



Time to Reboot?

Outlining critical factors for women's success in digitalized workplaces

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Executive Summary

This study uses a unique comparative approach to the issues of women in the tech sector. By stepping beyond traditional metric-based analyses of tech-focused industries, we have gotten a more nuanced view of the issues preventing female engagement in digitalized work environments across all sectors. This shift in focus uncovered many new takeaways:

- **Women across all sectors do not see their strength in their digital skills.** When asked to rank their strengths, women in highly digitalized environments consistently rank their digital skills lower than men, even though men in similar positions rank their digital skills as their top skill. Despite this, women benefit disproportionately from digitalized environments. They are equally, if not more, comfortable with advanced human-computer interfaces and benefit more from digitalization-enabled remote work than men.
- **Employers are being held back by their “pink glasses”.** In opposition of general wisdom, this study found that women are generally interested in the exact same incentives as men. While specific top-5 desired incentives do change from country to country, both men and women consistently most desired company cars, pensions, and stock options.
- **A generally inclusive corporate culture has multi-fold benefits.** In highly digitalized fields, women are significantly more likely than men to seek work environments that give them a sense of “belonging” and foster a culture that promotes teamwork over competition. In addition to attracting more women, such management cultures result in higher levels of employee acceptance of management authority and decisions.
- **Ageism is a uniquely urgent problem for women in ICT.** While ageism effects all genders and all industries, this study found remarkably higher levels of ageism specifically effect women in ICT, with women experiencing it up to 36% more than their male counterparts, particularly at the beginning and end of their carriers.
- **Gender inequality in tech may have significant knock-on effects for digitalization.** The dominance of men in technology development has resulted in a generation of technology that not only perpetuates gender stereotypes, but also neglects the needs of a user base that makes up half of our population. For example, women consistently view the impact of robots on both their personal lives and society as a whole less positively than men. By excluding women from involvement, they are excluded from the benefits.

Introduction

Digitalization has become a critical driver of innovation around the world, across sectors, and across a multitude of applications. While the IT & telecoms sector remains the propelling force for such innovations, the benefits of these innovations need to resonate with everyone if we hope to fully realize the value of digitalization.

Despite significant efforts from policymakers, companies, and other organizations, women still play a relatively minor role in IT & telecoms and in digital leadership in other sectors. The results of this study point to a need to reboot our thinking about involving women in digitalization. This report draws on a uniquely large survey of more than 21,000 respondents across seven countries (China, France, Germany, Greece, Italy, the UK, and the US).

This report shines a light on how women position digital skills among their comprehensive skillsets, and reveals marked differences in digital poise between women and men, even in comparably digitalized environments.

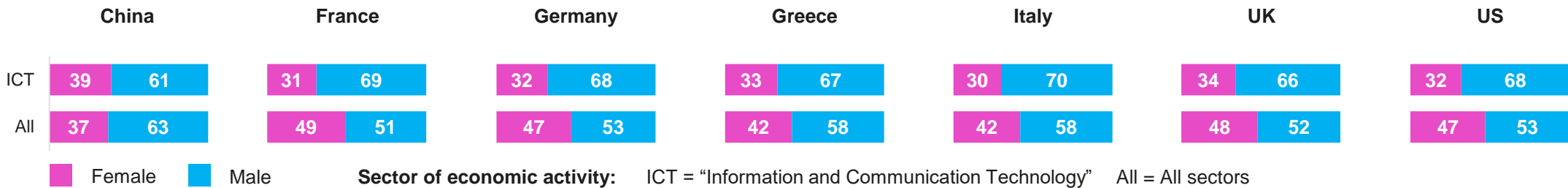
The research highlights ageism as a challenge women face in the IT & telecoms sector in particular. The data clearly shows that women prioritize similar benefits as men when choosing a job (company cars, meal plans, pension plans, and stock options). However, they place more importance on a corporate culture that fosters teamwork and knowledge exchange than men, particularly in highly digitalized workplaces.

Finally, this study found women to be more skeptical of robots than men, suggesting fundamental concerns related to men often designing tech for other men, instead of breaking existing gender stereotypes. This underlines the importance of building inclusive digital workplaces.

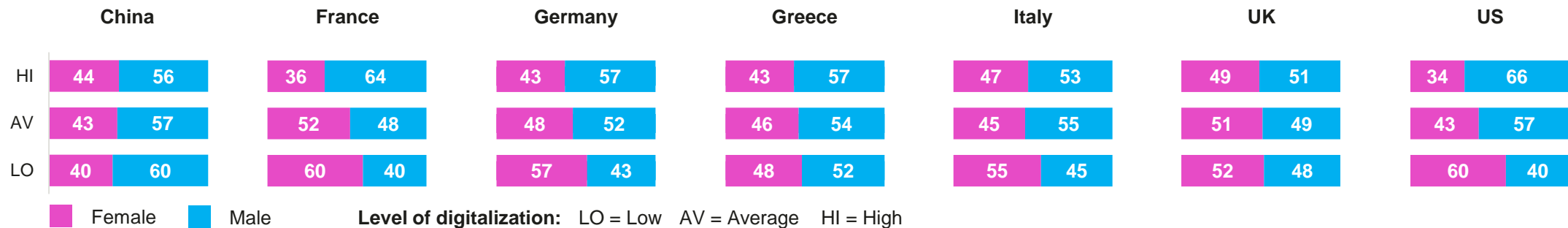
The status-quo of women in digitalized workplaces

In all surveyed countries except China, the share of females employed in IT & telecoms is significantly lower than their share in the general workforce. The largest gap is seen in France, where women represent only 31% of the workforce in IT & telecoms, but 49% of the overall workforce. This coincides with a significant fall in female participation in highly digitalized French firms compared to less digitalized French firms. The US and Germany mirror this pattern to a large extent and share a similarly large gender gap in their IT & telecoms sectors. **This report seeks to understand the factors that might affect women’s ability and desire to enter digitalized workplaces.**

Share of female and male workers across economic activities (ICT and all sectors)¹



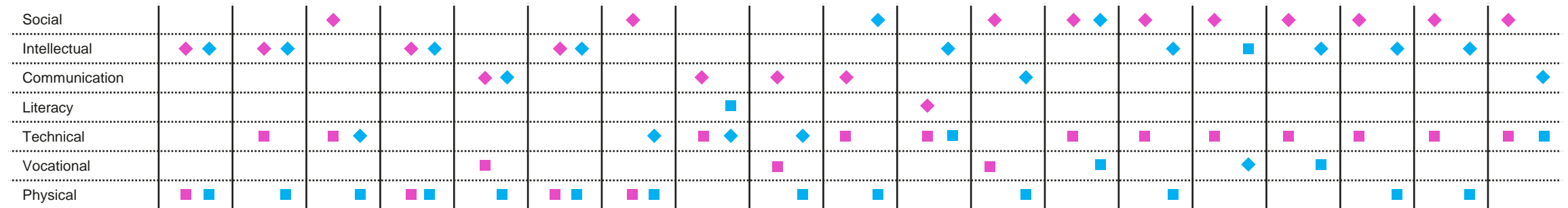
Share of female and male workers across levels of digitalization of workplaces (all sectors)²



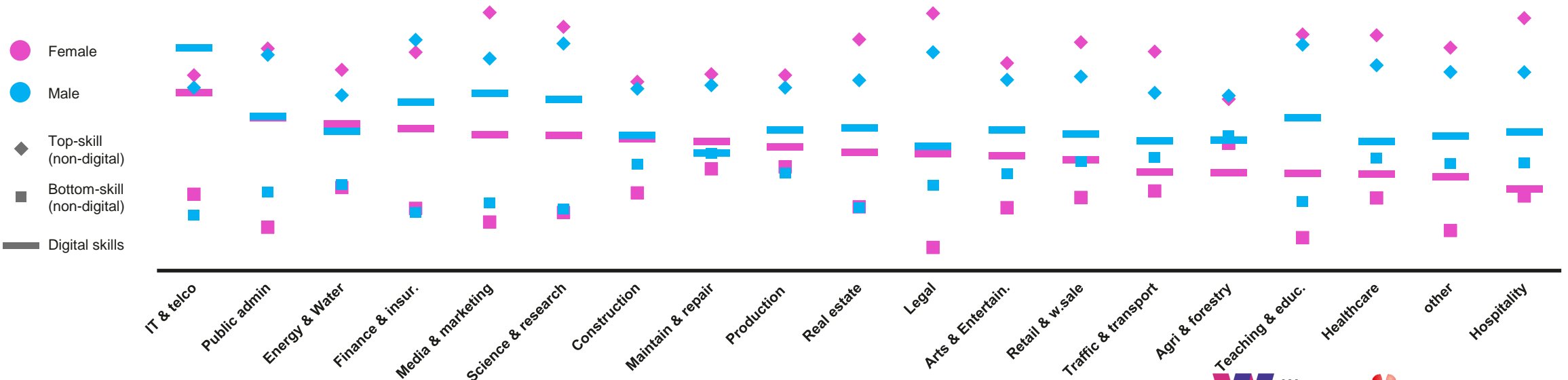
Sources and notes: ¹Latest data referring to all sectors of economic activity and "J Information and communication" (or the equivalent in non NACE classifications) respectively. China: Date for 2018; the sex composition of the employed population in urban public entities was drawn from the National Bureau of Statistics of China (国家统计局)'s report *Women and Men in China – Facts and Figures 2019*. EU countries: Eurostat data for 2021 (own calculations). UK: Office for National Statistics data for September 2022 (own calculations). US: ILO data for 2022. ²Survey (n=13,147). Digitalization of the company was measured on a nine item scale (Cronbach alpha >.9 for all countries) built from the Osterwalder and Pigneur (2010) business model canvas.. The groups for low, average, and high digitalization were developed for each country individually based on a triadic split of the data using +/- one standard deviation from the mean as the cut-off. For more information about the index methodology, see Schiffer, M., & Arnold, R. (2011). *Wirtschaft digitalisiert*. Cologne and Berlin: IW Consult and Bitkom. and Arnold, R. et al. (2013). *Wirtschaft digitalisiert. Welche Rolle spielt das Internet für die deutsche Industrie und Dienstleister?* Cologne and Berlin: IW Consult and Bitkom.

In over half of all sectors, women and men have similar skill profiles, but men claim to be more digitally savvy

Non-digital top- and bottom-skills by gender and sector



Digital skills in the context of non-digital top- and bottom-skills by gender and sector (average inverted rank for each sector)

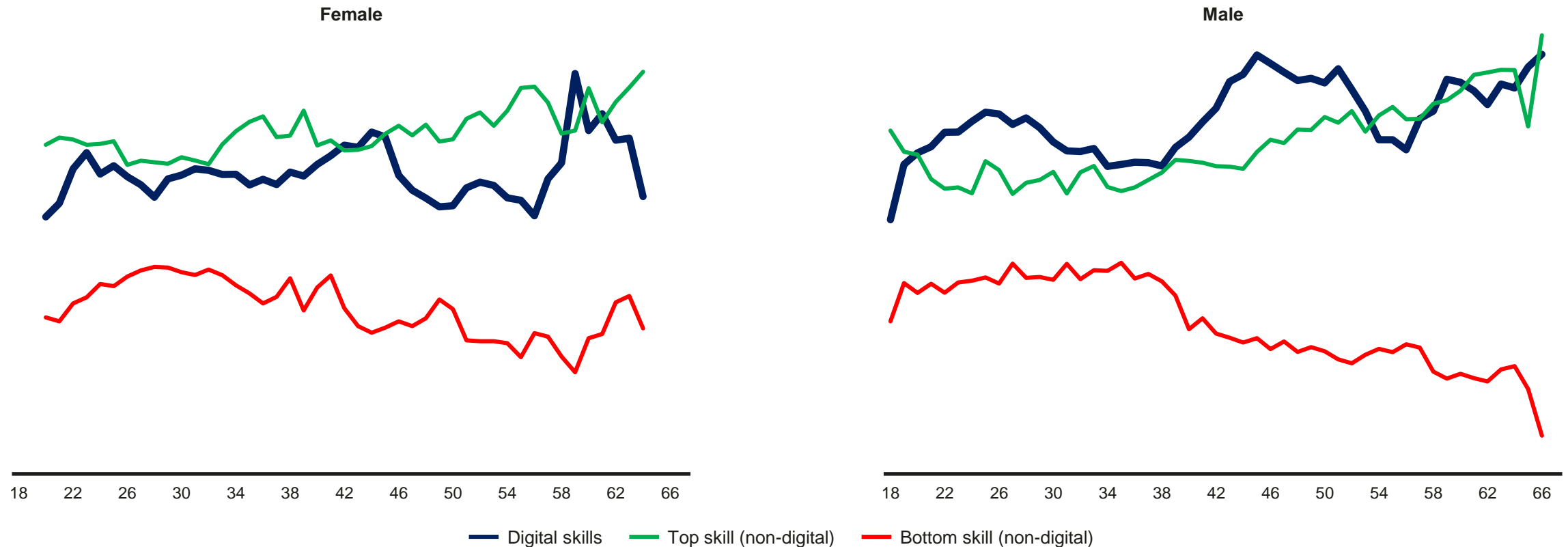


Source: Survey (n=10,919). Notes: Respondents were asked to rank eight sets of skills from top (what they are best at) to bottom (their weakest set of skills). The skillsets covered were (1) digital, (2) vocational, (3) social, (4) literacy, (5) technical, (6) intellectual, (7) communication, and (8) physical. Skillsets were presented in a randomized order for respondents to rank. Due to the small sample size in each sector, individual countries or regions cannot be analyzed individually.

Even when working in IT & telecoms, women do not see digital skills as their top skill

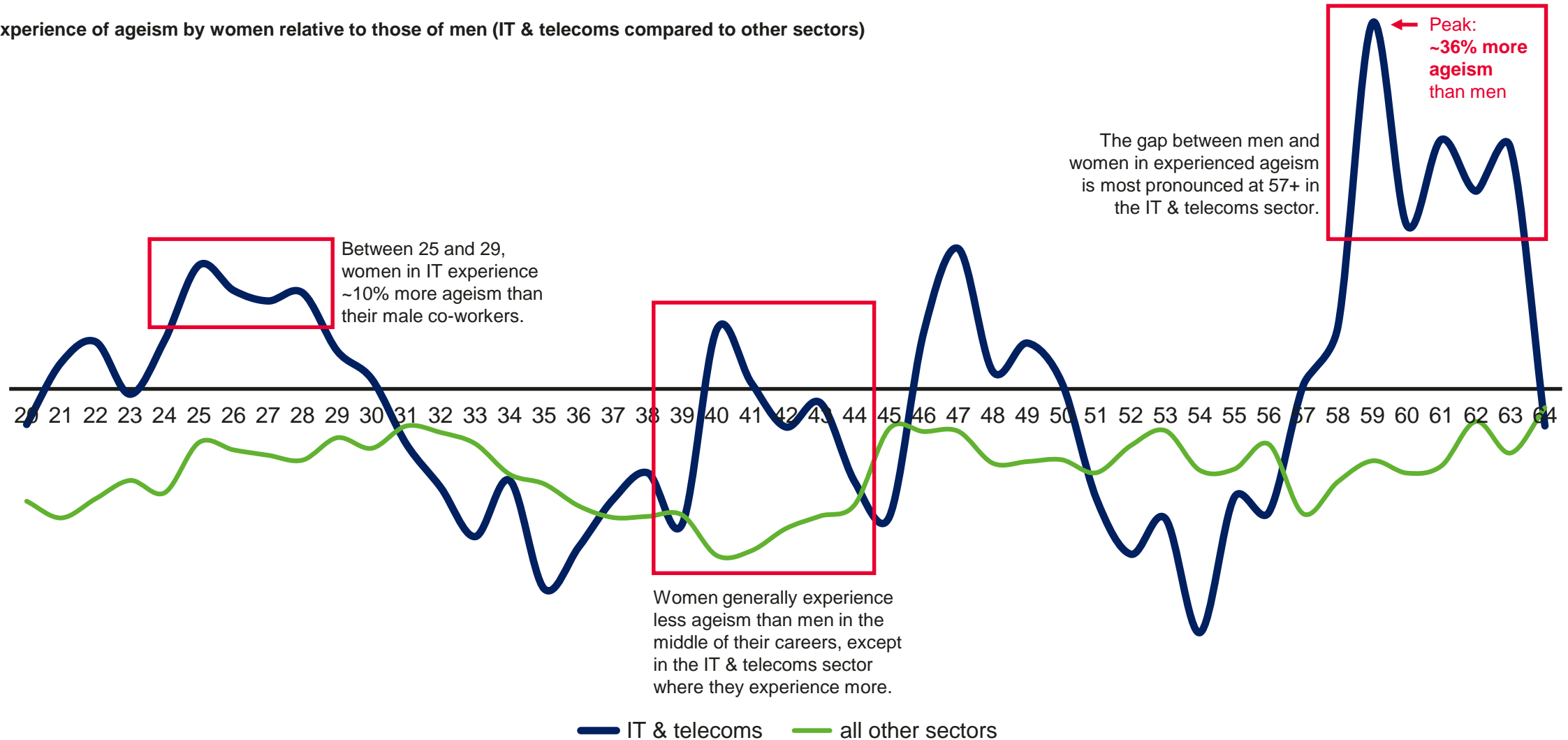
It is often assumed that people working in IT & telecoms have a higher degree of digital skills than the average worker. The charts below confirm this expectation. However, **women in IT & telecoms noticeably do not rate digital skills as their top skills**, whereas men working in the sector are more likely to view digital skills as their top skills.

IT & telecoms sector respondents' self-reported digital-skills level compared to their top and bottom skills (all countries)



Women in IT & telecoms experience more ageism than men

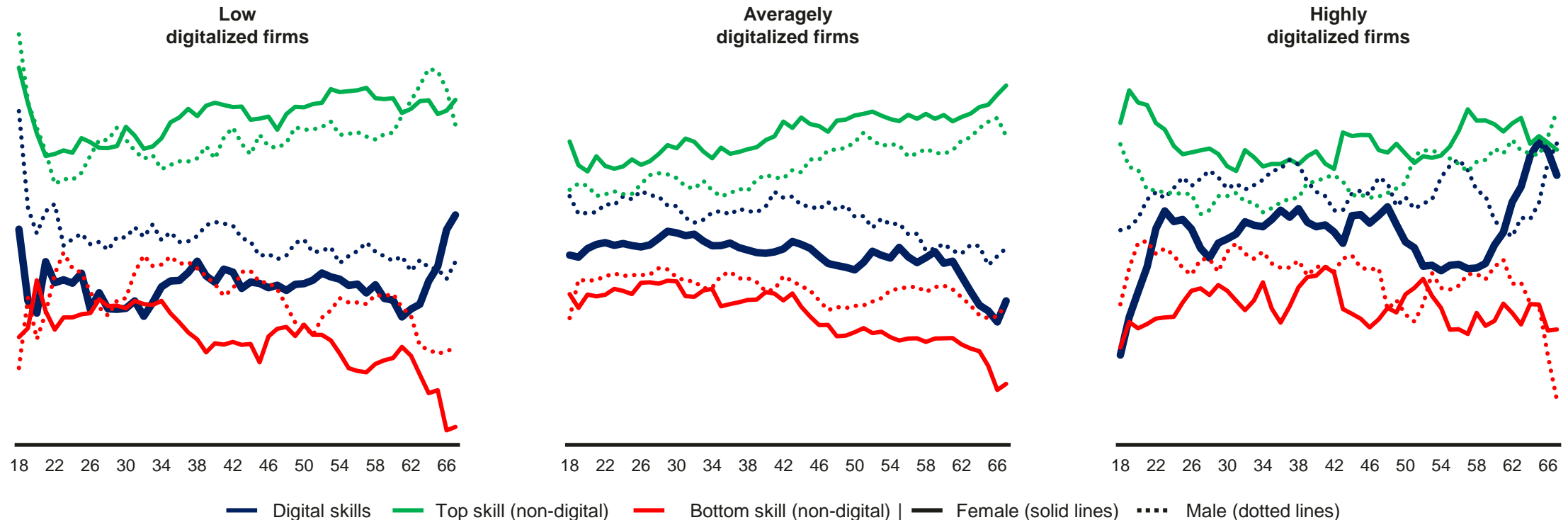
Experience of ageism by women relative to those of men (IT & telecoms compared to other sectors)



Women's digital skills barely rise with increased digitalization of workplaces

While the perceived skills profiles of women and men do not substantially differ when they work in low digitalized firms, only the perceived strength of men's digital skills increases sharply when they work in more digitalized environments. Women show only minor increases in perceived digital skills. Even in highly digitalized environments, women report feeling that their digital skills are not their top skills. Men in the same work environment frequently see digital skills as their top skill, especially in the 25 to 45 age group. These results underline the need for more efforts to equip women not just with digital skills, but also the confidence to put them to use.

Self-reported digital-skills level compared to respondents' top and bottom skills (all countries)



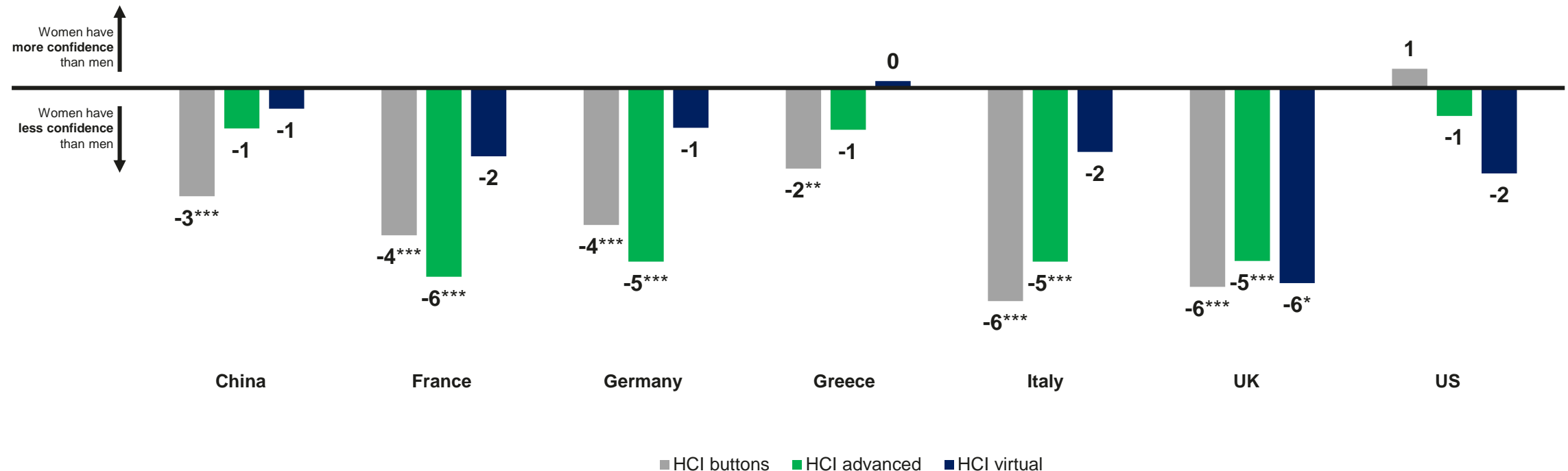
8 Source: Survey (n=19,363). Notes: Respondents were asked to rank eight sets of skills from top (what they are best at) to bottom (their weakest set of skills). The charts show the (moving) average (reversed) rank of their digital skills and their top and bottom non-digital skills on the same scale applied to all three charts. The skillsets covered were (1) digital, (2) vocational, (3) social, (4) literacy, (5) technical, (6) intellectual, (7) communication, and (8) physical. Skillsets were presented in a randomized order for respondents to rank. Respondents' age was capped at 67 years for this chart. Moving average for age +/- 2 years.



Advanced virtual interfaces flatten gender differences

Women and men generally perform similarly well with advanced (touch-centric) interfaces and any remaining difference between the genders completely flattens when using virtual interfaces. Women and men are also equally confident using virtual interfaces in all countries other than the UK, where the difference in confidence is only weakly significant. The way we interact with computers is rapidly changing, with modern voice assistants, AI chat services, and gesture controls becoming increasingly common since the mass adoption of touchscreens over the past 15 years. **The survey indicates women’s strong self-reported social and communicative skills may benefit them in using these newer human-computer interfaces (HCI) when compared with using traditional hard buttons.** These new HCIs may also help women improve their confidence in their digital skills. The way companies and policymakers currently think about and measure digital skills may not be optimally effective in light of these results.

Self-reported confidence using different types of human-computer-interfaces comparing women and men (in rounded %, 0 = same confidence)

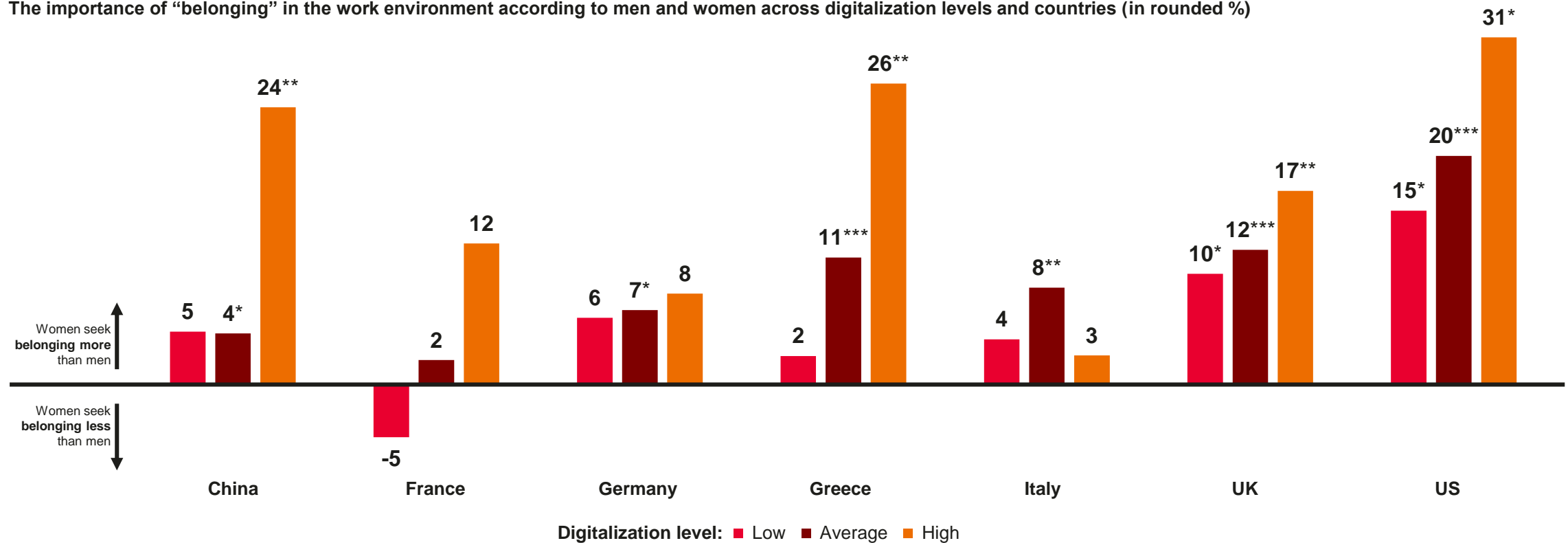


Sources: Survey (between n=4,870 and n=11,826 depending on the interface – users only). Notes: Scales were developed based on the recommendations by Bandura, A. (2006). Guide for constructing self-efficacy scales. Self-efficacy beliefs of adolescents, 5(1), 307-337. The scales captured the same five items for each interface representing increasingly difficult operations. The Cronbach alpha scores for the scales were all >.8 for all countries. The index ranged from Min=0 to Max=100. Advanced HCI comprises touch-centric interfaces (touchscreens and apps). Virtual HCI comprises voice and gesture interfaces. Statistically significant differences between women’s and men’s ratings were identified using Mann-Whitney-U tests: *p<.05; **p<.01; ***p<.001.

Women in digital firms seek ‘belonging’ more than men

In almost all cases, women sought a sense of “belonging” in their place of employment more than men, with this trend generally becoming more pronounced as firms become more digitalized. This supports other findings from the survey reported on the next page that digitalized workplaces differ markedly from less digitalized ones in their management culture and opportunities for knowledge exchange.¹ It also indicates that not only are women attracted to positions in companies that have a positive culture that promotes teamwork over competition, but that digitalization seems to be a critical factor in enabling the creation of these kinds of company cultures.

The importance of “belonging” in the work environment according to men and women across digitalization levels and countries (in rounded %)

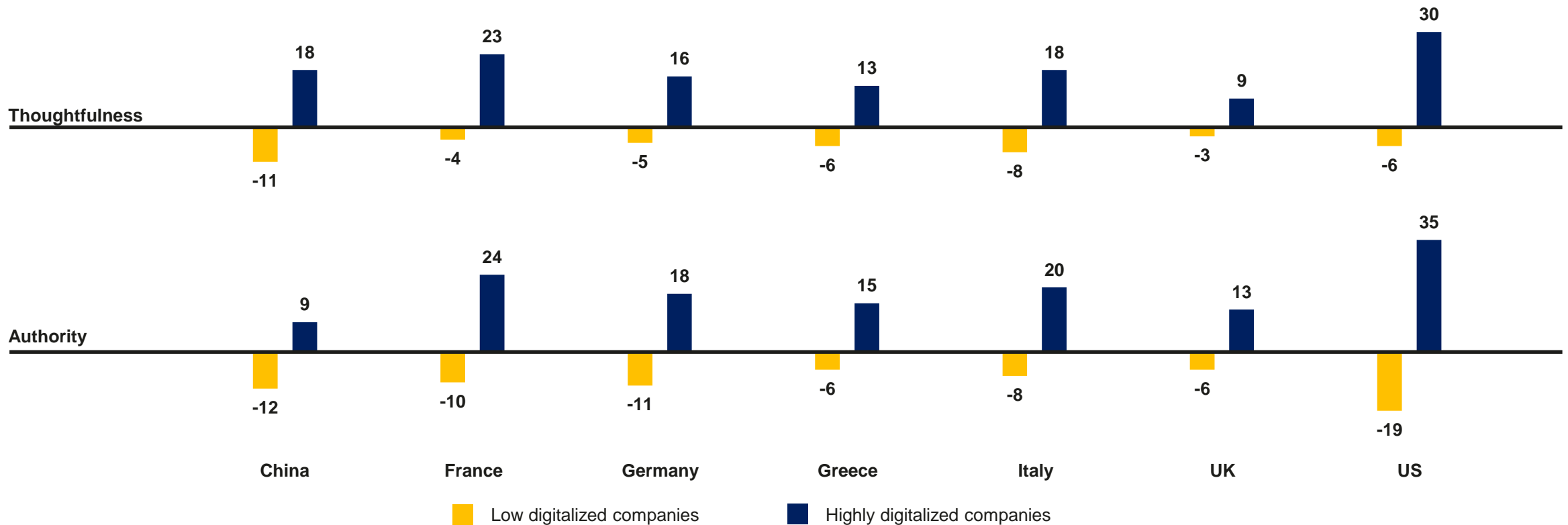


Source: Survey (n=13,147) Notes: The data presented in the chart refers to the difference in percent between women and men indicating how important “belonging” is to them compared to “exposure”.¹ Schneider, A., & Arnold, R. (2022): [Intergenerational collaboration and digitalization](#) – Key results of a seven country survey. Shenzhen: Huawei. Statistically significant differences between women’s and men’s ratings were identified using two proportion z-tests: *p<.05; **p<.01; ***p<.001. Digitalization of the company was measured on a nine item scale (Cronbach alpha >.9 for all countries) built from the Osterwalder and Pigneur (2010) business model canvas. The groups for low, average, and high digitalization were developed for each country individually based on a triadic split of the data using +/- one standard deviation from the mean as the cut-off. For more information about the index methodology, see Schiffer, M., & Arnold, R. (2011). *Wirtschaft digitalisiert*. Cologne and Berlin: IW Consult and Bitkom. and Arnold, R. et al. (2013). *Wirtschaft digitalisiert. Welche Rolle spielt das Internet für die deutsche Industrie und Dienstleister?* Cologne and Berlin: IW Consult and Bitkom.

Digital firms benefit from a more effective management culture

The survey data suggests that the digitalization of the workplace impacts the management culture of a firm. **Respondents in highly digitalized firms attribute more thoughtfulness to their managers, which appears to improve their acceptance of management authority and decisions.**

Change of perceived management culture indicators (index 0 = average digitalization level)

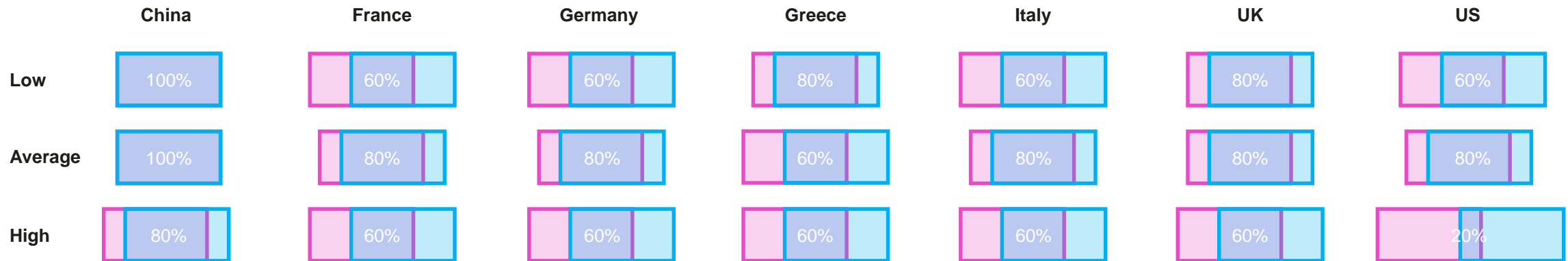


Source: Survey (n=13,147) Notes: Thoughtfulness and Authority represent indices based on multiple items, Cronbach alpha >.8 for all countries and both scales. Digitalization of the company was measured on a nine item scale (Cronbach alpha >.9 for all countries) built from the Osterwalder and Pigneur (2010) business model canvas. The groups for low, average, and high digitalization were developed for each country individually based on a triadic split of the data using +/- one standard deviation from the mean as the cut-off. For more information about the index methodology, see Notes: 1 Schiffer, M., & Arnold, R. (2011). Wirtschaft digitalisiert. Cologne and Berlin: IW Consult and Bitkom. and Arnold, R. et al. (2013). Wirtschaft digitalisiert. Welche Rolle spielt das Internet für die deutsche Industrie und Dienstleister? Cologne and Berlin: IW Consult and Bitkom. Except the differences from average to low digitalization levels in FR and UK all differences across digitalization levels were statistically significant at least p<.05 using Tukey-HSD tests.

Women and men look for similar incentives from employers

There is an average 69% overlap in the incentives sought by women and men. Preferences conformed the most in China (where there was a 93% overlap), and the least in the US (with a 53% overlap). **The specific desired incentives named by respondents were quite similar across gender, with company cars, free food, company pensions, and stocks topping the list in virtually all countries surveyed.** However, women valued incentives like mental health services, retail discounts, and sabbaticals at higher rates than men. Interestingly, childcare only featured among the top-5 most valued incentives for women in Greece and the UK and for men in the US.

Overlap in the top five incentives women and men want from their employers (in %) across countries and levels of digitalization (low, average, and high)



Top 5 listed incentives respondents looked for across countries (listed in alphabetical order)

Gender	China	France	Germany	Greece	Italy	UK	US
All	Fitness, free food, pensions, sabbaticals, stocks	Car, free food, pension, sust. home improvement support	Company cars, free food, pensions, public transportation vouchers	Company cars, free education, free food, pensions, stocks	Company cars, free education, free food, pensions	Free food, pensions, sabbaticals, sust. home improvement support, stocks	Company cars, free food, pensions, stocks
Women			Mental health services, retail discounts	Childcare, mental health services, retail discounts	Retail discounts, sabbaticals	Childcare, fitness, mental health services, retail discounts	Free education, mental health services
Men	Accommodation	Accommodation, digital devices	Education courses, stocks	Digital devices, sust. home improvement support	Digital devices	Company cars	Childcare, digital devices, retail discounts, sabbaticals, sust. home improvement support

Sources and notes: Survey (n=13,147). Notes: Respondents were asked to rank the top 5 incentives they would choose if offered by their employer from a list of 21 incentives. The specific incentive choices were chosen by both sexes, and the ones chosen solely by women or men respectively across the three levels of digitalization in each country. Digitalization of the company was measured on a nine item scale (Cronbach alpha >.9 for all countries) built from the Osterwalder and Pigneur (2010) business model canvas. The groups for low, average, and high digitalization were developed for each country individually based on a triadic split of the data using +/- one standard deviation from the mean as the cut-off.

Women benefit more from digitalized remote work

All seven countries surveyed saw increased remote and mobile work in recent years due to the pandemic's acceleration of global digitalization. **These more flexible work arrangements benefit women who still shoulder more domestic duties than men.** The research indicates that women benefit more from digitalization as regards to working remotely than men.

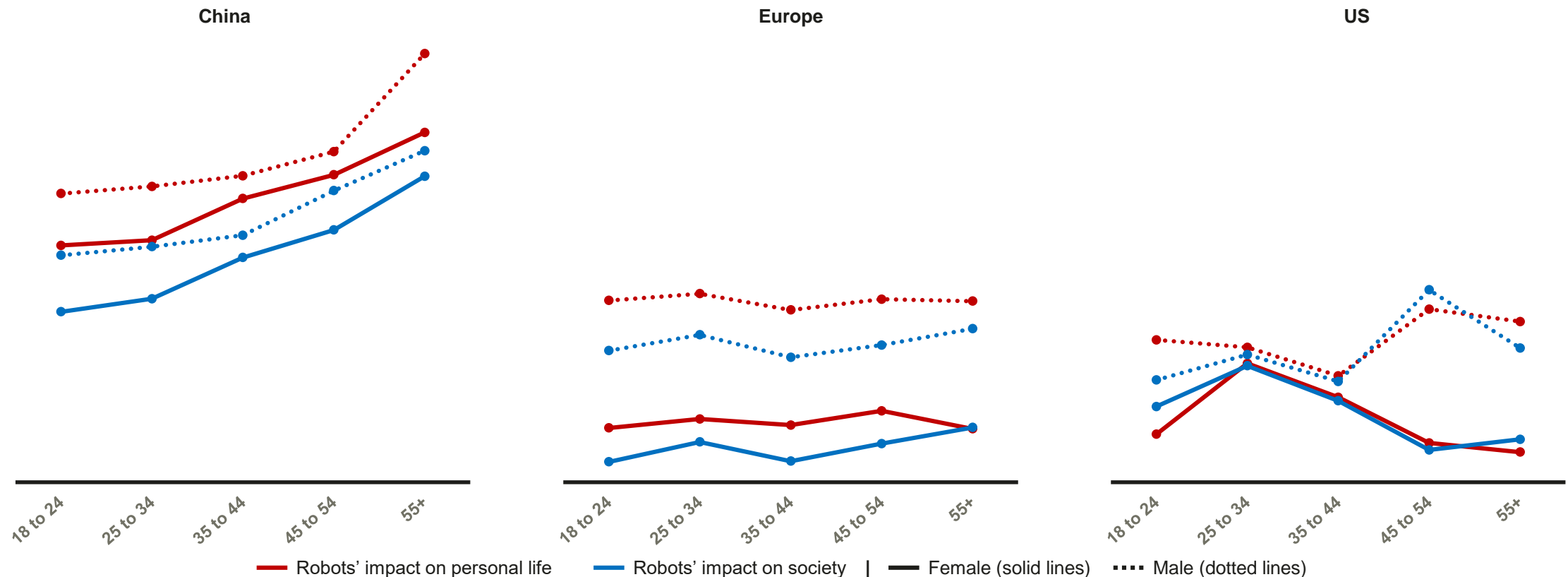
Share of remote work (WFH and mobile work) in the last four weeks prior to the survey grouped by low, average, and high digitalized work environments (only employees)



Women have a less positive attitude towards robots than men

Female respondents consistently viewed the impact of robots on both their personal lives and society as a whole less positively than male respondents. Robots are often designed by men for men, perpetuating gender stereotypes instead of breaking them. Robots are also frequently personified and gendered in a way that matches the preconceived roles of men and women in society, with “female” robots filling caretaking, cleaning, and assistance roles while “male” robots solve hard problems, lift heavy inventory, or venture into dangerous environments. This may influence the less positive view women on robots, both from their individual and a societal perspective. These views could potentially be reversed by diversifying the workforce developing robots.

Attitudes towards robots across genders and regions (higher scores indicate a more positive attitude)



Sources: Survey (n=19,363). Notes: Scales from Koverola, M., Kunnari, A., Sundvall, J., & Laakasuo, M. (2022). General attitudes towards robots scale (GAToRS): A new instrument for social surveys. International Journal of Social Robotics, 14(7), 1559-1581. Cronbach alpha >.7 for all scales in all countries. Moving average for age +/- 2 years. Respondents' age was capped at 67 years for this chart. Europe comprises data for France, Germany, Greece, Italy, and the UK. Scores presented are the normalized differentials between positive and negative attitudes scales.



Conclusions

- The effects and extent of digitalization are difficult to capture and compare. The same is true for digital skills. This survey drew from a uniquely large sample, allowing it to offer an alternative to typical approaches. It measures both digitalization and digital skills comparatively instead of against arbitrary metrics, and therefore, arrives at novel insights that can help shape our understanding of the critical factors for women's success in digitalized workplaces.
- Objectively, there is no reason why women should have less-developed digital skills than men. However, the results of this study indicate that women across multiple sectors perceive their digital skills as worse than or at most on par with men's. Worryingly, this gap is particularly pronounced in the IT & telecoms sector. While men in this sector frequently see digital skills as their top skill, women very often do not. **The IT & telecoms industry has to go a long way to properly recognize and promote women's digital skills.**
- The study also found women in the IT & telecoms sector disproportionately impacted by ageism. This poses a significant social barrier for female graduates that could discourage them from seeking a longer career within the sector. **Improvements must be made, particularly at the early stages of employment, to prevent a subsequent loss of valuable diversity.**
- While these results reaffirm the existence and impact of well-known barriers women face in the ICT industry, they more importantly indicate that these barriers also effect female participation in the workforce of highly digitalized firms. **Female digital leadership in all sectors must also be supported to close this digital divide.**
- This survey identified areas of improvement where clear concrete action can be taken to attract and retain female talent in digitalized workplaces. Digitalization can also play a critical role in these changes. **The advantage digitalization gives employees by creating more flexible work environments disproportionately benefitted women. More digitalized firms have also been shown to embrace women's need for team-oriented corporate cultures and, in turn, benefit from a different management culture.**
- These positive takeaways were all tempered, however, by the clear lack of confidence that plagues women due to the gender disparity within the tech sector. This can be clearly seen in the less positive attitudes women hold towards robots, likely as they were not designed to serve women's needs. Men continue to dominate the development of robots, and this lack of diversity means robots are not only made for men, but they also often reinforce traditional gender stereotypes. **The digital revolution itself will have to be more equitable if we hope for everyone to reap its benefits.**

Methodology

Method:	CAWI: Computer Assisted Web Interview
Sample size(s):	n=21,427 (China n=3,063; France n=3,051; Germany n=3,078; Greece n=3,031; Italy n=3,066; UK n=3,070; US n=3,068)
Sampling time:	2022/11/02 to 2022/11/15
Length of interview:	The median interview length varied between 24 and 32 minutes depending on the country.
Sampling frame:	The sample type is a non-probability sample recruited and stratified on the basis of representative quota distributions (quota sample).
Sampling procedure:	Using YouGov's proprietary sampling technology, quotas were framed based on the initial census or profile of the target population. This frame was the basis on which the sampling software controlled the flow of members into each survey. The sampling software randomly selected members from the available panel, and allocated them to surveys according to the quotas set. YouGov's sampling software included a router which removed the risk of self-selection on surveys, and increased our ability to deliver lower incidence samples within a short time frame. Panelists received an invitation email containing a survey link. When they accessed the link the router checked their participation against quotas on all live surveys and allocated them to a suitable survey. Since panelists were not invited to one specific survey the risks of early response bias, social desirability and other motivational biases were minimized.
Survey pretest:	To allow for testing, the online survey was soft-launched from 2022/11/02 to 2020/11/03. Based on the results, no adjustments were made.
Questionnaire:	Huawei, in collaboration with Prof. Dr. Anna Schneider (lead), Prof. Dr. Ulrike Fasbender, and Prof. Dr. Fabiola Gerpott, provided the master questionnaire in English. YouGov reviewed the questionnaire and translated it into the local languages required for the target countries.
Data preparation and analysis:	The survey data was processed by YouGov and provided in a SPSS data set. Incomplete entries were removed from the data set along with cases from the pretest and cases with duplicate cookie IDs were removed. The data was analyzed in R.

About the author

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Since 2017, Anna Schneider is Professor of Business Psychology. Her research interests and teaching revolve around the impact of digitalization on consumer behavior, and in particular how people communicate and interact with emerging technology. Anna is a member of various research associations and sits on the scientific board of the Wissenschaftliches Institut für Infrastruktur und Kommunikationsdienste (WIK) – a renowned communications and internet policy think tank. Drawing on more than 20 years of hands-on experience in market research she regularly advises public and private organizations on surveys as well as qualitative research projects.

Bring digital to every person, home and organization for a fully connected, intelligent world.

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