables	Years included in the analysis
At least 1 of the 6 computer related activities	i_csk_lo + i_csk_me + i_csk_hi	2007, 2011, 2014
At least 3 of the 6 computer related activities	i_csk_me + i_csk_hi	2007, 2011, 2014
At least 5 of the 6 computer related activities	i_csk_hi	2007, 2011, 2014
At least 1 of the 6 Internet related activities	i_isk_lo + i_isk_me + i_isk_hi	2007, 2011, 2013
At least 3 of the 6 Internet related activities	i_isk_me + i_isk_hi	2007, 2011, 2013
At least 5 of the 6 Internet related activities	i_isk_hi	2007, 2011, 2013

Table 4. Computer skills indicators and gender gaps in the EU-28 (individuals aged 16-74 years old; years 2007, 2011, 2014)

	% of women				% of men				Gender gap (women-men, in pp)			
	2007	2011	2014	Trend	2007	2011	2014	Trend	2007	2011	2014	Trend
Copy or move a file or folder (L)	52.5	60.2	62.6		58.8	65.7	68.5		-6.4	-5.5	-5.9	
Use copy or cut and paste tools to duplicate or move information on screen (L)	51.1	58.9	61.4		56.2	63.2	66.3		-5.1	-4.3	-4.8	
Transfer files between computer and other devices (L)	:	46.0	51.3		:	56.4	61.0		:	-10.4	-9.7	
Use basic arithmetic formulae to add, subtract, multiply or divide in a spreadsheet (M)	35.4	39.6	40.6		42.6	46.4	47.8		-7.2	-6.7	-7.2	
Connect and install new devices, e.g. a printer or a modem (M)	29.8	33.4	36.3		49.2	52.4	54.3		-19.4	-19.0	-18.0	
Compress files (M)	23.0	30.3	31.9		37.8	44.0	45.3		-14.8	-13.8	-13.4	
Create electronic presentations with presentation software (e.g. slides) (M)	:	27.1	30.2		:	33.9	37.1		:	-6.7	-6.9	
Modify or verify the configuration parameters of software (except Internet browsers) (M/H)(C)	:	18.3	20.4		:	34.3	35.5		:	-16.0	-15.2	
Detect and solve computer problems (e.g. computer runs slowly) (C)	15.3	:	:		31.7	:	:		-16.4	:	:	
Install a new or replace an old operating system (H)(C)	:	11.9	13.5		:	30.1	31.6		:	-18.2	-18.1	
Connect computers to a local area network (C)	10.9	:	:		26.8	:	:		-15.9	:	:	
Write a computer program using a specialised programming language (H)	5.0	6.4	6.5		12.4	13.7	14.6		-7.4	-7.3	-8.0	
Individuals who have carried out at least 1 of the 6 computer related activities	56.4	64.0	66.7		62.8	69.5	72.6		-6.4	-5.6	-5.9	
Individuals who have carried out at least 3 of the 6 computer related activities	41.7	47.6	49.1		52.0	57.3	59.4		-10.3	-9.7	-10.3	
Individuals who have carried out at least 5 of the 6 computer related activities	15.4	19.7	21.5		30.7	34.6	35.8		-15.2	-15.0	-14.3	

Note: The tasks and the amplitude indicators lists are sorted in descending order by the women's values in 2014 (for those tasks without data in that year, values in 2007 are the reference).

(L) Low difficulty task. (M) Medium difficulty task. (M/H) Medium/High difficulty task. (H) High difficulty task. (C) Complex task. See Table 1 for more details.

: Not available data

Table 5. Internet skills indicators and gender gaps in the EU-28 (individuals aged 16-74 years old; years 2007, 2011, 2013)

	% of women				% of men				Gender gap (women-men, in pp)			
	2007	2011	2013	Trend	2007	2011	2013	Trend	2007	2011	2013	Trend
Use a search engine to find information (L)	53,7	68,2	72,8		60,8	73,5	77,8		-7,1	-5,3	-5,0	
Send an email with attached files (L)	46,2	60,4	62,2		52,7	65,2	67,3		-6,5	-4,8	-5,0	
Keep viruses, spyware and adware off their computer (C)	21,4	:	:		38,0	:	:		-16,6	:	:	
Post messages to chat rooms, newsgroups or an online discussion forum (M)	20,4	30,9	35,5		27,3	35,2	39,7		-6,9	-4,3	-4,2	
Find, download and install software (C)	18,3	:	:		34,5	:	:		-16,2	:	:	
Use the Internet to make phone calls (M)	11,9	23,8	30,8		17,7	28,6	35,2		-5,9	-4,8	-4,3	
Upload text, games, images, films or music to websites (e.g. for social networking) (M)	:	24,0	27,5		:	29,8	33,0		:	-5,8	-5,4	
Modify the security settings of Internet browsers (H)(C)	:	15,7	17,8		:	30,4	31,3		:	-14,7	-13,5	
Use peer-to-peer file sharing for exchanging movies, music, etc. (M)	8,1	10,9	10,1		17,0	18,4	18,2		-9,0	-7,5	-8,0	
Create a Web page (H)	7,3	7,4	6,6		13,0	13,8	13,1		-5,7	-6,3	-6,5	
Individuals who have carried out at least 1 of the 6 Internet related activities	55,8	70,3	74,6		62,7	75,1	79,2		-6,9	-4,9	-4,6	
Individuals who have carried out at least 3 of the 6 Internet related activities	25,9	39,3	44,0		35,0	46,0	49,5		-9,1	-6,7	-5,5	
Individuals who have carried out at least 5 of the 6 Internet related activities	4,9	7,8	8,5		11,3	14,0	15,7		-6,4	-6,2	-7,3	

Note: The tasks and the amplitude indicators lists are sorted in descending order by the women's values in 2013 (for those tasks without data in that year, values in 2007 are the reference).

(L) Low difficulty task. (M) Medium difficulty task. (M/H) Medium/High difficulty task. (H) High difficulty task. (C) Complex task. See Table 2 for more details.

: Not available data

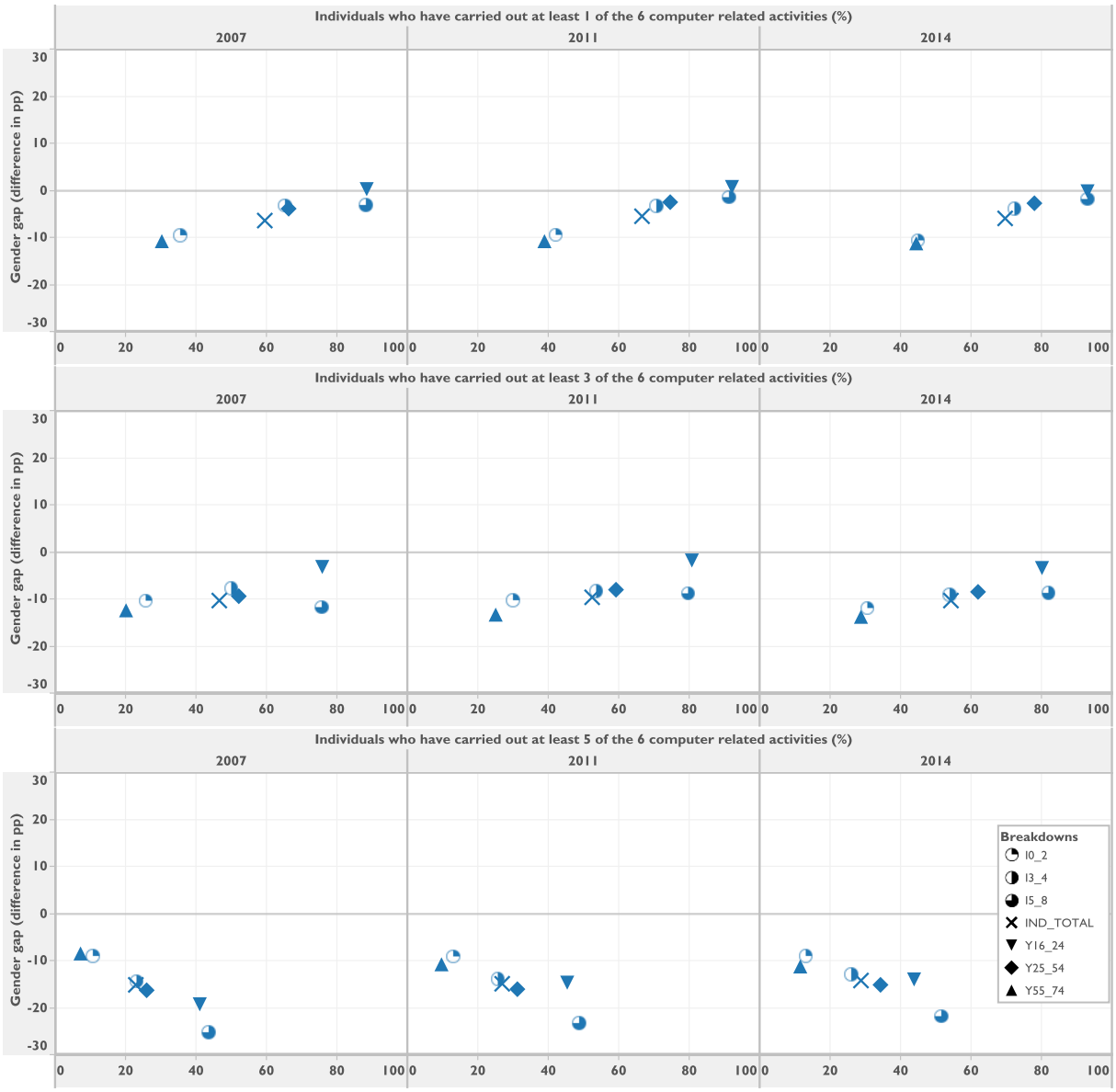

Figure 1. Amplitude of computer skills and gender gaps among age and formal education groups, in the EU-28 (2007, 2011, 2014)

I0_2: ISCED 0-2, low formal education; I3_4: ISCED 3-4, medium formal education; I5_8: ISCED 5-8, high formal education. IND_TOTAL: All individuals aged 16-74 years old. Y16_24: 16 to 24 years old; Y25_54: 25 to 54 years old; Y55_74: 55 to 74 years old.

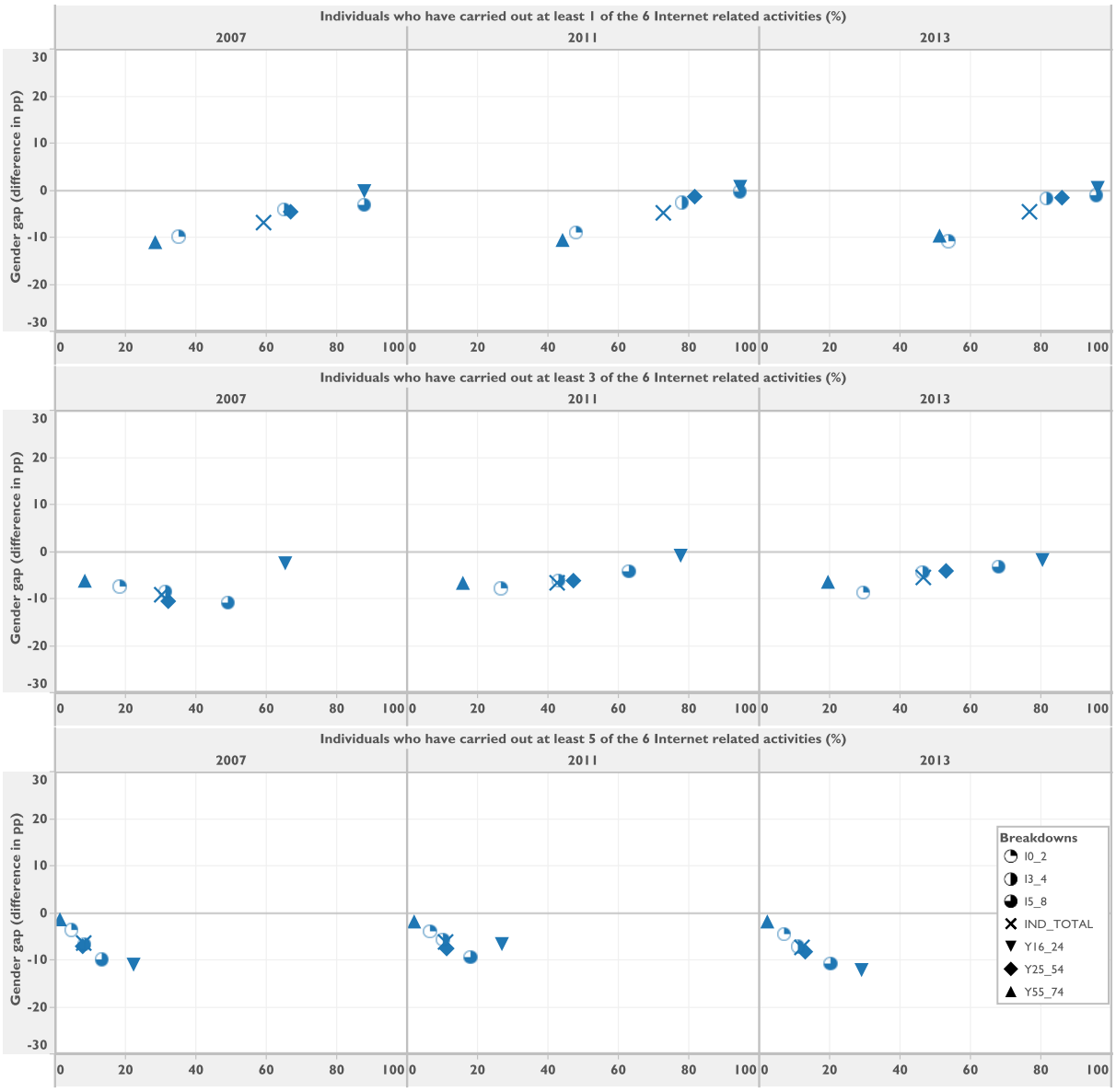

Figure 2. Amplitude of Internet skills and gender gaps among age and formal education groups, in the EU-28 (2007, 2011, 2013)

I0_2: ISCED 0-2, low formal education; I3_4: ISCED 3-4, medium formal education; I5_8: ISCED 5-8, high formal education. IND_TOTAL: All individuals aged 16-74 years old. Y16_24: 16 to 24 years old; Y25_54: 25 to 54 years old; Y55_74: 55 to 74 years old.

Table 6. Computer skills indicators and gender gaps by age and education breakdowns in the EU-28 (2014)

	% of individuals							Gender gap (women-men, in pp)						
	I0_2	I3_4	I5_8	*IND_TOTAL*	Y16_24	Y25_54	Y55_74	I0_2	I3_4	I5_8	*IND_TOTAL*	Y16_24	Y25_54	Y55_74
Copy or move a file or folder (L)	40.5	67.4	90.6	*65.5*	90.2	73.7	39.8	-10.2	-4.0	-2.3	*-5.9*	-0.5	-3.1	-10.7
Use copy or cut and paste tools to duplicate or move information on screen (L)	39.5	65.1	89.5	*63.9*	88.7	72.0	38.0	-8.9	-2.9	-1.6	*-4.8*	0.0	-1.9	-9.5
Transfer files between computer and other devices (L)	35.0	56.4	80.0	*56.2*	84.7	64.0	29.2	-11.0	-9.4	-7.2	*-9.7*	-0.7	-7.8	-14.4
Use basic arithmetic formulae to add, subtract, multiply or divide in a spreadsheet (M)	22.0	42.9	72.0	*44.2*	65.2	50.7	23.1	-7.0	-4.3	-10.9	*-7.2*	-1.9	-5.6	-10.1
Connect and install new devices, e.g. a printer or a modem (M)	25.8	45.0	68.3	*45.3*	65.5	52.5	23.4	-14.7	-18.1	-19.9	*-18.0*	-11.1	-18.1	-18.6
Compress files (M)	19.7	36.6	64.1	*38.7*	56.9	45.7	17.8	-11.1	-12.8	-15.7	*-13.4*	-12.8	-13.3	-11.6
Create electronic presentations with presentation software (e.g. slides) (M)	18.4	28.6	60.6	*33.7*	64.7	37.5	12.9	-4.6	-6.4	-9.6	*-6.9*	2.3	-7.0	-8.6
Modify or verify the configuration parameters of software (except Internet browsers) (M/H)(C)	14.9	26.1	47.6	*27.8*	43.2	33.2	11.4	-9.2	-14.1	-24.3	*-15.1*	-13.6	-16.8	-10.9
Install a new or replace an old operating system (H)(C)	11.9	21.5	36.9	*22.6*	35.0	26.7	9.8	-10.7	-16.8	-27.9	*-18.1*	-19.2	-20.9	-11.1
Write a computer program using a specialised programming language (H)	5.5	8.8	19.6	*10.6*	19.7	12.1	3.8	-3.7	-6.1	-16.4	*-8.0*	-8.6	-9.6	-4.2

Note: The list of tasks is sorted in descending order by the values in IND_TOTAL column. The intensity of the blue celds indicates the frequency of people who have carried out the corresponding task within the corresponding group of the population. The intensity of the red celds indicates the size of the gender gap for the corresponding task within the corresponding group of the population.

I0_2: ISCED 0-2, low formal education; I3_4: ISCED 3-4, medium formal education; I5_8: ISCED 5-8, high formal education. IND_TOTAL: All individuals aged 16-74 years old. Y16_24: 16 to 24 years old; Y25_54: 25 to 54 years old; Y55_74: 55 to 74 years old.

(L) Low difficulty task. (M) Medium difficulty task. (M/H) Medium/High difficulty task. (H) High difficulty task. (C) Complex task. See Table 1 for more details.

Table 7. Internet skills indicators and gender gaps in the EU-28 (2013)

	% of individuals							Gender gap (women-men, in pp)						
	I0_2	I3_4	I5_8	*IND_TOTAL*	Y16_24	Y25_54	Y55_74	I0_2	I3_4	I5_8	*IND_TOTAL*	Y16_24	Y25_54	Y55_74
Use a search engine to find information (L)	52.0	79.9	94.9	*75.3*	94.7	84.4	49.5	-10.8	-2.4	-1.6	*-5.0*	-0.1	-1.7	-10.4
Send an email with attached files (L)	39.9	67.2	89.9	*64.7*	88.1	72.8	38.9	-9.5	-2.6	-3.1	*-5.0*	0.7	-2.3	-9.7
Post messages to chat rooms, newsgroups or an online discussion forum (M)	26.4	38.0	50.4	*37.6*	74.7	42.9	10.7	-7.7	-3.1	-1.8	*-4.2*	-3.4	-3.1	-3.1
Use the Internet to make phone calls (M)	20.2	31.9	50.3	*32.9*	54.4	36.8	15.9	-5.3	-3.7	-4.2	*-4.3*	-3.4	-4.0	-3.1
Upload text, games, images, films or music to websites (e.g. for social networking) (M)	20.3	30.2	42.0	*30.2*	62.2	33.7	9.1	-6.6	-4.5	-5.5	*-5.4*	-4.1	-5.1	-3.9
Modify the security settings of Internet browsers (H)(C)	12.3	24.3	39.6	*24.5*	38.9	28.4	10.6	-7.0	-12.9	-22.3	*-13.5*	-13.7	-14.5	-9.8
Use peer-to-peer file sharing for exchanging movies, music, etc. (M)	9.0	13.4	21.5	*14.1*	33.7	15.3	2.9	-6.2	-8.3	-9.7	*-8.0*	-12.1	-9.1	-2.6
Create a Web page (H)	5.3	8.6	17.7	*9.8*	19.0	11.1	3.2	-2.9	-6.0	-12.0	*-6.5*	-8.6	-7.8	-2.4

Note: The list of tasks is sorted in descending order by the values in IND_TOTAL column. The intensity of the blue cells indicates the frequency of people who have carried out the corresponding task within the corresponding group of the population. The intensity of the red cells indicates the size of the gender gap for the corresponding task within the corresponding group of the population.

I0_2: ISCED 0-2, low formal education; I3_4: ISCED 3-4, medium formal education; I5_8: ISCED 5-8, high formal education. IND_TOTAL: All individuals aged 16-74 years old. Y16_24: 16 to 24 years old; Y25_54: 25 to 54 years old; Y55_74: 55 to 74 years old.

(L) Low difficulty task. (M) Medium difficulty task. (M/H) Medium/High difficulty task. (H) High difficulty task. (C) Complex task. See Table 2 for more details.