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WOMEN IN DESIGN

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Foreword

In recent years, the issue of gender equality has become increasingly important in all walks of life, including in the field of intellectual property. The desire to remove barriers to women's participation in IP is based both on a moral and an economic imperative. The moral imperative is simply that gender equality is an essential element of human rights, something which has value in and of itself. The economic imperative is that a society that discriminates against women is not making optimal use of the talents and abilities of half of its population, thereby missing out on economic development, growth and well-being.

Accordingly, WIPO has chosen the theme 'Women and IP: Accelerating innovation and creativity' for the World Intellectual Property Day, 26 April 2023.

In March 2023, 36 of the world's leading IP offices, including the EUIPO, published a joint statement[1], which states, in part, the following:

> *We commit to working together to support and empower women and girls to inclusively access the innovation and creative economy to achieve their professional aspirations through the use of IP system.*
>
> *In addition, we commit to encouraging women and girls within our communities, including from any indigenous and local communities, to become familiar with, and make effective use of the IP system, including as appropriate any tools for the protection of traditional knowledge, traditional cultural expressions, and genetic resources, for their own benefit and the benefit of their communities.*

To understand the extent of women's participation in IP and possible barriers to their participation, various IP offices have carried out studies during the past few years, including the USPTO[2], the

(1) Available at: https://euipo.europa.eu/ohimportal/en/web/guest/-/news/international-women-s-day-joint-statement-1.
(2) See Economic Note 102, available at: https://www.uspto.gov/sites/default/files/documents/oce-ip-econ-note-102.pdf.

EPO([3]) and the UKIPO([4]). Most of the studies carried out to date have focused on inventors and patents. This study, focusing on women designers and their participation in the RCD system, aims to make a useful contribution to this body of knowledge.

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([3]) See 'Women's participation in inventive activity', available at: https://documents.epo.org/projects/babylon/eponet.nsf/0/7A4224E289AA190BC12588EF0035BD67/$File/womens_participation_in_inventive_activity_2022_en.pdf.
([4]) See 'Gender profiles in worldwide patenting', available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/846363/Gender-profiles-in-worldwide-patenting-2019.pdf.

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Executive Summary

Gender equality is one of the fundamental aims of the European Union (EU). Achieving this goal requires data and information to analyse the situation of women and men in all policy domains. To contribute to the current state of play on gender analysis, the European Union Intellectual Property Office (EUIPO) has analysed the gender gap[5] in designs from different perspectives.

The starting point is to analyse the participation of women designers in the labour market, measuring the gender employment gap complemented by differences in personal, job and employer characteristics between women and men in the design field. Moving to decomposing the gender pay gap (GPG) of designers allows to better understand and identify which factors play a role in the differences in earnings bringing to light the unmet objective of 'equal pay for equal work'.

The gender employment gap between designers, or the under-representation of women in the creation of designs, is reflected in a lower participation of women registering designs at the EUIPO. Detailed information from the Registered Community Design (RCD) filings[6] is being used for the first time to analyse the participation of women in the creation of Community designs, and the characteristics of designs registered by women.

This report uses a large dataset to demonstrate the presence of a gender gap in the designer occupation (in the EU[7] and in 2021, 24 % of designers were women) and a similar gender gap in the registration of European designs (26 % of designs registered with the EUIPO by EU-based owners had at least one woman designer in the same year), the RCD gender gap[8]. Both of these gender gaps have been narrowing in the last decade but the movement towards gender parity is

[5] 'Gender gap is the gap in any area between women and men in terms of their levels of participation, access, rights, remuneration or benefits', European Institute for Gender Equality (EIGE).
[6] The gender analysis of RCD designers is based on 670 000 designs and 210 000 designers with information about the name of the designer in the EUIPO databases (43 % of the RCD registrations).
[7] The gender employment gap between women and men designers is estimated based on the Labour Force Survey (LFS) microdata for 23 EU member states (data not available for Bulgaria, Germany, Malta and Slovenia). Detailed data for the calculation of gender employment gap in designer occupations covers the period 2011-2021.
[8] This is in contrast with findings from the United States Copyright Office (2022) 'the share of women's authors in registration is substantially smaller than women's participation rate in corresponding occupations. This suggests a gender disparity exists in the usage of the copyright system'. Different findings are revealed by the United States Patent and Trademark Office, USPTO (2019): 'Across nearly all science occupations, women participate at a much higher rate than they invent patented technology. It is only in engineering that women's workforce participation rate resembles the overall women inventor rate'.

slow. The average annual growth rate of women designers in the period 2011-2021 was 5 % and the average annual growth rate registered in the same period [9] of RCD filings with at least one women designer was 2.5 % and 1 % for RCD filings without women. Therefore, at this pace it would take 51 years to achieve gender parity in the registration of RCDs [10].

The gender employment gap in the occupation of designers is the consequence of a gender-based sectoral and occupational segregation, or the concentration of one gender in certain sectors and occupations, which may explain the difference in earnings between women and men, since women tend to be concentrated in low-paying occupations. Women designers represent almost 40 % of designers in the public administration, arts, entertainment and human health and social work activities. The gender employment gap between designers is explained by a very low share of women working as electrotechnology engineers and software and applications developers and analysts. The participation of women in physical and earth science professionals and architects, planners, surveyors and designers is even higher, reaching over 50 % in these occupations in seven EU Member States.

The average gross hourly earnings [11] of designers [12] are 50 % above the average earnings of all employees for both women and men but the analysis has also confirmed a gender pay gap (GPG) within the design-related occupations: in 2018, women designers earned 12.8 % less than men designers, on average, in 14 EU Member States. Different personal, job and employer characteristics of women and men designers can only partially explain this gap: women designers are expected to earn on average 4.8 % less than men, according to their average characteristics in the labour market (less remunerative than those for men), so that the unexplained GPG for designers is still 8 %. The variables that further explain the lower earnings of women designers are: the country of the employer (1.8 %); the fact that women are on average younger than men (1.6 %); the different occupations of designers (1.2 %); their higher share of temporary contracts (0.4 %); and the higher presence of women in public controlled enterprises, which on average pay lower salaries to designers (0.3 %). On the other hand, as usual in this type of analysis, education records a negative gap, illustrating

[9] The average annual rate of RCD participation of women in the complete period 2005-2022 is identical.
[10] The World Intellectual Property Organisation, WIPO (2016), estimated that starting from a 15 % women inventors rate in 2015, the gender balance in Patent Cooperation Treaty (PCT) will take no less than 64 years.
[11] For simplicity, along this report by average earnings is meant average gross hourly earnings.
[12] The analysis of gender pay gap is based on 14 Member States for which detailed microdata from the Structural Earnings Survey (SES) is available for research purposes: Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Greece, France, Italy, Lithuania, Luxembourg, Latvia, Malta, Poland and Slovakia.

the fact that in average women engaged in the labour market tend to have higher education levels than men and consequently women designers would be expected to earn more (1.2 %) than men. This negative gap partially offset the explained gap of the rest of the variables included in the analysis.

Another interesting finding is the broader gender gap in the registration of RCD filings from EU-based enterprises (an average of 21 % of designs with at least one woman designer in the period 2003-2022) compared with non-EU-based owners of RCDs (31 % designs with women participation on average in the same period), with designs filed by Korean enterprises exceeding 50 % of RCDs with participation of women designers, and with 40 % of designs from Chinese based enterprises with participation of women designers.

Finally, three Locarno classes[13] have a share of filings with at least one woman designer above 35 %: Class 28: Pharmaceutical and cosmetics products, toilet articles and apparatus; Class 11: Articles of adornment and Class 05 Textile piece goods, artificial and natural sheet material. At the other extreme, the minimum share of RCD filings with women designers is below 10 % in the Locarno Class 17: Musical instruments, and three classes have a share below 15 %: Class 22: Arms, pyrotechnic articles, articles for hunting, fishing and pest killing; Class 25: Building units and construction elements; and Class 08: Tools and hardware.

The different situation of women designers in the EU Member States is summarised in Table 1, with the employment gender gap (share of women designers), the gender pay gap between designers before and after correction from different characteristics of women and men designers (unadjusted and adjusted GPG), and the share of RCDs with at least one woman designer or gender gap in registration of RCDs.

The table shows that RCDs filed by companies from Belgium, Denmark, Germany, Estonia, Ireland, Greece, France, Latvia, Lithuania, Luxembourg, Netherlands, Portugal, Slovenia, Finland Sweden, have shares of woman designers above the EU average of 20.9 %.

[13] Locarno is the international classification used for the purposes of the registration of industrial designs to indicate the product(s) which the design is intended to be applied to or incorporated in.

Table 1: Share of women designers, unadjusted and adjusted gender pay gap (GPG) and Registered Community Design (RCD) with at least one women designer.

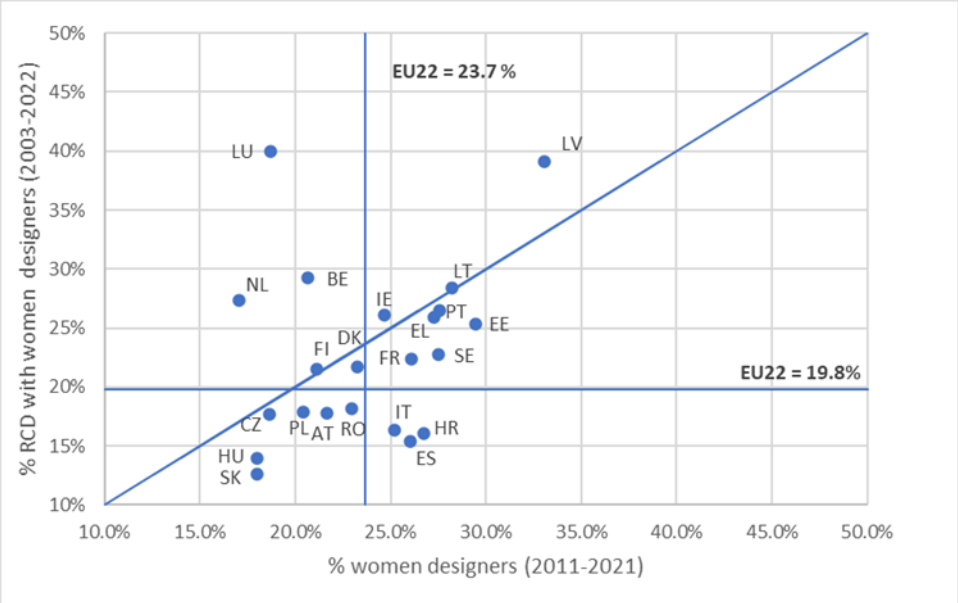
% women	Designers	Unadjusted GPG	Adjusted GPG	RCD*
EU	**23.7**	**12.8**	**8.0**	**20.9**
Austria	20.4			17.9
Belgium	20.6			29.2
Bulgaria		28.1	28.0	5.4
Czech Rep.	18.7	18.9	14.4	17.7
Germany				22.4
Denmark	23.3	10.2	5.8	21.7
Estonia	29.5	20.9	15.0	25.4
Greece	27.3	23.0	15.0	25.9
Spain	26.0			15.4
Finland	21.1			21.5
France	26.1	11.1	9.1	22.3
Croatia	26.7			16.0
Hungary	18.0			14.0
Ireland	24.7			26.1
Italy	25.2	9.5	7.9	16.3
Lithuania	28.2	21.1	12.1	28.4
Luxembourg	18.7	9.0	5.5	40.0
Latvia	33.0	27.1	18.9	39.1
Netherlands	17.1			27.4
Poland	21.7	24.5	15.9	17.8
Portugal	27.6			26.5
Romania	22.9			18.1
Sweden	27.5			22.7
Slovenia				21.2
Slovakia	18.0	12.8	11.5	12.6

Source: Authors' calculations based on EU-LFS/SES microdata for research purposes with available and reliable data and RCD database.
Note: reference periods are: designers (2011-2021); GPG (2018) and RCD gender gap (2003-2022).
* % of RCD filings with at least one woman designer.

Figure 1 compares the participation of women in the design occupation and their participation in the RCD system in 22 Member States [14]. Half of the Member States are on, or close to, the diagonal, meaning that the participation of women in the design occupation is parallel to their use of the European registration system. Latvia stands out with close to 35 % of women designers in both indicators. On the other extreme, three countries show a disparity in the participation of women in designer occupation and in the RCD system: Spain, Croatia, and Italy have shares of women as designers in RCDs ten percentage points lower than their participation in the labour market.

Therefore, women designers are underrepresented among designers filing RCDs. They also participate less frequently than men designers and receive a lower remuneration for their work. While progress is being made, the pace of change is slow.

Figure 1: Share of women designers and RCD filings with at least one women designer in EU Member States.



Source: Authors' calculations based on EU-LFS microdata for research purposes with available and reliable data and RCD database.

[14] Employment gender gap between designers is missing for Bulgaria, Germany, Malta and Slovenia and the RCD gender gap is missing for Cyprus and Malta. The EU average ratios in this comparison refers to the common Member States (EU22) which is 1 percentage point below the EU27 average.

1 Introduction

Innovation and creativity are key drivers of progress and serve to foster economic growth and employment. However, numerous studies have shown that some groups remain under-represented in these areas.

Promoting gender equality is a key principle of the EU[15], which has made significant progress over the last decades with more women in the labour market and progress in securing better education and training. However, gender gaps remain, with women being over-represented in lower paid sectors and under-represented in decision-making positions and research. The European Institute for Gender Equality (EIGE) provides a solid body of publications on gender analysis[16], which is essential to provide the data and information to integrate the gender perspective into policies. The gender gap in research and innovation[17] is also reflected in the intellectual property (IP) system, with fewer women than men participating in many areas of the IP system and practice[18].

This gender gap in woman innovators, entrepreneurs and creators is being documented in an increasing number of publications. The World Intellectual Property Organization (WIPO)[19], the United States Patent and Trademark Office (USPTO)[20], the Organisation for Economic Co-operation and Development (OECD)[21], the European Patent Office (EPO)[22] and the United Kingdom Intellectual Property Office (UKIPO)[23], amongst other organisations, have released a variety of studies on the topic. The growing interest in the situation of women in IP has also led to a large number of initiatives and actions. A few examples of the initiatives in which the European Union Intellectual Property Office (EUIPO) currently participates are: Girls Go Circular[24], under the

(15) Gender Equality Strategy 2020-2025. https://commission.europa.eu/strategy-and-policy/policies/justice-and-fundamental-rights/gender-equality/gender-equality-strategy_en
(16) https://eige.europa.eu/publications?a%5B%5D=616&a%5B%5D=616.
(17) Women accounted for just 33 % of European researchers in 2018. https://eige.europa.eu/publications/gender-research-0.
(18) Only 16.5 % of inventors named in international patent filings in 2020 were women. https://www.wipo.int/women-and-ip/en/news/2021/news_0002.html.
(19) https://www.wipo.int/women-and-ip/en/.
(20) https://www.uspto.gov/ip-policy/economic-research/publications/reports/progress-potential.
(21) https://www.oecd.org/gender/.
(22) https://www.epo.org/news-events/in-focus/women-inventors.html.
(23) https://www.gov.uk/government/publications/gender-profiles-in-worldwide-patenting-an-analysis-of-female-inventorship-2019-edition.
(24) https://eit-girlsgocircular.eu/.

coordination of the European Institute of Innovation and Technology (EIT); and the Women and Girls in STEM (science, technology, engineering and mathematics) Forum([25]) organised in close cooperation with the European Commission's DG EAC (Directorate-General Education, Youth, Sport and Culture).

The purpose of this study on gender disparities among designers is to add to this body of knowledge by examining the role of women designers in Registered Community Design (RCD) filings at the EUIPO. It supplements the studies referenced above, which mostly focus on patents.

The present study has a twofold scope: the situation of women designers([26]) in the labour market and the IP gender gap based on the registration of RCD filings by women.

Section 2 summarises the registered Community design (RCD) system, and section 3 presents some findings on the industries that use more RCD than the EU average, based on previous joint research from the European Patent Office (EPO) and the European Intellectual Property Office (EUIPO)([27]). Sections 4 and 5 focus on the gender differences among designers in the labour market and in the registration of RCD filings. Section 4 analyses two types of gender gaps: the Gender Employment Gap explained by the share and characteristics of women working as designers, and the Gender Pay Gap (GPG). This section is based on Eurostat's microdata of official statistics and analyses gender gaps based on different characteristics of workers and enterprises. Section 5 presents the results of an analysis of the EUIPO's RCD database, to understand the role of women designers in RCD filings during the last two decades. For this analysis, the RCD database was used to derive the share of filings in which (one of) the designer(s) is a woman and the characteristics of designs registered by women. Finally, section 6 presents some conclusions and suggestions for further research for a deeper knowledge of women in designs.

([25]) https://eit.europa.eu/news-events/events/women-and-girls-stem-forum.
([26]) Designer occupation is defined in ISCO-08 (International Standard Classification of Occupations) based on tasks performed and included in sub-major groups 21 and 25. More details on ISCO-08 can be found in Appendix I.
([27]) EPO/EUIPO (2022).

2 Registered Community Designs (RCD)

A design is the appearance of a product or part of a product. Designs can be protected at national level or at EU level. The Registered Community Design (RCD) is the design registered at the EUIPO [28] and provides uniform protection throughout the EU with a single filing. An RCD is a registered right created under the design regulation [29] [30].

The core function of the design right is to protect the visual appearance of a product, not a technological development. Article 3 of the design regulation clarifies some definitions: 'design means the appearance of the whole or a part of a product resulting from the features of, in particular, the lines, contours, colours, shape, texture and/or materials of the product itself and/or its ornamentation'; 'product means any industrial or handicraft item, including, inter alia, parts intended to be assembled into a complex product, packaging, get-up, graphic symbols and typographic typefaces, but excluding computer programs'.

The design regulation requires that the design is new (no identical design has been disclosed before) and possesses individual character (the overall impression differs from that conveyed by any other previous designs). To indicate the product(s) which the design is intended to be applied to or incorporated in, the Locarno Classification [31] is used.

Any individual or company can apply for an RCD, a right that is renewable for up to 25 years.

([28]) RCDs can also be filed through the International Bureau of the World Intellectual Property Organisation (WIPO). The analysis of RCD registrations by women designers in this report is based on the EUIPO database and refers only to RCDs filed at the EUIPO, which represent 92 % of all RCDs.
([29]) https://euipo.europa.eu/ohimportal/en/web/guest/community-design-legal-texts.
([30]) Currently, the design regulation is in the process of legislative reform, with the goal of adapting EU design law to the new technology-based environment and the adaptation to the digital age of the definition of design.
([31]) https://www.wipo.int/classifications/locarno/en/ – the list of Locarno classification headings is included in Appendix IV.

3 Contribution of design-intensive industries to the EU economy

The economic case for design registration builds primarily on the idea of promoting innovation. The production of new designs is a creative activity, requiring significant investments of time, skills and labour. If no exclusive rights were available, any party could replicate a design and use it to directly compete with the original creator. Providing a legal mechanism to protect new designs should ultimately enhance investments in design production and creative work.

In EPO/EUIPO (2022), design-intensive industries are defined as those industries that have registered more RCDs than the EU[32] average industry, considering designs registered between 2013 and 2017. Enterprises that have successfully filed RCDs between 2013 and 2017 are found in 487 out of 615 NACE[33] classes but only 177 of these classes were selected as design-intensive (industries with more than 1.66 designs per 1 000 employees). Design-intensive industries are mostly found in the manufacturing sector of the economy[34].

Between 2017 and 2019, 27 million people were employed in the design-intensive industries within the EU, representing 13 % of total employment in the EU and generating 15.5 % of EU GDP, reflecting the higher productivity (value added per employed person) associated with these industries[35].

The contribution of design-intensive industries to international trade is even more remarkable with a trade surplus of more than EUR 200 billion with non-EU countries and even greater figures in intra-EU trade, representing 50 % of the trade of goods and services among EU Member States between 2017 and 2019[36].

(32) The EU acronym refers to the current 27 Member States (MS) of the European Union, unless otherwise indicated.
(33) NACE stands for *'Nomenclature statistique des activités économiques dans la Communauté européene'* and it is the official classification of economic activities used in the EU official statistics.
(34) A list of design-intensive industries is available in the EPO/EUIPO (2022).
(35) Contribution of design-intensive industries to employment, GDP and international trade are estimated by the EPO/EUIPO based on Eurostat's data of Structural Business Survey, National Accounts and international trade in goods and services.
(36) The EPO/EUIPO (2022).

The single market offers the possibility of locating production and innovative activities in different Member States and RCDs registered at the EUIPO protect designs in all Member States. The report on the contribution of IPR-intensive industries to the EU economy revealed that many of the more recent EU Member States have relatively high proportions of employment and GDP in IPR-intensive industries. Therefore, Bulgaria, the Czech Republic, Germany, Estonia, Italy, Lithuania, Hungary, Poland, Portugal, Slovenia and Slovakia all have shares of employment and GDP in the design-intensive industries above the EU average. The Czech Republic and Slovakia are the two Member States with the highest contribution of design-intensive industries to employment and GDP[37].

Nevertheless, the economic contribution of IPR-intensive industries in each Member State does not necessarily reflect the degree to which a country's economy is innovative but the location of enterprises that benefit from IP protection. For example, a country may be a good location for design-intensive industries due to low costs, a favourable business climate or the availability of natural resources. That country may then have a high share of employment in design-intensive industries although enterprises from those industries have their head offices and carry out their research and development (as opposed to production) elsewhere. When RCD filings are analysed by country of origin, the highest number of filings correspond to the largest Member States (Germany, Italy, France, Poland and Spain) and in relative terms (number of design filings per employee) the ranking is led by Denmark followed by Austria and Malta[38].

The importance of EU-wide IPRs such as RCDs in supporting economic integration among Member States is reflected in the creation of jobs by foreign affiliated enterprises[39] from other EU28[40] Member States. Between 2017 and 2019, 25 % of jobs created in design-intensive industries were in foreign-controlled enterprises from other countries, of which 14 % were in enterprises based in other EU Member States. Six countries show percentages above 40 % of employment from other Member State enterprises in design-intensive industries: Hungary, Romania, the Czech Republic, Luxembourg, Slovakia and Estonia[41]. With the exception of Luxembourg, a founding member of the EU, these are all countries that joined in 2004 or 2007.

(37) ibid.
(38) ibid.
(39) Foreign Affiliate is defined as an enterprise resident in one country but controlled by an institutional unit not resident in the country.
(40) Results of foreign affiliates include the United Kingdom among EU Member States.
(41) The EPO/EUIPO (2022).

This reflects the successful implementation of the single market in the Central and Eastern European countries that joined the EU in the 2004 and subsequent enlargements, specifically in the industries that register European designs.

4 Women designers in the labour market

The presence of women in the labour market has progressed in recent decades but there are still differences between the participation of women and men in the labour market in every country in the world, even though gender equality is one of the EU fundamental rights [42].

The gender employment gap is an indicator of systematically lower employment rates for women than for men. In the EU in 2022, the employment rate for women was approximately 69 %, versus 80 % for men [43]. Sub-section 4.1 analyses the presence of women working as designers and their characteristics and compares it with the general situation of women in the EU labour market.

The gender pay gap is an indicator of average earnings being higher for men than for women. On average, women earned 14 % less than men [44] in 2018, and, after correcting for some differences in their average characteristics, this gap was still 11 %. Sub-section 4.2 analyses earnings of women and men designers and partially explains the gender pay gap due to different characteristics of workers and employers.

The employment and pay gender gaps are estimated based on Eurostat's microdata for research purposes from the Labour Force Survey (LFS) [45] and the Structure of Earnings Survey (SES) [46]. These two official statistics are surveys addressed to individuals. Their main purpose is to classify the population with regard to their situation in the labour market (LFS) and to estimate average earnings of employees (SES) depending on personal characteristics, type of contract and enterprise characteristics. Both surveys use official classifications to group employed persons, including those specialised in creating designs. The official classification of occupations, International Standard Classification of Occupations (ISCO-08) details the tasks that are typically performed by each occupation to help classify workers in a homogeneous and coherent way.

([42]) Article 23 of the Charter of Fundamental Rights of the EU (equality between women and men):'Equality between women and men must be ensured in all areas, including employment, work and pay. The principle of equality shall not prevent the maintenance or adoption of measures providing for specific advantages in favour of the under-represented sex'.
([43]) https://eige.europa.eu/gender-mainstreaming/policy-areas/employment.
([44]) Eurostat, https://ec.europa.eu/eurostat/databrowser/view/LFSI_EMP_A__custom_5582085/default/table?lang=en.
([45]) More details about the LFS can be found on the Eurostat web page https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_labour_force_survey.
([46]) More details about the SES can be found on the Eurostat web page https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Structure_of_earnings_survey_(SES).

A designer is a person who imagines or plans how something new will look and how it could be made (in the case of a physical product). The main task of a designer is to create products or parts of a product([47]). Some examples of different fields where designers work typically include (but are not limited to): architecture, costume, fashion, engineering, furniture, industrial, jewellery, game, urban, packaging, web design, etc.

ISCO-08([48]) sub-major group 21 (Science and Engineering Professionals) includes six minor groups of which four (211, 214, 215 and 216)([49]) are defined by tasks typically performed by designers. Sub-major group 25 (Information and Communications Technology Professionals) includes two minor groups of which only one (251)([50]) performs tasks leading to the creation of designs. Competent performance in most occupations in this sub-major group requires skills at the fourth ISCO skill level, comprising education that begins at the age of 17 or 18, lasts for 3, 4 or more years, and leads to a university or postgraduate university degree, or the equivalent. Tasks defining occupations in the selected minor groups include conducting research in different fields and designing products, processes and systems.

In this section, the profession of designer is defined by occupations included in ISCO-08 minor groups 211, 214, 215, 216 and 251. This definition of the occupation of designer is quite broad to ensure a good coverage of different types of designs, at the cost of including some workers whose main task could be different from the creation of designs.

4.1 Gender employment gap

Women's participation in the labour market has increased in recent years, although their participation rates are still lower than those for men. This is reflected in a share of woman in employment below 50 %([51]). The percentage of women among all workers and designers in all Member States shows how far the EU countries have to go to achieve equal participation of women and men in the labour market in general, and specifically in the design profession. Additionally, some personal

([47]) Some examples of designs can be found on the EUIPO web page: https://euipo.europa.eu/ohimportal/en/web/guest/design-definition.
([48]) Appendix I presents ISCO-08 definitions of occupations included in 21 and 25 sub-major groups.
([49]) 211 'Physical and Earth Science Professionals'; 214 'Engineering Professionals (excluding Electrotechnology)'; 215 'Electrotechnology Engineers'; 216 'Architects, Planners, Surveyors and Designers'.
([50]) 251 'Software and Applications Developers and Analysts'.
([51]) At the EU level women represented 50 % of the population aged between 15 and 64 years (ranging from 47 % to 52 % at Member State level) and 46 % of total employed persons in 2021 (ranging from 42 % to 50 % by Member State).

characteristics of women and men designers are compared with regards to their average age, working experience and level of education as well as their job characteristics, such as temporary or part-time contracts, most frequent industries, occupations or professional status (employees and self-employed).

Based on LFS microdata ([52]), women represented 46 % of all workers in 23 EU Member States in 2021, with an increase in the last 10 years of 1 percentage point ([53]). The lower participation of women is not the only gender difference (segregation effect) in the labour market, there is also a gender-based segregation in employment, meaning that women are over/under-represented in some sectors, occupations, or tend to have different types of contracts from men.

Gender sectoral segregation ([54]) is reflected in women representing more than 70 % of workers in human health and social work activities and in education, and 90 % of domestic workers. The greatest under-representation of women in the labour market occurs in construction and mining and quarrying industries, with only 10 % of employees in those sectors being women.

In EU23 in 2021, women tended to participate in the labour market as employees (48 % of all employees were women) rather than as self-employed (32 %); women signed more temporary contracts than men (16 % of women had a temporary contract compared with 14 % of men) and they were over-represented in part-time contracts (25 % of women worked part-time compared with only 9 % of men, so that 71 % of part-time workers were women).

Women designers represented 24 % of all designers working in EU23 in 2021. 6 % of working men were designers while only 2 % of women workers were classified in these occupations. This figure confirms the higher employment gender gap in designs that occurs in general in technology-oriented fields and research.

Designers were concentrated in manufacturing, information and communication and professional, scientific and technical activities, with 69 % of women and 72 % of men designers employed in these

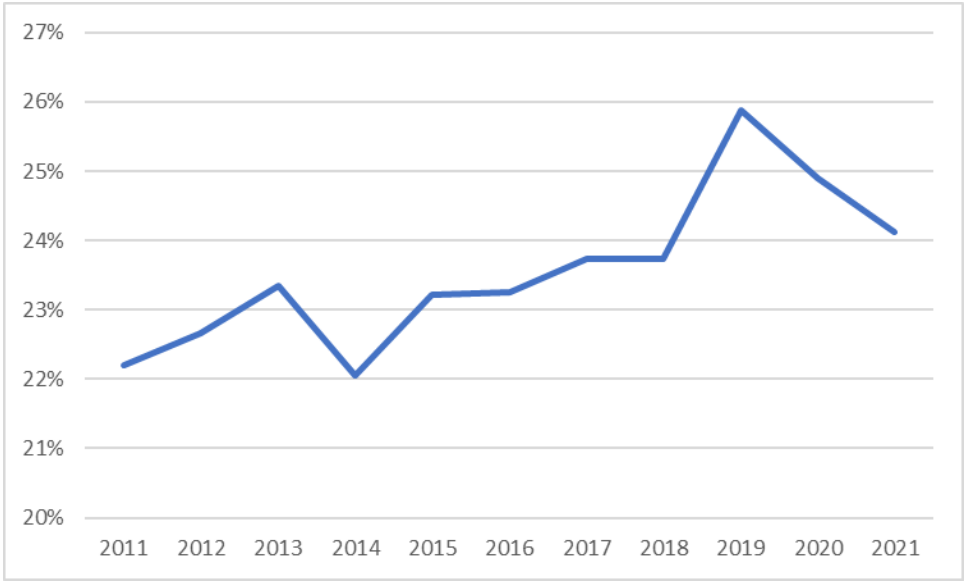
([52]) Eurostat LFS microdata for research purposes including occupations at 3-digit ISCO level between 2011 and 2021, except for Bulgaria, Slovenia (2-digit level) and Malta (1-digit level), No data was provided for Germany. For comparison purposes, the employment gender gaps for designers and all occupations are estimated in section 4.1, based on the remaining 23 EU Member States. For the reasons explained in Appendix II, results are slightly different from those published by Eurostat.
([53]) There is a break in the LFS series in 2021 when calculated from microdata for research purposes.
([54]) For more details on sectoral and occupational segregation see Eurostat (2021), page 24.

industries. Women designers represented almost 40 % of designers in public administration, arts and entertainment and human health and social work activities. However, less than 10 % of designers in mining and quarrying industries were women.

Table 3 illustrates the gender occupational segregation among designers, with few women working as electrotechnology engineers (215) and software and applications developers and analysts (251) and more than 40 % of women designers in physical and earth science professionals (211) and architects, planners, surveyors and designers (216). As a result, the most common occupation of women designers is architects, planners, surveyors and designers (36 %) with only 15 % of men designers in these occupations.

Figure 2 shows the trend of the employment gender gap between designers. The share of women designers has grown by 2 percentage points in the last decade, from 22 % in 2011 to 24 % in 2021. However, there was a noticeable decrease in the last 2 years, from the peak of 26 % in 2019. As mentioned above, comparisons with 2021 should be taken with caution due to a break in the series of LFS microdata.

Figure 2: Share of women designers in EU23, 2011-2021



Source: Authors' calculations based on EU-LFS microdata for research purposes with available and reliable data. EU23 refers to EU27, excluding Bulgaria, Germany, Malta and Slovenia.

Designers have fewer temporary contracts than the average worker: 12 % of women designers and 8 % of men designers had a temporary contract in the EU23 in 2021, resulting in 33 % of designers with temporary contracts being women.

Designers with part-time contracts represented only 13 % of women and 5 % of men. This gender difference is quite significant but far from the gender gap in all occupations, with 24 % of women and 8 % of men working part-time.

In contrast to the general tendency of women to work as employees (48 % of all employees were women and only 32 % of self-employed persons), the share of self-employed women designers was almost the same as employees.

Table 2: Share of women by type of contract in EU23: all occupations and designers, 2021

% women	All occupations	Designers
Employed persons	45.9	24.1
Temporary contract	51.1	32.6
Part-time contract	71.1	44.4
Employees	48.3	24.0
Self-employed	32.3	24.5

Source: Authors' calculations based on EU-LFS microdata for research purposes with available and reliable data.

As shown in Table 2, the participation of women in occupations related to designs was lower than the average participation of women in the labour market. They work as much as employees than self-employed in contrast with the usual higher participation of women as employees. Women had more temporary contracts than men, and the gender gap in part-time contracts was smaller among designers than in all occupations.

Designers were, on average, younger than the average workers, with noticeable gender differences. Women designers were, on average, 39.3 years old, 2 years younger than men designers who had

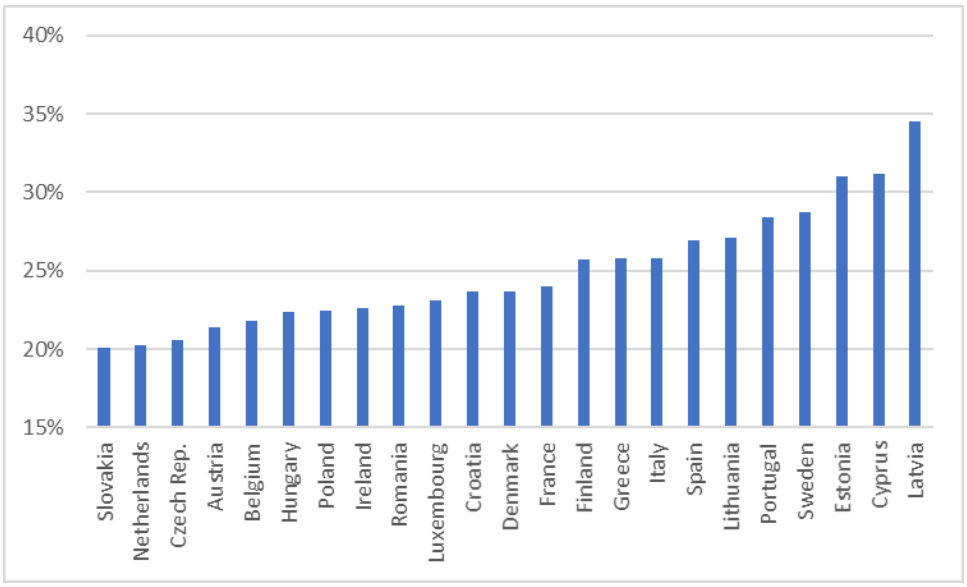
an average age of 41.3 years, whereas the overall average age of employed women was 46.4 years compared with 46.7 years for men.

Despite the small difference of 2 months in the average age of employed women and men, the average working experience of women in the current job was 8 months shorter than for men (10.5 years average working experience for women and 11 years and 2 months average working experience for men). The average working experience was shorter for designers: women designers had an average working experience of 8 years and 5 months and men designers had worked in their current job an average of 9 years and 7 months. In other words, women designers had 14 months shorter working experience than men designers, a smaller gender difference than in the average age of designers (2 years).

Summarising, women were less represented in designer positions, with an employment rate of just over half that of men designers. Nevertheless, there were smaller gender differences with regards to part-time contracts, and women designers were more willing to work as self-employed. A distinguishing characteristic of designers is their average age: both women and men designers are younger and have less working experience than the average worker; and within the design profession, women designers are younger and have shorter working experience in their current job compared to their male colleagues.

Gender employment gaps among designers differ among the EU Member States, ranging from 20 % women designers in Slovakia, the Netherlands and the Czech Republic to 35 % in Latvia.

Figure 3: Share of women designers in selected EU Member States, 2021



Source: Authors' calculations based on EU-LFS microdata for research purposes with available and reliable data.

Table 3 shows the percentages of women in the five ISCO-08 minor groups of the designer occupation, as well as in all occupations, and for all designers. The low participation of women in designs is explained by the very low share of women working as electrotechnology engineers (215) and software applications developers and analysts (251). However, the participation of women in physical and earth science professionals (211) and architects, planners, surveyors and designers (216) was higher, even exceeding 50 % in seven Member States.

Table 3: Share of women designers in EU Member States, 2021

% women	All occupations	Designers	Physical 211	Engineers 214	Electrotech 215	Architect 216	Software 251
EU23	46.0	24.1	41.0	21.9	10.3	42.9	17.4
Austria	46.8	21.4	39.7	16.3	11.3	42.3	14.2
Belgium	46.9	21.8	3.3	16.2	10.7	45.4	15.7
Cyprus	46.9	31.2	76.3	14.4	4.2	66.6	18.4
Czech Rep.	44.0	20.6	51.2	22.1	7.3	38.9	12.7
Denmark	46.9	23.7	50.2	18.8	8.9	49.5	18.4
Estonia	49.3	31.0	64.0	32.2	11.6	56.6	24.3
Greece	42.2	25.8	39.5	27.8	9.2	40.6	19.6
Spain	46.1	26.9	37.8	22.1	15.8	38.1	20.0
Finland	47.9	25.7	33.2	22.8	13.4	40.3	27.6
France	48.9	24.0	50.8	22.8	8.3	43.8	14.6
Croatia	45.9	23.6	79.7	20.5	5.1	30.3	24.1
Hungary	46.7	22.4	37.0	24.7	10.8	39.3	14.1
Ireland	46.4	22.6	32.5	21.1	11.2	34.7	21.6
Italy	42.2	25.8	39.3	19.0	10.1	40.4	18.3
Lithuania	49.8	27.1	42.9	24.0	12.8	65.0	19.9
Luxembourg	46.1	23.1	5.8	13.3	13.0	53.0	22.4
Latvia	50.1	34.6	65.4	32.2	3.2	68.8	19.7
Netherlands	47.1	20.2	24.9	13.2	7.4	39.6	15.5
Poland	45.3	22.5	48.4	21.6	6.2	52.5	13.8
Portugal	49.5	28.4	43.2	32.6	3.5	44.3	21.4
Romania	41.7	22.8	44.3	19.5	13.4	34.9	29.2
Sweden	46.9	28.7	39.3	32.0	10.6	55.6	21.2
Slovakia	46.9	20.1	46.7	20.3	13.9	32.5	11.6

Source: Authors' calculations based on EU-LFS microdata for research purposes with available and reliable data.
Note: 211 Physical and earth science professionals; 214 Engineering professionals (excluding electrotechnology); 215 Electrotechnology engineers; 216 Architects, planners, surveyors and designers; and 251 Software and applications developers and analysts.

This subsection has shown that there was a higher gender employment gap among designers (lower share of women among designers compared to the average participation of women in the labour

market). Compared to the general labour market, women designers were less over-represented in part-time contracts, with significant gender differences in average age and occupations.

Average earnings of women and men designers are analysed in sub-section 4.2, based on detailed data for employees[55].

4.2 Gender pay gap

The presence of more women in some sectors or occupations is known as sectoral or occupational gender-based segregation and has been analysed in sub-section 4.1. The average earnings of women and men designers are compared in this sub-section to estimate the gender pay gap, some of which can be partially explained by different characteristics of workers and their contracts and employers.

As explained in sub-section 4.1, 24.1 % of employees working as designers in the EU in 2021 were women.

The Gender Pay Gap (GPG) is defined as the difference between the mean gross hourly earnings[56] of men and women as a percentage of the mean gross hourly earnings for men and can be estimated based on the Structural Earnings Survey (SES)[57]. The estimation of GPG for 2018 replicates Eurostat estimations[58] as closely as possible[59].

([55]) Not including self-employment, since self-employed workers by definition do not receive a salary.
([56]) For simplicity, throughout this report, mean or average gross hourly earnings are also referred to as average earnings.
([57]) Although Eurostat provides microdata for research purposes for 24 Member States (excluding Germany, Ireland and Austria) it includes enough detail to calculate GPG between designers only in 14 EU Member States: Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Greece, France, Italy, Lithuania, Luxembourg, Latvia, Malta, Poland and Slovakia. Reference is made to EU14 for the GPG between designers as well as for all employees for comparison purposes.
([58]) Eurostat (2021) 'Gender pay gaps in the European Union, a statistical analysis' Revision 1.
([59]) Eurostat estimation of GPG uses SES data excluding NACE sections A 'Agriculture, forestry and fishing', O 'Public administration, and defence; compulsory social security' and T 'Activities of households as employers; undifferentiated goods – and services – producing activities of households for own use'; enterprises with less than 10 employees, apprentices, and occupations ISCO 0 (Armed forces) and 6 (Skilled agricultural, Forestry and Fishery workers). In the calculation of GPG in this report, all enterprises were included, regardless of their size (enterprises with less than 10 employees are also included) and activity as well as all employees.

The GPG, calculated for EU14[60] in 2018, as the difference between average gross earnings per hour[61] received by men and women (all employees[62]) was 13.3 %, meaning that men earned on average EUR 14.6 per hour and women earned EUR 12.7 per hour, or 13.3 % less than men.

Eurostat's SES microdata for research purposes includes ISCO occupations at least at the 2-digit level. Consistent with previous analysis of the gender employment gap in sub-section 4.1, designers are defined as workers in occupations included in ISCO minor groups 211, 214, 215, 216 and 251 and then only 14 Member States with occupation details at 3-digit level were included.

The employment gender gap in the occupation of designers is partly the consequence of gender-based occupational segregation, or concentration of one gender in certain occupations, which may explain the difference in earnings between women and men, since women tend to be concentrated in low-paying occupations. The earnings of designers were 50 % above the average earnings of all employees for both women and men but the analysis has also confirmed a gender pay gap (GPG) between designers: women designers earn 12.8 % less than men designers, on average.

Nevertheless, the gender discrimination as such in the sense of 'unequal pay for equal work' is not captured by the unadjusted GPG. In fact, sub-section 4.1 demonstrated that women and men designers have different characteristics: women designers are younger, more often work part-time and are over-represented in some occupations and sectors, and this could partially explain their lower hourly earnings. Women designers are also more represented among physical earth science professionals and architects, planners, surveyors and designers (occupations with average hourly earnings 22 % and 34 % lower than the average hourly earnings for all designers) and much less in electrotechnology engineers and software and applications developers and analysts (hourly earnings slightly above the average earnings for designers).

For the correct calculation of the gender pay gap, differences in average earnings of women and men explained by differences in personal, job and enterprises characteristics should be considered.

(60) As a reference, GPG calculated for all employees in the 24 Member States that provide SES microdata is 12.6 %. The detailed analysis of GPG for all occupations that follows, is almost identical when 24 Member States are included.
(61) The average gross earnings per hour is calculated based on the actual remuneration in cash paid before any tax deduction and social security contributions and the number of hours actually paid.
(62) The SES refers to wages received by employees and does not include self-employed persons.

To carry out this analysis, the logarithm of hourly earnings by women and men is regressed on the following explanatory variables.

PERSONAL AND JOB CHARACTERISTICS:

- age [63] (six intervals);
- education (four levels);
- occupation (ISCO-08 at 3-digit level: 125 occupations);
- working time (full time or part time contract);
- employment contract (indefinite or temporary duration contract and apprentices).

ENTERPRISE CHARACTERISTICS:

- principal economic activity of employer (NACE Rev 2 at division level: 39 activities);
- geographical location of the enterprise (14 countries);
- enterprise control (public, private, and shared);
- enterprise size (five levels defined by employment).

Two regressions are run (for women and men), and the adjusted GPG based on the Blinder-Oaxaca decomposition [64] can be interpreted as the part of the unadjusted GPG that remains after correcting for different characteristics of women and men in the labour market.

The calculation of adjusted GPG is a way to filter out sectoral and occupational segregation effects from the unadjusted GPG, as (partially) measured through the SES variables mentioned above.

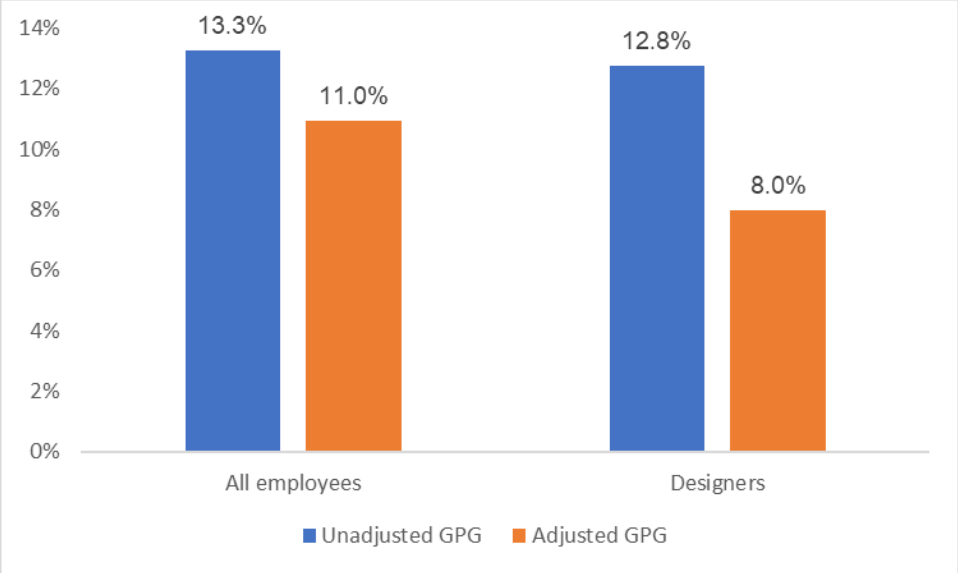
The adjusted GPG is then calculated for all employees and for designers, including all available information from the SES. For all employees, the mentioned characteristics of workers and enterprises explains only 2.3 percentage points (women are expected to learn 2.3 % less than men according to their characteristics) so that there is still 11 % of difference between hourly earnings of

([63]) Eurostat uses age in years and squared age in their calculation of adjusted GPG but this variable in microdata for research purposes is only available codified in six intervals. Due to this limitation, squared age is not included as an explanatory variable. The working experience variable was missed in many countries and, therefore, it was not included in the analysis.
([64]) The technical details are provided in Appendix II.

men and women that is not explained by known differences in average personal, job and enterprise characteristics.

Nevertheless, there are two possible sources of the unexplained or adjusted GPG: the difference between earnings of women and men with the same average characteristics that reflects 'unequal pay for equal work' and differences explained by missing detailed information on economic activity or occupations in which women can be under/over-represented and cannot be captured by SES microdata([65]).

Figure 4: Unadjusted and adjusted GPG in EU14: all employees and designers, 2018



Source: Authors' calculations based on EU-SES microdata for research purposes with available and reliable data.

The variable that contributes the most to explain the unadjusted GPG (4.7 %) is the economic activity: women work more often in activities that pay a lower salary. The higher share of women working part time explains 0.5 % of the GPG. However, women are expected to earn more (1.6 %) than men due to their higher average education level and because women tend to work more in better-paying occupations (women are expected to earn 1.4 % more than men based on this factor). Women are also expected to earn 0.3 % more than men because they are concentrated in medium

([65]) An example of a missing variable in the SES that could partially explain different earnings is the total working experience (this variable is defined in the survey as the months of experience in the current position).

age groups (40-59 years) and they are also expected to earn 0.2 % more than men due to their higher participation in medium sized enterprises. The remaining variables have less explanatory power, except the country of location of the statistical unit, which explains 0.8 % of the GPG (in particular, the lower participation of Italian women stands out among the 14 Member States included in the analysis).

As shown in figure 5, several variables make a negative contribution to the unadjusted GPG and they cancel out the contribution of differences in the economic activity of employers, their occupation and the part-time contracts, so that all variables included in the regressions explain 2.3 % and the unexplained or adjusted GPG is still 11 %.

The same analysis was carried out for women and men designers, considering now only five ISCO/08 minor groups defining designers([66]). The explained part of the unadjusted GPG in occupations related to designs represents 4.8 percentage points (p.p.): women designers are expected to earn, on average, 4.8 % less than men, according to their average characteristics on the labour market (less remunerative than those for men), so that the adjusted GPG for designers is 8.0 %, 3 p.p. lower than the adjusted GPG for all occupations.

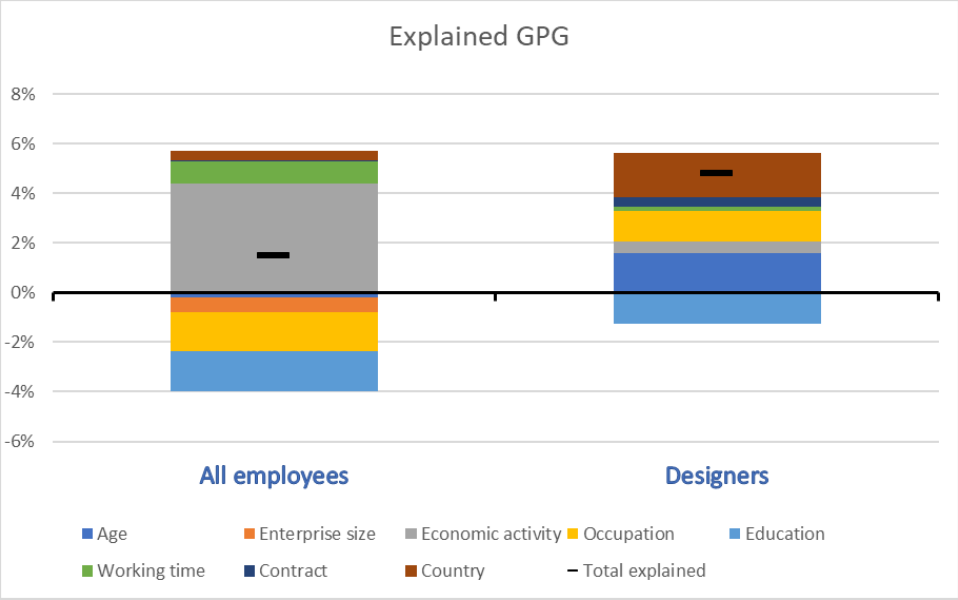
The explained part of the GPG may be caused by gender biased preferences in occupations, sectors or educational fields, stereotypes or even discrimination elements if there are barriers to entering specific economic activities or occupations.

There are interesting differences in the most important explanatory variables of GPG among designers compared with those explaining GPG among all employees. The variables that best explain the lower earnings of women designers are: the presence of younger women compared with men (1.6 %); the different occupations within designers ISCO-08 codes([67]) (1.2 %); the economic activity of the employer (0.5 %); and their higher share of temporary and part time contracts (0.4 % and 0.2 % respectively). However, as was the case for all occupations, women designers are expected to earn more (1.2 %) than men due to their higher education level, although this is the only variable that contributes negatively to the GPG of designers. The lower average earnings of women

([66]) Designers include ISCO-08 minor groups 211, 214, 215, 216 and 251.
([67]) In the EU14 Member States and in 2018 women designers were over-represented in occupations 211 ‘Physical and earth science professionals’ and 216 ‘Architects, planners, surveyors and designers’ which were the design occupations with lower average earnings in all Member States and accounting for 40 % of women designers and less than 20 % of men designers.

designers are also explained by the country of location of the local unit, they are expected to earn 1.8 % less than men due to their lower relative participation in countries with a lower GPG, such as Italy.

Figure 5: GPG explained by personal, job and enterprise characteristics in EU14: all employees and designers, 2018

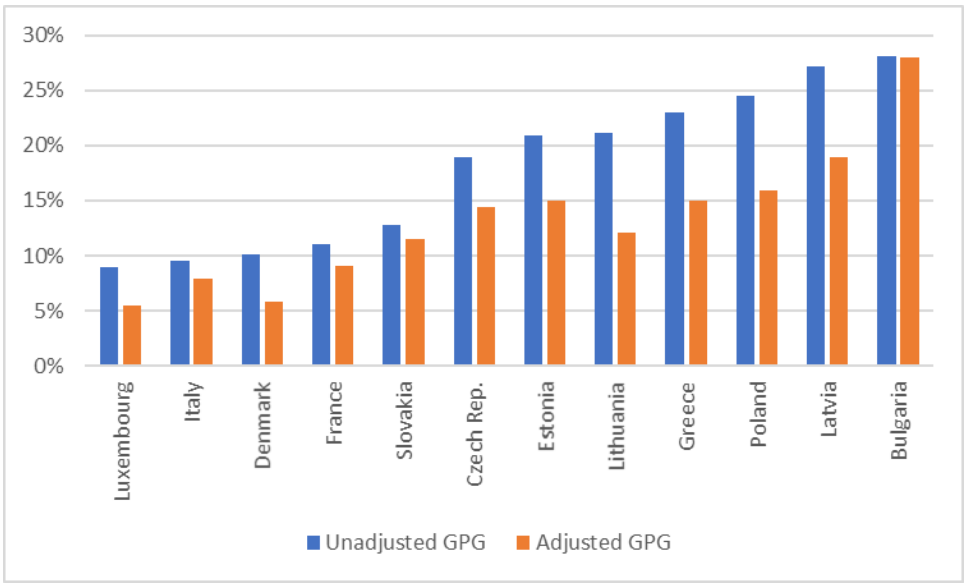


Source: Authors' calculations based on EU-SES microdata for research purposes with available and reliable data.

The GPG for designers ranges from 28 % in Bulgaria to less than 10 % in Italy and Luxembourg. Nevertheless, the nine characteristics included in the analyses contribute to explain a significant share of these gender differences.

In relative terms, Lithuania and Denmark stand out due to the high share of gender differences in earnings explained by the different characteristics of women and men designers.

Figure 6: GPG for designers in 12 Member States, 2018



Source: Authors' calculations based on EU-SES microdata for research purposes with available and reliable data.

Table 4 shows the detailed results of GPG at Member State level including the explanatory capacity of nine variables related to the designer, job and enterprise. Results for Cyprus and Malta are used in the total EU14 but are not presented independently due to their lower reliability reflecting the smaller samples in the SES for those two countries.

Occupation and age are the two variables that best explain the gender differences in earnings of designers. By contrast, as in the EU GPG, the average higher level of education of women designers has a negative explanation to gender differences in 9 out of 12 countries.

Table 4: GPG for designers explained by personal, job and enterprise characteristics in the EU and Member States, 2018

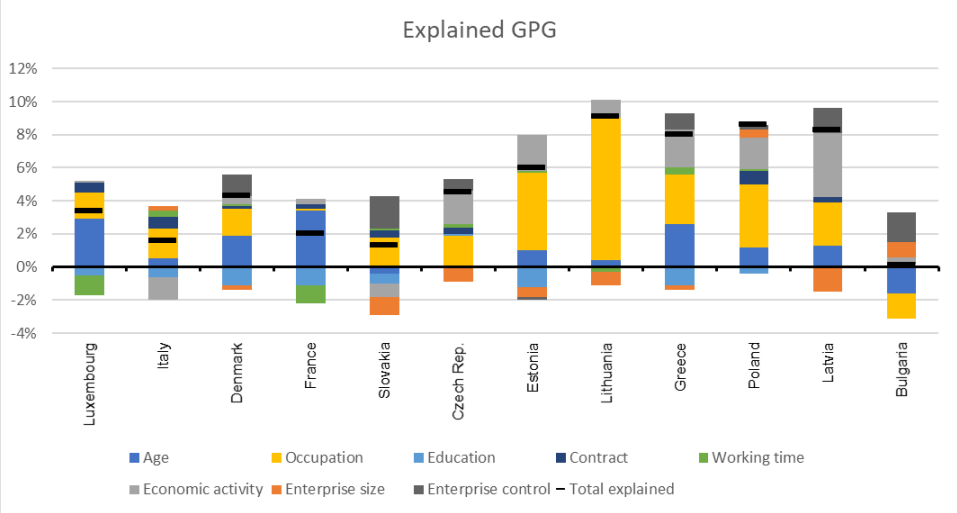
	Unadjusted GPG	Explained GPG										Unexplained /Adjusted GPG
		Total explained	Personal and job characteristics					Enterprise characteristics				
			Age	Occupation	Education	Employment contract	Working time	Geographical location	Economic activity	Enterprise size	Enterprise control	
EU14	12.8	4.8	1.6	1.2	-1.2	0.4	0.2	1.8	0.5	0.0	0.3	8.0
Bulgaria	28.1	0.1	-1.6	-1.5	0.2	0.1	0.0		0.3	0.9	1.8	28.0
Czech Rep.	18.9	4.5	0.0	1.9	0.1	0.4	0.2		2.0	-0.9	0.7	14.4
Denmark	10.2	4.3	1.9	1.6	-1.1	0.2	0.1		0.5	-0.3	1.3	5.8
Estonia	20.9	6.0	1.0	4.7	-1.2	0.0	0.1		2.2	-0.6	-0.2	15.0
Greece	23.0	8.0	2.6	3.0	-1.1	0.0	0.4		2.3	-0.3	1.0	15.0
France	11.1	2.0	3.4	0.1	-1.1	0.3	-1.1		0.3	0.0	0.0	9.1
Italy	9.5	1.6	0.5	1.8	-0.6	0.7	0.4		-1.4	0.3	0.0	7.9
Lithuania	21.1	9.1	0.4	8.6	-0.1	0.0	-0.2		1.1	-0.8	0.0	12.1
Luxembourg	9.0	3.4	2.9	1.6	-0.5	0.6	-1.2		0.1	0.0	0.0	5.5
Latvia	27.1	8.3	1.3	2.6	0.0	0.3	-0.1		3.9	-1.4	1.5	18.9
Poland	24.5	8.6	1.2	3.8	-0.4	0.8	0.1		1.9	0.5	0.3	15.9
Slovakia	12.8	1.3	-0.4	1.8	-0.6	0.4	0.1		-0.8	-1.1	2.0	11.5

Source: Authors' calculations based on EU-SES microdata for research purposes with available and reliable data.

This confirms that the unadjusted GPG is not appropriate when comparing gender inequalities in design occupations and that the variables that explain those differences should be considered in any policy aiming to close the gender gap between designers.

The different variables explaining GPG among countries are shown in figure 7. The GPG between designers is mainly explained by different occupations of women and men in Estonia, Greece Lithuania, and Poland while age explains a significant part of the GPG in Denmark, France and Luxembourg.

Figure 7: GPG between designers explained by personal, job and enterprise characteristics in 12 EU Member States, 2018



Source: Authors' calculations based on EU-SES microdata for research purposes with available and reliable data.

5 Gender gap in registration of Registered Community Designs (RCDs)

Section 4 has examined the gender employment gap (i.e. under-representation of women in the designer occupation) and the gender pay gap (i.e. lower earnings of women compared with men designers). In this section, the focus is on the gender of RCD designers, specifically on the use of the RCD registration system by women designers.

The gender analysis of RCD designers is based on 670 000 designs and 210 000 designers in the EUIPO databases. The information about the name of the designer is not compulsory. It is included in 43 % of the RCD registrations but only in one third of the designs filed by EU-based owners. Due to this bias in the response rate of the field containing the name of the designer, the results presented in this section are based on a weighted sample that balances out the registration of designs by country of the owner and by Locarno classes ([68]).

The World Gender Name Dictionary (WGND) ([69]) developed by WIPO provides the dataset that allows to disambiguate the gender based on the first name of the designer and the country of the owner of the RCD ([70]). The method applied by the EUIPO in this study has been able to indicate the designer's gender in 94 % of the designs with information on designers available. More details on the process of disambiguating the gender of RCD designers are included in Appendix III.

Analysis of the RCD register with indicated gender for the designer(s) ([71]), shows that 19.5 % of the RCD designers are women and the average share of designs with at least one woman designer between 2003 and 2022 is 24.7 %. Due to the presence of designs with more than one designer and at the same time designers with several designs, and the fact that the observation unit is the design

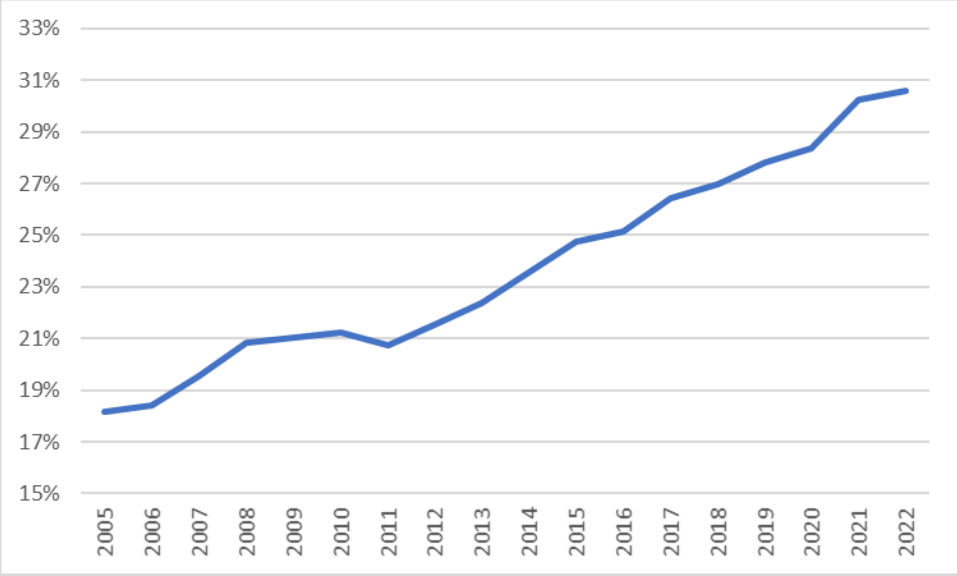
([68]) Locarno is the international classification used for the purposes of the registration of industrial designs to indicate the product(s) that the design is intended to be applied or incorporated in. Locarno classification headings are included in appendix IV.
([69]) https://www.wipo.int/about-ip/en/ip_innovation_economics/gender_innovation_gap/gender_dictionary.html.
([70]) There is no information about the country of origin of the designer and it is not possible to figure it out based on the available information at the EUIPO. The gender of the designers is then assigned based on the first name and the country of origin of the owner of the design.
([71]) More than 30 % of the RCDs filings include more than one designer.

filing, the analysis that follows is based on the share of RCDs with at least one woman designer, as the indicator for gender gap in RCD filings.

Figure 8 shows the evolution of the share of RCD filings with at least one woman designer from 2005 until 2022 based on 3-year averages([72]) to avoid excessive volatility of the series.

The trend of RCDs with participation of women is positive, starting the series with 18 % of designs with at least one woman designer and reaching 30 % at the end of the series, a 12 percentage point increase in 17 years.

Figure 8: Share of RCD filings with at least one woman designer, 2005-2022



Source: Authors' calculations based on RCD database.

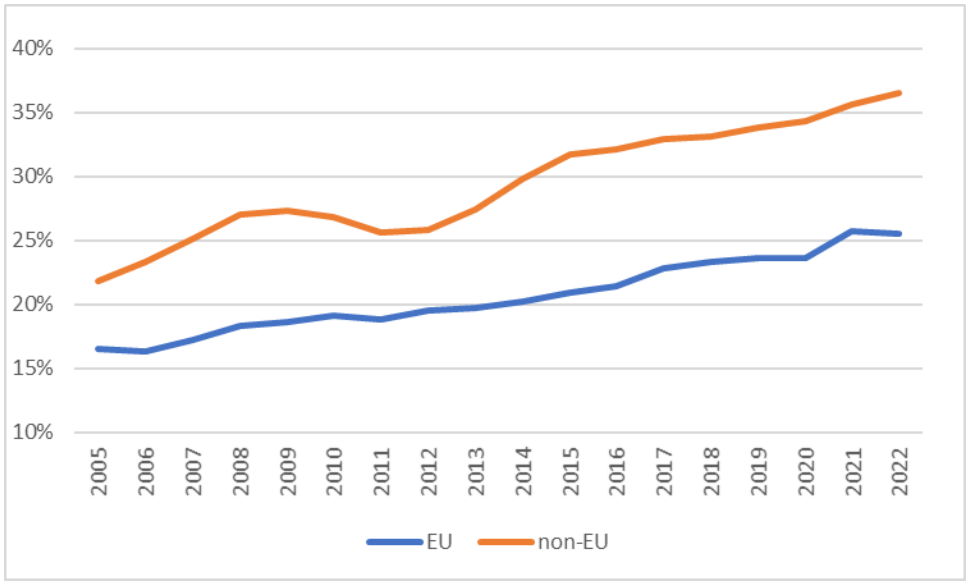
An interesting finding is the different gender gap in registration of RCDs by region of origin of the design owner: the average participation of women designers among EU-based owners between 2003 and 2022 is 21 %, while for non-EU owners it is 10 percentage points higher([73]). As shown in

([72]) The 3-year moving average is assigned to the last year of the period, for example, the value assigned to 2005 correspond to the average for the period 2003-2005.
([73]) For countries using non-Latin alphabets, RCD designers' names used for the gender disambiguation were available in their transliterated Latin version. Since various transliteration schemes were probably used by the filers, the error rate may be higher for countries where names written in the original alphabet were not available. This could affect the statistics for

figure 9, the lead of the non-EU owners when compared with EU owners of RCDs as regards the participation of women designers has grown significantly. In 2005, the share of designs with at least one woman designer in non-EU based RCD filings was 22 % and 17 % in EU-based designs. In 2022, the difference between non-EU and EU owners more than doubled, reaching 37 % for non-EU-based RCDs and 26 % in EU-based designs. This is explained by the strong increase of this ratio in non-EU-based RCDs (15 p.p. increase in 17 years) compared to a more modest reduction of the RCD gender gap in the EU (9 p.p. in the same period).

At the end of the period analysed, the share of RCD filings from EU-based owners with at least one woman designer is close to the share of women working as designers, as explained in sub-section 4.1. The average annual growth rate registered between 2003 and 2022 of RCD filings with at least one women designer was 2.5 % (compared to 1 % for RCD filings without women), so that at this pace it would take 51 years to achieve gender parity in EU-based RCD filings([74]).

Figure 9: Share of RCD filings with at least one woman designer in EU- and non-EU-based owners, 2005-2022



Source: Authors' calculations based on RCD database.

Korea, China or Japan, which should therefore be treated as approximations, with a higher degree of uncertainty than statistics for the EU countries.

([74]) In WIPO (2016), an estimation based on listed inventors in the Patent Cooperation Treaty (PCT) indicated that it will take no less than 64 years to reach a balanced gender distribution of inventors. As explained above, the share of RCD filings with at least one woman designer does not correspond with the share of designers in RCD filings but the former is considered a more appropriate indicator for gender gap in registration of RCD due to the nature of the available data.

The impressive growth rate of the non-EU based RCD filings with at least one woman designer occurred in the context of an overall growth rate of RCD filings from non-EU countries that was more than double the growth rate of EU-based filings. As a result, the number of RCD filings with at least one women designer from non-EU-based entities surpassed the number of such filings from EU-based applicants in 2020.

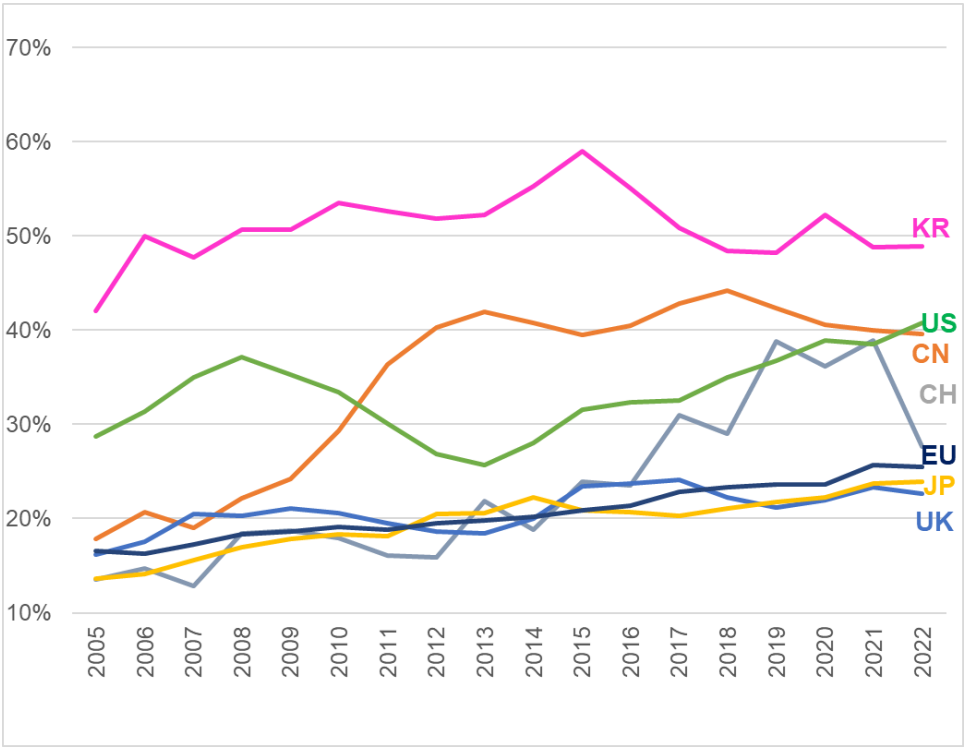
The six non-EU countries with the highest participation in RCD filings had a different behaviour in the period analysed. In 2005, RCDs registered by owners from China represented less than 1 % of all RCDs, while in 2022, China was first in the ranking, with 24 % of all RCDs registered that year. The United States was in fourth position in 2022 with a stable share of around 10 % of all RCDs, while the United Kingdom fell to 9th position (from 4th position in 2005). The different participation of these countries in the registration of the European designs has consequences for the RCD gender gap due to the different RCD gender gaps in each country, as shown in figure 10.

The growth of RCD filings with at least one woman designer in non-EU countries is led by Korean, Chinese and US companies. Chinese filings had an average share of 40 % in the last decade. The participation of women designers in RCD filings from Chinese owners registered an impressive increase from 24 % in 2009 to 36 % in 2011 ([75]). In contrast, RCD filings from the United States registered a sharp decrease in participation of women designers from a peak of 37 % in 2008 to a minimum of 26 % in 2013. The recovering rates in the United States resulted in a share of RCD filings with at least one woman designer very close to the levels of China since 2020 and close to 40 %.

The highest share of RCD filings with at least one woman designer is registered in Korea (reaching more than 50 % in 12 out of 18 years). The share of RCDs with representation of women designers based in the United Kingdom and Japan is very similar to that for EU-based RCD owners, with a stable average close to 20 % in the period analysed. Finally, the participation of women designers in RCD filings from Switzerland was close to those in the EU until 2016, when it registered an increase to above 30 %, reached levels close to 40 % between 2019 and 2021, and a sharp decrease in 2022, but it is still above the EU average.

([75]) Please see footnote 71 for discussion of the possible biases affecting statistics for non-EU countries.

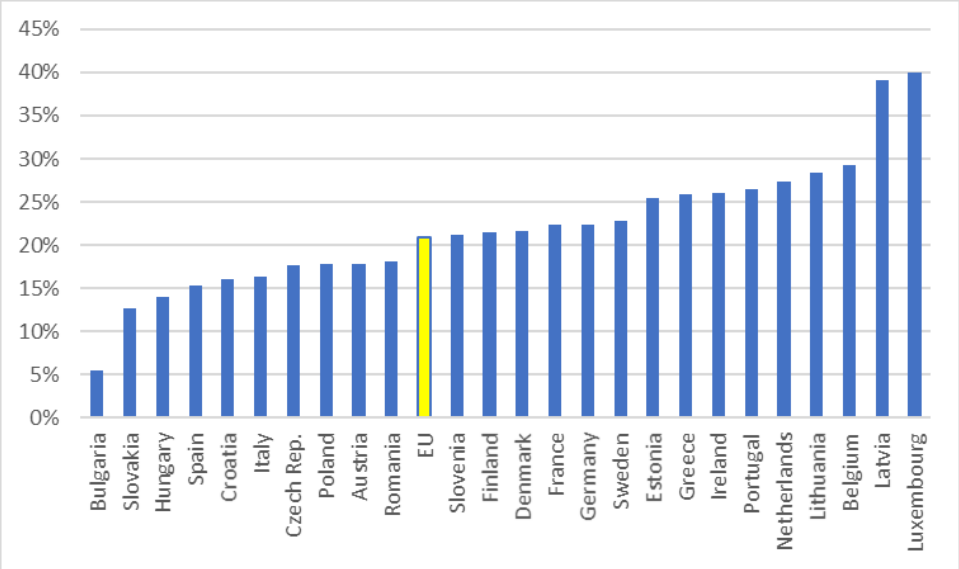
Figure 10: Share of RCD filings with at least one woman designer, EU and six non-EU countries, 2005-2022



Source: Authors' calculations based on RCD database.
Note: CH = Switzerland; CN = China; EU = European Union; JP = Japan; KR = Korea; UK = United Kingdom; US = United States

RCD filings from EU-based owners represented almost 70 % in 2005 and decreased to less than 60 % in 2022. Regarding the RCD filings with at least one woman designer, EU-based owners had a share slightly above 70 % in 2005 and this decreased to 45 % in 2022, explained by the higher increase of women participation in RCDs in non-EU countries.

Figure 11: Share of RCD filings with at least one woman designer in EU Member States([76]) (average 2003-2022)



Source: Authors' calculations based on RCD database.
Note: The figures for Cyprus and Malta are not published separately due to their volatility, explained by the smaller samples for those countries, but RCD filings from these two Member States are included in the EU totals.

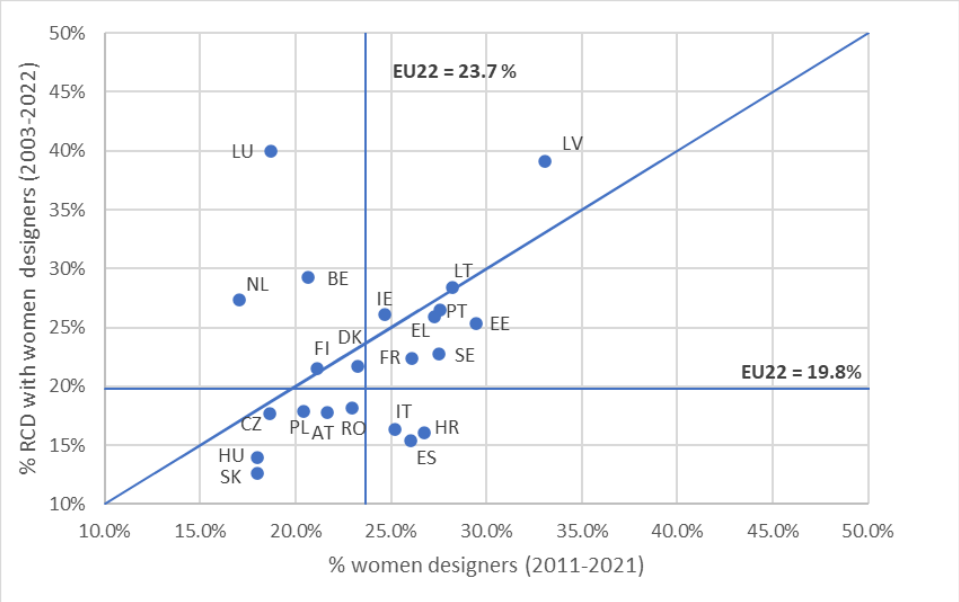
As shown in figures 10 and 11, compared with large non-EU countries, no EU Member State is close to the participation of women designers in China, Korea or the US, except for Latvia and Luxembourg.

Among the largest EU Member States, Spain, Italy and Poland show greater RCD gender gaps than the EU average (lower share of RCD filings with at least one woman designer). These three countries represent 40 % of all registered designs among EU Member States but only 32 % of designs with women designers. Germany and France show shares of RCD filings with at least one woman designer above the EU average with one third of all RCD filings and 36 % of all RCDs with women designers respectively.

([76]) Countries with above EU average of designs with women designers and above average EPO women inventor rates are Latvia, Portugal, Lithuania, Estonia, Greece, France, Belgium, and Ireland.

The comparison of the participation of women in the designer occupation (from sub-section 4.1) and in the RCD system in 22 Member States[77] is shown in figure 12. Half of the Member States are on, or close to, the bisector[78] (or diagonal), meaning that the participation of women in the designer occupation is roughly equal to their use of the European registration system. Latvia stands out with close to 35 % of women designers in both indicators. At the other extreme, three countries show a disparity in the participation of women in the RCD system: Croatia, Spain and Italy have significantly lower shares of women as designers in RCDs than their participation in the labour market.

Figure 12: Share of women designers and share of RCD filings with at least one woman designer in 22 EU Member States

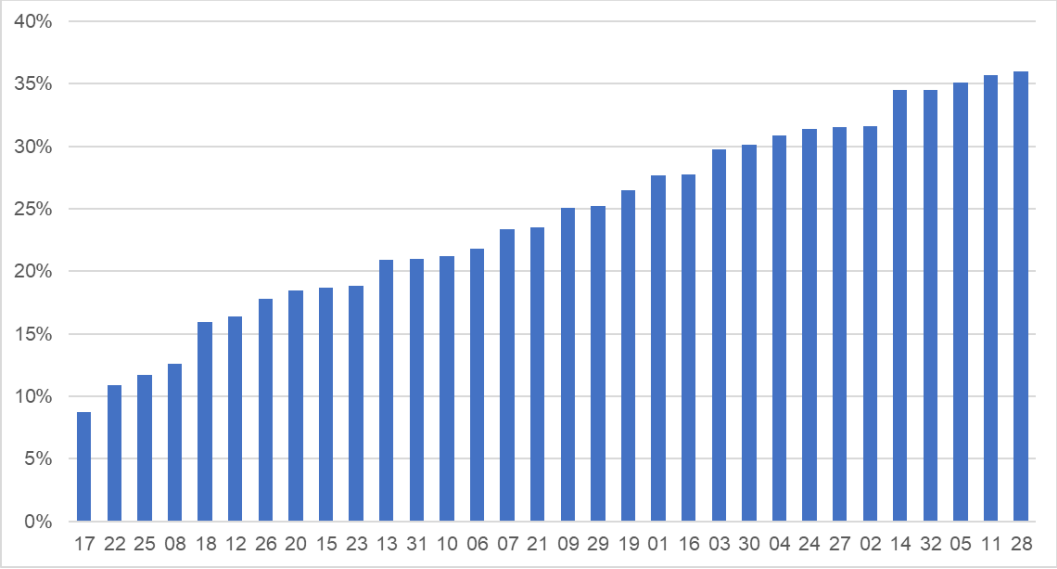


Source: Authors' calculations based on EU-LFS microdata for research purposes with available and reliable data and RCD database.

The participation of women designers in RCDs differs depending on the type of designs. This is reflected in figure 13, which shows the share of RCD filings with at least one woman designer by Locarno class[79].

(77) The employment gender gap between designers is missing for Bulgaria, Germany, Malta and Slovenia and the RCD gender gap is missing for Cyprus and Malta. The EU average ratios in this comparison refers to the common Member States (EU22) which is 1 percentage point below EU27 average.
(78) The bisector is a line that divides something into two equal parts so that points in this line have the same value in both axis and then have equal shares of women designers and RCD filings with at least one woman designer.
(79) Locarno classes headings are reproduced in Appendix IV.

Figure 13: Share of RCD filings with at least one woman designer in EU27 by Locarno class (average 2003-2022)



Source: Authors' calculations based on RCD database.

Three Locarno classes have a share of filings with at least one woman designer above 35 %: 28: Pharmaceutical and cosmetics products, toilet articles and apparatus; 11: Articles of adornment 05: Textile piece goods, artificial and natural sheet material. Two classes are very close to 35%: 32: Graphic symbols and logos, surfaces patterns, ornamentation; and 14: Recording, telecommunication or data processing equipment. At the other extreme, the minimum share of RCD filings with women designers is below 10 % in the Locarno Class 17: Musical instruments, and three classes have a share below 15 %: 22: Arms, pyrotechnic articles, articles for hunting, fishing and pest killing; 25: Building units and construction elements; and 08: Tools and hardware.

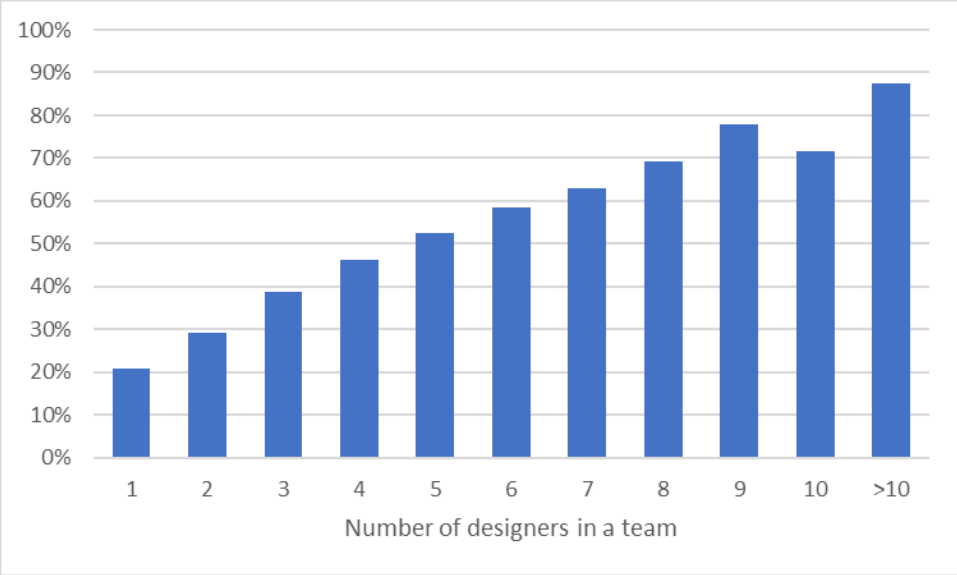
68 % of all RCD filings have only one designer per design, while the remaining 32 % have multiple designers or teams of designers. Women designers are more likely to work individually([80]) than men designers, with 43 % of women designers working only individually, compared to 38 % of men designers. More than half of the designers work exclusively in teams (52 % of women designers and

([80]) This finding is coherent with the higher presence of women designers as self-employed as shown in section 4.1.

56 % of men designers). There is a small share of designers working both in teams and individually (5 % and 7 % of women and men designers respectively) ([81]).

Regarding the presence of women designers in teams, it is noticeable that, although the percentage of teams with at least one woman designer increases with the size of the team, there are still 30 % of teams with 10 members without a women and 12 % of teams with more than 10 members composed only of men.

Figure 14: Share of RCD filings with at least one woman designer by size of team (EU only, average 2003-2022)



Source: Authors' calculations based on RCD database.

Finally, 37 % of designers have registered only one design, with lower average numbers of designs per woman designer than man (5.2 and 5.7 respectively). This explains the lower share of women designers compared to the share of designs with at least one woman designer.

([81]) It should be noted, however, that this discussion is based on the information in the RCD registration. Strictly speaking, it cannot be excluded that a design with just one designer on the filing can be the result of work by several designers, or indeed vice versa.

6 Conclusions and suggestions for further research

Equality of women and men in the field of designs is far from being achieved, whether consideration is given to the share of women designers, their salaries or the registration of RCDs by women designers. Nevertheless, the most worrying finding is the slow pace of reduction of the gender gap in designs, so that, on current trends, it would take 51 years to achieve gender parity in the registration of RCD filings by EU-based owners.

Regarding the differences in earnings of women and men designers, although some factors can partially explain gender differences in earnings, there is still a significant gender pay gap among designers, which needs more investigation.

This report makes use of the abundant information on designers' employment and earnings by gender provided by Eurostat and the partial information on designers in the registration system of European designs. The importance of gender data in all fields is crucial. The low participation of women designers in some fields could be understood better if more data on designers that participate in the IP system were available. The age of women designers and their working experience is one example of information that could explain gender differences in the registration of RCDs.

Data at country level show significant differences, with some EU Member States in a good situation (e.g. Denmark ranks first in relative design intensity (measured by design filings per thousand employees), lies above the EU average in the share of RCD filings with at least one woman designer and has a low GPG between designers). However, there is still room for improvement in most countries.

Future research on the gender gap in IP could focus on the reasons behind the step backward in participation of women in designer occupations since 2019[82]; adding national designs to the analysis; and more knowledge on the characteristics of women designers registering RCD filings.

([82]) The Covid-19 pandemic is one obvious candidate, but it is unclear what mechanisms would link the pandemic to the decline in women designers' participation in the RCD system.

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List of Tables and Figures

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Acronyms and Abbreviations

EIGE	European Institute for Gender Equality
EIT	European Institute of Innovation and Technology
EU	European Union
EUIPO	European Union Intellectual Property Office
Eurostat	Statistical Office of the European Union
GDP	Gross Domestic Product
DG-EAC	Directorate-General Education, Youth, Sport and Culture
GPG	Gender Pay Gap
IP	Intellectual Property
IPR	Intellectual Property Right
ISCO	International Standard Classification of Occupations
LFS	Labour Force Survey
NACE	Nomenclature statistique des activités économiques dans la Communauté européene
OECD	Organisation for the Economic Co-operation and Development
PCT	Patent Cooperation Treaty
RCD	Registered Community Design
SES	Structure Earnings Survey
STEM	Science, Technology, Engineering and Mathematics
UK	United Kingdom
UKIPO	United Kingdom Intellectual Property Office
US	United States
USPTO	United States Patents and Trademarks Office
WGND	World Gender Name Dictionary
WIPO	World Intellectual Property Office

Appendix I: International Standard Classification of Occupations (ISCO-08).

A job is defined in ISCO-08 as a ‘set of tasks and duties performed, or meant to be performed, by one person, including for an employer or in self-employment’.

Occupation refers to the kind of work performed in a job. The concept of occupation is defined as a ‘set of jobs whose main tasks and duties are characterized by a high degree of similarity’. It is then clear that an occupation is defined by the tasks performed and not by the requirement (studies, experience, etc) requested for the job.

Skill is defined as ‘the ability to carry out the tasks and duties of a given job’ and skill level is defined as a ‘function of the complexity and range of tasks and duties to be performed in an occupation’. Skill level is measured operationally by considering the nature of the work performed, the level of formal education and the amount of informal on-the-job training and/or previous experience.

The first level of ISCO-08 consists of ten major groups which are made up of one or more sub-major groups, which in turn are made up of one or more minor groups. Each of the 130 minor groups is made up of one or more unit groups. In general, each unit group is made up of several ‘occupations’ that have a high degree of similarity in terms of skill level and skill specialization.

In this appendix we will limit the analysis to minor groups which is the maximum level of detail of microdata used in section 4.

Among the ten major groups of ISCO-08, 1 (Managers) and 2 (Professionals) require skills at the fourth ISCO skill level, which comprise education which begins at the age of 17 or 18, lasts about three, four or more years, and leads to a university or postgraduate university degree, or the equivalent.

Major group 1 includes managers and supervisors that may plan, organize, coordinate, control and direct the work done by others. The typical tasks of managers do not include design of products.

The occupations included in major group 2 are now detailed based on definitions of ISCO-08 to delimitate which of their 27 minor groups carry out tasks required to design of products.

Major group 2: Professionals

Professionals increase the existing stock of knowledge; apply scientific or artistic concepts and theories; teach about the foregoing in a systematic manner; or engage in any combination of these activities. Competent performance in most occupations in this major group requires skills at the fourth ISCO skill level.

Tasks performed by professionals usually include: conducting analysis and research, and developing concepts, theories and operational methods; advising on or applying existing knowledge related to physical sciences, mathematics, engineering and technology, life sciences, medical and health services, social sciences and humanities; teaching the theory and practice of one or more disciplines at different educational levels; teaching and educating persons with learning difficulties or special needs; providing various business, legal and social services; creating and performing works of art; providing spiritual guidance; preparing scientific papers and reports. Supervision of other workers may be included.

Occupations in this major group are classified into the following sub-major groups:

- **21 Science and Engineering Professionals**
- **22 Health Professionals**
- **23 Teaching Professionals**
- **24 Business and Administration Professionals**
- **25 Information and Communications Technology Professionals**
- **26 Legal, Social and Cultural Professionals-**

Sub-major groups 21 and 25 include occupations related to design.

Sub-major Group 21: Science and Engineering Professionals

Science and engineering professionals conduct research; improve or develop concepts, theories and operational methods; or apply scientific knowledge relating to fields such as physics, astronomy,

meteorology, chemistry, geophysics, geology, biology, ecology, pharmacology, medicine, mathematics, statistics, architecture, engineering, design and technology.

Tasks performed by workers in this sub-major group usually include: conducting research, enlarging, advising on or applying scientific knowledge obtained through the study of structures and properties of physical matter and phenomena, chemical characteristics and processes of various substances, materials and products, all forms of human, animal and plant life and of mathematical and statistical concepts and methods; advising on, designing and directing construction of buildings, towns and traffic systems, or civil engineering and industrial structures, as well as machines and other equipment; advising on and applying mining methods and ensuring their optimum use; surveying land and sea and making maps; studying and advising on technological aspects of particular materials, products and processes, and on efficiency of production and work organization; preparing scientific papers and reports. Supervision of other workers may be included.

Occupations in this sub-major group are classified into the following minor groups:

- **211 Physical and Earth Science Professionals**

Physical and earth science professionals conduct research; improve or develop concepts, theories and operational methods; or apply scientific knowledge relating to physics, astronomy, meteorology, chemistry, geology and geophysics.

Tasks performed usually include: enlarging scientific knowledge through research and experiments related to mechanics, thermodynamics, optics, sonics, electricity, magnetism, electronics, nuclear physics, astronomy, various branches of chemistry, atmospheric conditions and the physical nature of the Earth; advising on or applying this knowledge in such fields as manufacturing, agriculture, medicine, navigation, space exploration, oil, gas, water and mineral exploitation, telecommunications and other services, or civil engineering; preparing scientific papers and reports.

- **212 Mathematicians, Actuaries and Statisticians**

Mathematicians, actuaries and statisticians conduct research; improve or develop mathematical, actuarial and statistical concepts, theories and operational models and techniques; and apply this

knowledge to a wide range of tasks in such fields as engineering, business and social and other sciences.

Tasks performed usually include: studying, improving and developing mathematical, actuarial and statistical theories and techniques; advising on or applying mathematical principles, models and techniques to a wide range of tasks in the fields of engineering, natural, social or life sciences; conducting logical analyses of management problems, especially in terms of input-output effectiveness, and formulating mathematical models of each problem usually for programming and solution by computer; designing and putting into operation pension schemes and life, health, social and other types of insurance systems; applying mathematics, statistics, probability and risk theory to assess potential financial impacts of future events; planning and organizing surveys and other statistical collections, and designing questionnaires; evaluating, processing, analysing and interpreting statistical data and preparing them for publication; advising on or applying various data collection methods and statistical methods and techniques, and determining reliability of findings, especially in such fields as business or medicine as well as in other areas of natural, social or life sciences; preparing scientific papers and reports; supervising the work of mathematical, actuarial and statistical assistants and statistical clerks.

- **213 Life Science Professionals**

Life science professionals apply knowledge gained from research into human, animal and plant life and their interactions with each other and the environment to develop new knowledge, improve agricultural and forestry production, and solve human health and environmental problems.

Tasks performed usually include: collecting, analysing and evaluating experimental and field data to identify and develop new processes and techniques; providing advice and support to governments, organizations and businesses about ecological sustainable development of natural resources.

- **214 Engineering Professionals (excluding Electrotechnology)**

Engineering professionals (excluding electrotechnology) design, plan and organize the testing, construction, installation and maintenance of structures, machines and their components, and production systems and plants; and plan production schedules and work procedures to ensure that engineering projects are undertaken safely, efficiently and in a cost-effective manner.

Tasks performed usually include: planning and designing chemical process systems, civil engineering projects, mechanical equipment and systems, mining and drilling operations, and other engineering projects; specifying and interpreting drawings and plans, and determining construction methods; supervising the construction of structures, water and gas supply and transportation systems, and the manufacture, installation, operation and maintenance of equipment, machines and plant; organizing and managing project labour and the delivery of materials, plant and equipment; estimating total costs and preparing detailed cost plans and estimates as tools for budgetary control; resolving design and operational problems in the various fields of engineering through the filing of engineering technology.

- **215 Electrotechnology Engineers**

Electrotechnology engineers conduct research on and design, advise, plan and direct the construction and operation of electronic, electrical and telecommunications systems, components, motors and equipment. They organize and establish control systems to monitor the performance and safety of electrical and electronic assemblies and systems.

Tasks performed usually include: conducting research, advising on and directing the maintenance and repair of electrical, electronic and telecommunications products and systems; advising on and designing power stations and systems that generate, transmit and distribute electrical power; establishing control standards to monitor performance and safety of electrical, electronic and telecommunication systems and equipment.

- **216 Architects, Planners, Surveyors and Designers**

Architects, planners, surveyors and designers plan and design landscapes, building exteriors and interiors, products for manufacture, and visual and audiovisual content for the communication of information. They conduct survey work to precisely position geographical features; design, prepare and revise maps; and develop and implement plans and policies for controlling the use of land.
Tasks performed usually include: determining the objectives and constraints of the design brief by consulting with clients and stakeholders; formulating design concepts and plans that harmonize aesthetic considerations with technical, functional, ecological and production requirements; preparing sketches, diagrams, illustrations, animations, plans, maps, charts, samples and models to

communicate design concepts and other information; analysing photographs, satellite imagery, survey documents and data, maps, records, reports and statistics; undertaking research and analysing functional, spatial, commercial, cultural, safety, environmental and aesthetic requirements.

Sub-major group 25: Information and Communications Technology Professionals

Information and communications technology professionals conduct research; plan, design, write, test, provide advice and improve information technology systems, hardware, software and related concepts for specific filings; develop associated documentation including principles, policies and procedures; and design, develop, control, maintain and support databases and other information systems to ensure optimal performance and data integrity and security.

Tasks performed by workers in this sub-major group usually include: researching information technology use in business functions; identifying areas for improvement and researching the theoretical aspects and operational methods for the use of computers; evaluating, planning and designing hardware or software configurations for specific filings including for Internet, Intranet and multimedia systems; designing, writing, testing and maintaining computer programs; designing and developing database architecture and database management systems; developing and implementing security plans and data administration policy, and administering computer networks and related computing environments; analysing, developing, interpreting and evaluating complex system design and architecture specifications, data models and diagrams in the development, configuration and integration of computer systems.

Occupations in this sub-major group are classified into the following minor groups:

- **251 Software and Applications Developers and Analysts**

Software and applications developers and analysts conduct research; plan, design, write, test, provide advice on and improve information technology systems such as hardware, software and other applications to meet specific requirements.

Tasks performed usually include: researching information technology use in business functions and identifying areas in which improvements could be made to maximize effectiveness and efficiency; conducting research into the theoretical aspects of and operational methods for the use of

computers; evaluating, planning and designing hardware or software configurations for specific applications; designing, writing, testing and maintaining computer programs for specific requirements; evaluating, planning and designing Internet, Intranet and multimedia systems.

- **252 Database and Network Professionals**

Database and network professionals design, develop, control, maintain and support the optimal performance and security of information technology systems and infrastructure, including databases, hardware and software, networks and operating systems.

Tasks performed usually include: designing and developing database architecture, data structures, dictionaries and naming conventions for information systems projects; designing, constructing, modifying, integrating, implementing and testing database management systems; developing and implementing security plans, data administration policy, documentation and standards; maintaining and administering computer networks and related computing environments; analysing, developing, interpreting and evaluating complex system design and architecture specifications, data models and diagrams in the development, configuration and integration of computer systems.

Based on ISCO 08 description, the occupations that perform tasks related to designs are included in sub-major group 21 excluding 212 and 213 which are related to mathematical and biological related research that usually do not result in a design plus minor group 251 for Information and Communication Technology (ICT) related designs.

Designer is understood in section 4 as all workers in occupations included in the following five minor groups (3-digit level) classified into detailed unit groups (4-digit level):

211 Physical and Earth Science Professionals
- 2111 Physicists and Astronomers
- 2112 Meteorologists
- 2113 Chemists
- 2114 Geologists and Geophysicists

214 Engineering Professionals (excluding Electrotechnology)
- 2141 Industrial and Production Engineers

2142 Civil Engineers

2143 Environmental Engineers

2144 Mechanical Engineers

2145 Chemical Engineers

2146 Mining Engineers, Metallurgists and Related Professionals

2149 Engineering Professionals Not Elsewhere Classified

215 Electrotechnology Engineers

2151 Electrical Engineers

2152 Electronics Engineers

2153 Telecommunications Engineers

216 Architects, Planners, Surveyors and Designers

2161 Building Architects

2162 Landscape Architects

2163 Products and Garment Designers

2164 Town and Traffic Planners

2165 Cartographers and Surveyors

2166 Graphic and Multimedia Designers

251 Software and Applications Developers and Analysts

2511 Systems Analysts

2512 Software Developers

2513 Web and Multimedia Developers

2514 Applications Programmers

2519 Software and Applications Developers and Analysts Not Elsewhere Classified

Appendix II: Methodology for the estimation of Gender Pay Gap (GPG)

This appendix is extracted from Eurostat (2021) 'Gender pay gaps in the European Union, a statistical analysis, Revision 1, 2021 edition'. Dennis Leythienne and Marina Pérez-Julián for clarification of the concepts used in sub-section 4.2.

The unadjusted gender pay gap (GPG) is calculated as the relative difference between the average earnings of women and men. However, the unadjusted GPG does not capture discrimination as such in the sense of 'equal pay for equal work or work of equal value'. Indeed, the unadjusted GPG combines (1) possible differences in the average characteristics of men and women in the labour market (e.g. different occupations, economic activities and average age) and (2) gender gaps for the same average characteristics.

To analyse the GPG, Eurostat has used microdata from the Structure of Earnings Survey (SES) 2018[83]. The microdata cover two broad areas: the earnings of individual employees and the observed characteristics of individual employees.

A statistical method known as the Blinder-Oaxaca method was applied on this data set to single out the contribution of each observed characteristic to the unadjusted GPG. According to this decomposition, the unadjusted GPG can be split into three parts: (1) the part explained by the different average characteristics of the men and woman employees, (2) the part explained by gender differences in returns for the same average characteristics and (3) the unexplained residual.

The unadjusted gender pay gap (GPG)

Eurostat publishes the unadjusted GPG annually. It is based on the methodology of the Structure of Earnings Survey (SES), which is released every 4 years. The unadjusted GPG is derived from SES data recorded in reference years 2002, 2006, 2010, 2014 and 2018, and from other national sources for the years between surveys. The scope and coverage of the unadjusted GPG are as follows: (1)

[83] Only 3 MS are missing in SES microdata for research purposes: Austria, Germany and Ireland. Nevertheless, for 10 countries the occupation is detailed at ISCO-08 2-digit level: Belgium, Spain, Finland, Croatia, Hungary, Netherlands, Portugal, Romania, Sweden and Slovenia. Therefore, the analysis of GPG is limited to the 14 MS with detailed occupations data at ISCO-08 3-digit level.

economic activity sections B to S with the exclusion of O[84], defined by the statistical classification of economic activities in the European Community (NACE) Revision 2, (2) only enterprises with 10 employees or more, (3) no restrictions for age and hours worked, and (4) both full-time and part-time employees are included.

The definition of the unadjusted GPG, expressed as a percentage, is as follows:

$$\frac{Mean\ (gross)\ hourly\ earnings\ of\ men - Mean\ (gross)\ hourly\ earnings\ of\ women}{Mean\ (gross)\ hourly\ earnings\ of\ men}$$

The mean gross hourly earnings are defined as the actual remuneration in cash paid during the reference month before any tax deduction and social security contributions payable by wage earners and retained by the employer divided by the number of hours actually paid during the reference month.

As an unadjusted indicator, the GPG gives an overall picture of the differences in pay between men and women. It measures a concept that is broader than the concept of 'equal pay for equal work or work of equal value'. A part of the difference in earnings between men and women can be explained by differences in the average characteristics of men and woman employees. The differences in the average characteristics can result from many factors, including the concentration of one gender in certain economic activities or occupations.

Another possible source of GPGs is the difference between the returns paid to women versus those paid to men with the same average characteristics. Such differences may stem from 'unequal pay for equal work' but also from the lack of information on detailed economic activities and occupations in which men and women may be concentrated. Such effects of segregation cannot be captured directly because SES variables are collected at a rather aggregated level (e.g. NACE sections).

The unadjusted GPG is therefore a complex indicator. Its measurement covers possible discrimination between men and women through 'unequal pay for equal work'; the differences in the

[84] The unadjusted GPG estimated by Eurostat covers all economic activities except agriculture, forestry and fishing (section A), public administration, defence and compulsory social security (section O), and activities of households as employers, undifferenciated goods and services producing activities of households for own use (section T).

average characteristics of men and woman and further segregation effects that would show up in the different returns of men and women.

To differentiate the different factors at work in the GPG, Eurostat applied the Oaxaca-Blinder methodology.

In the first stage, we ran a regression analysis to estimate the earnings equations for men (M) and women (W) separately, as detailed in the following equations:

$$lny_i^W = \beta_0^W + \sum_{k=1}^{K} x_{ki}^M \beta_k^W + \varepsilon_i^W$$

$$lny_i^M = \beta_0^M + \sum_{k=1}^{K} x_{ki}^M \beta_k^M + \varepsilon_i^M$$

Where:

- lny_i represents the natural log of hourly earnings for observation i;
- x_{ki} from k=1 to k=K, are explanatory variables covering the observed personal, job and enterprise characteristics that may impact on the log hourly earnings of individual i;
- β_0 is a constant and β_k , from k=1 to k=K, are the parameters for the corresponding variables covering the observed characteristics;
- ε_i is a disturbance term for observation i, independent from each other and normally distributed with average zero and same variance (i.e. 'white noise').

The regression analysis includes the SES variables as explanatory variables covering the observed personal, job and enterprise characteristics.

In the second stage, a decomposition analysis of the difference between the means of log hourly earnings of men and women is carried out:

$$\Delta = \overline{lny}^M - \overline{lny}^W$$

The Oaxaca decomposition uses the following regression property for the means of log hourly earnings of men and women:

$$\overline{lny}^M = \hat{\beta}_0^M + \sum_{k=1}^{K} \bar{x}_k^M \hat{\beta}_k^M$$

$$\overline{lny}^W = \hat{\beta}_0^W + \sum_{k=1}^{K} \bar{x}_k^W \hat{\beta}_k^W$$

These equations provide insights into the men and woman earnings structures by showing the relationship between the mean of log hourly earnings and the observed average characteristics for men and women ($\bar{x}_k^M$ and $\bar{x}_k^W$, respectively) as well as the corresponding returns ($\hat{\beta}_k^M$ and $\hat{\beta}_k^W$, respectively).

Assuming, in accordance with the definition of the unadjusted GPG, that the men earnings structure constitutes the benchmark, the estimated constant and coefficients in the men's equation are treated as the non-discriminatory benchmarks for the returns on characteristics of employees.

The difference between the logarithms of the earnings of men and women can thus be decomposed as follows:

$$\overline{lny}^M - \overline{lny}^W = \underbrace{\sum_{k=1}^{K} \hat{\beta}_k^M \left(\bar{x}_k^M - \bar{x}_k^W\right)}_{Different\ characteristics\ (E)} + \underbrace{\sum_{k=1}^{K} \bar{x}_k^W \left(\hat{\beta}_k^M - \hat{\beta}_k^W\right)}_{Different\ returns\ (U1)} + \underbrace{\left(\hat{\beta}_0^M - \hat{\beta}_0^W\right)}_{Residuals\ (U2)}$$

Where k=1 to k=K refers to the corresponding variables covering the observed characteristics.

If we call the gap explained by the different average characteristics of men and woman employees E, the unexplained part caused by different returns U1 and the remaining residual U2, we have:

$$\overline{lny}^M - \overline{lny}^W = E + U1 + U2$$

Then, we correct the mean hourly earnings of women for the explained part E and define:

$$\overline{lny}^{W\ adjusted} = \overline{lny}^W + E$$

The GPG definition is based on average hourly earnings:

$$GPG\ not\ adjusted = 1 - \left(\frac{\overline{y^W}}{\overline{y^M}}\right)$$

We define the GPG adjusted as:

$$GPG\ adjusted = 1 - \left(\frac{\overline{y^{Wadjusted}}}{\overline{y^M}}\right) = 1 - \left(\frac{\overline{y^W}}{\overline{y^M}}\right) * \left(\frac{\overline{y^{Wadjusted}}}{\overline{y^W}}\right)$$
$$= 1 - (1 - GPG\ not\ adjusted) * \left(\frac{\overline{y^{Wadjusted}}}{\overline{y^W}}\right)$$

The estimate for $\overline{y^{Wadjusted}}$ can be derived from $\overline{lny}^{W\ adjusted}$ as follows:

$$\overline{y^{Wadjusted}} = Exp\left(\overline{lny}^{W\ adjusted}\right) * \overline{Exp(\varepsilon_i^W)} = Exp\left(\overline{lny}^W\right) * Exp(E) * \overline{Exp(\varepsilon_i^W)}$$

Likewise: $\overline{y^W} = Exp\left(\overline{lny^W}\right) * \overline{Exp(\varepsilon_i^W)}$

Hence: $\left(\frac{\overline{y^{W\ adjusted}}}{\overline{y^W}}\right) = Exp(E)$

Therefore: $GPG\ adjusted = 1 - (1 - GPG\ not\ adjusted) * Exp(E)$

Hence: $GPG\ adjusted = Exp(E) * GPG\ not\ adjusted + [1 - Exp(E)]$

The adjustment of the GPG (GPG not adjusted – GPG adjusted) can be calculated as:

$$GPG\ adjustment = [Exp(E) - 1] * (1 - GPG\ not\ adjusted)$$

And this last equation may be applied to E as a whole or to each component: $\hat{\beta}_k^M\left(\bar{x}_k^M - \bar{x}_k^W\right)$ separately. This way, it is possible to measure how differences in the average profile of men and woman employees contribute to the GPG, for each variable (age, occupation, education, etc.).

GPG explained part (by each variable and total) and the unexplained/adjusted GPG is presented in table 1 in the Executive Summary. The unexplained or adjusted GPG cannot be directly understood as a measurement of discrimination through 'unequal pay for equal work' due to data limitations of SES: some variables are compiled in an aggregated way and other variables are not included in the

survey that cannot capture all the characteristics of a job[85]. This limitation should be considered when interpreting the unexplained GPG, in particular for those countries with a low coefficient of determination, presented for all MS and both genders in table 5.

Table 5: Coefficients of determination (R^2) of regressions explaining log hourly wages by women and men designers.

R^2 (%)	Women designers	Men designers
EU14	74.5	67.7
Bulgaria	18.9	17.1
Czech Republic	30.0	31.5
Denmark	44.5	40.9
Estonia	33.7	30.7
Greece	50.0	44.4
France	27.0	24.4
Italy	46.0	42.3
Lithuania	41.9	36.4
Luxembourg	48.7	44.1
Latvia	30.5	34.7
Poland	33.1	30.7
Slovakia	33.7	33.1

Source: Authors' calculations based on EU-SES microdata for research purposes with available and reliable data.

[85] An important variable not included in SES is the total working experience, in the current and previous positions.

Appendix III: Determination of the gender of designers in Registered Community Design (RCD) filings.

The source of data used in section 5 to analyse gender of designers is the EUIPO database of RCDs filings. It is not obligatory to provide the data of designers in the RCD filing, therefore this information is available only for a fraction of RCDs. Additionally, the data on designers is stored in one field containing first name and surname, and sometimes additional data identifying a designer[86].

Therefore, the first challenge in data analysis consisted in separation of first name of designer from additional data. Then, an algorithm was used to disambiguate the gender based on the first name and the World Gender Name Dictionary (WGND)[87] developed by WIPO, with some additional cleaning[88].

Information on designer was available for over 670 000 observations, corresponding to over 43 % of all designs' filings. Approximately 330 000 of those filings correspond to filings of EU-based owners. The ratio of designer data availability for RCDs with EU-based applicants is lower and amounts to 32%. The availability of designers' data varies depending on country of origin of owner. Whereas the RCDs filed by the EU based owners make up approximately 70% of all filings, they correspond to approximately 50% of the sample with designers' data. Availability of designers' data varies also by Locarno class associated with designs. The ratio of designers' data availability is higher for Locarno classes with lower rate of women designers which also might introduce some bias in the analysis. Estimation of the RCD gender gap in section 5 has been performed based on weighted statistics correcting sample observations with weights reflecting distribution of designs by year, country and Locarno class.

Based on the algorithm, the project team was able to indicate designers' gender for almost 632 000 (94 %) of all designs with information of the designer available. In the case of designs with EU-based owners, the team was able to determine designers' gender in case of over 308 000 RCDs (94 % of designs with designer information available). The quality check of the disambiguation of gender data

[86] The field with the name of the designer includes first name, surname and address information without separation. This field was cleaned before extracting the most probable first name.

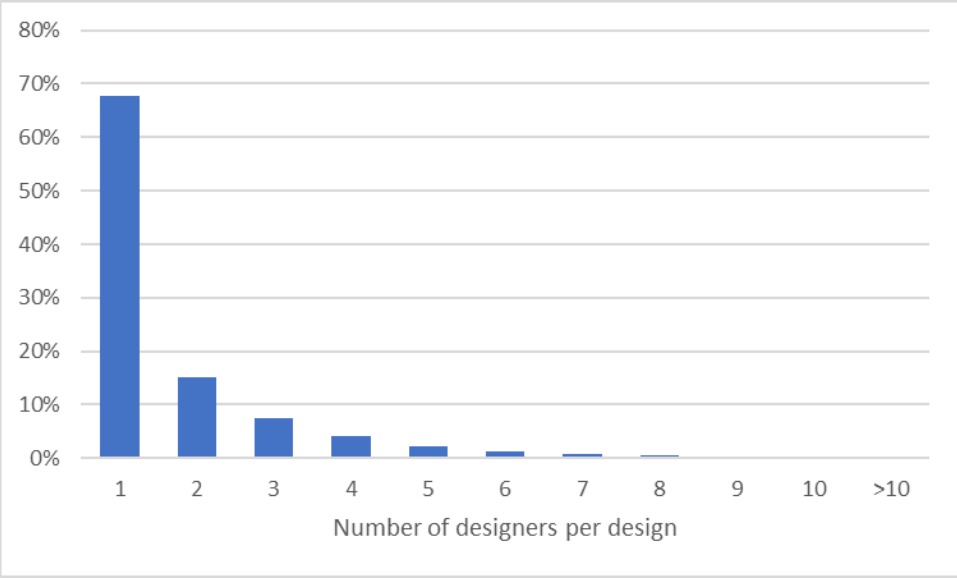
[87] https://www.wipo.int/about-ip/en/ip_innovation_economics/gender_innovation_gap/gender_dictionary.html

[88] The gender is assigned based on the first name and country of the owner. When the filing is filed by owners of different countries, the country used to assign the gender of the designer is the country of the first owner.

resulted in 1 % of false positive errors[89] and approx. 50 % of false negative errors[90]. It is important to emphasise that false negative errors affect only those observations where the designers' data is present in the file, but gender was not indicated (approx. 6% of designs with designers' data). The quality check of the correctness of gender disambiguation, conducted on a sample of designs, showed that the error rate is below 5%.

The average number of designers per design is 1.7, with a maximum of 26 designers and two thirds of designs with only one designer.

Figure 15: Share of RCD filings by number of designers.



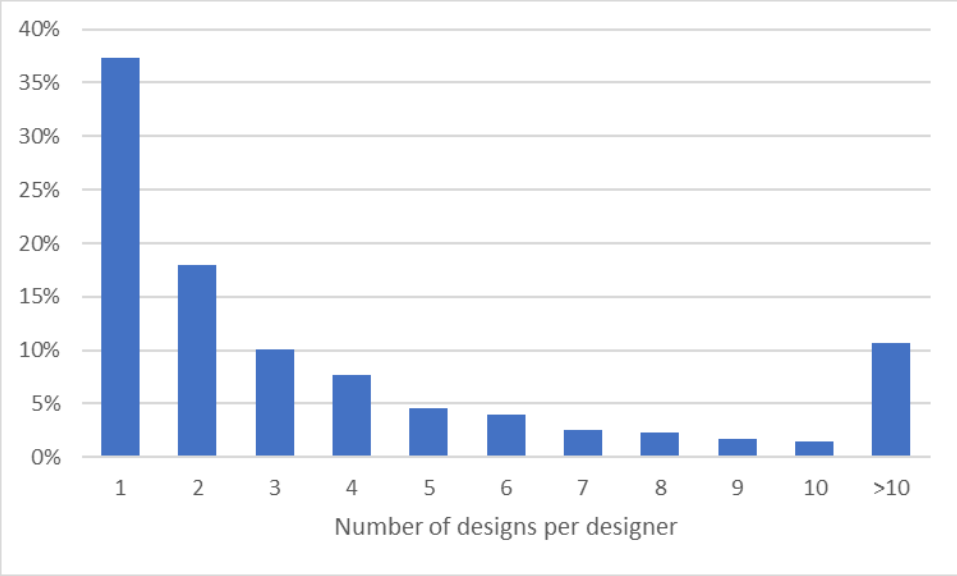
Source: Authors' calculations based on RCD database.

Based on all the RCD designers identified in EUIPO database, the average number of designs per designer in 5.6 with a maximum of 6 877 designs. 37 % of the designers have registered only one RCD design and more than half designers have registered a maximum of 2 designs.

[89] False positive error corresponds to the case when the algorithm assigns a gender to a field that does not contains a first name, and it should not assign any gender.

[90] False negative error is the case when the algorithm is not able to associate a gender with the first name when it should do so. This error is related to lack of presence of specific name-country pairs in the dictionary, problems in gender disambiguation of names of foreign designers or rejection of an observation during the cleaning phase.

Figure 16: Share of designers by number of designs.



Source: Authors' calculations based on RCD database.

Appendix IV: Locarno classification

Class Number	**Class Heading**	**Subclass Number**	**Subclass Heading**
01	Foodstuffs	01	Bakers' products, biscuits, pastry, pasta and other cereal products, chocolates, confectionery, ices
		02	Fruit, vegetables and products made from fruits and vegetables
		03	Cheeses, butter and butter substitutes, other dairy produce
		04	Butchers' meat (including pork products), fish
		05	Tofu and tofu products
		06	Animal foodstuffs
		99	Miscellaneous
02	Articles of clothing and haberdashery	01	Undergarments, lingerie, corsets, brassières, nightwear
		02	Garments
		03	Headwear
		04	Footwear, socks and stockings
		05	Neckties, scarves, neckerchiefs and handkerchiefs
		06	Gloves
		07	Haberdashery and clothing accessories
		99	Miscellaneous
03	Travel goods, cases, parasols and personal belongings, not elsewhere specified	01	Trunks, suitcases, briefcases, handbags, keyholders, cases specially designed for their contents, wallets and similar articles
		03	Umbrellas, parasols, sunshades and walking sticks
		04	Fans
		05	Devices for carrying and walking with babies and children

Class Number	Class Heading	Subclass Number	Subclass Heading
		99	Miscellaneous
04	Brushware	01	Brushes and brooms for cleaning
		02	Toilet brushes, clothes brushes and shoe brushes
		03	Brushes for machines
		04	Paintbrushes, brushes for use in cooking
		99	Miscellaneous
05	Textile piece goods, artificial and natural sheet material	01	Spun articles
		02	Lace
		03	Embroidery
		04	Ribbons, braids and other decorative trimmings
		05	Textile fabrics
		06	Artificial or natural sheet material
		99	Miscellaneous
06	Furnishing	01	Seats
		02	Beds
		03	Tables and similar furniture
		04	Storage furniture
		05	Composite furniture
		06	Other furniture and furniture parts
		07	Mirrors and frames
		08	Clothes hangers
		09	Mattresses and cushions
		10	Curtains and indoor blinds
		11	Carpets, mats and rugs
		12	Tapestries
		13	Blankets and other covering materials, household linen and napery
		99	Miscellaneous
07	Household goods, not elsewhere specified	01	China, glassware, dishes and other articles of a similar nature
		02	Cooking appliances, utensils and containers
		03	Table cutlery
		04	Appliances and utensils, hand-operated, for preparing food or drink
		05	Flat-irons, and washing, cleaning and drying equipment
		06	Other table utensils
		07	Other household receptacles
		08	Fireplace implements
		09	Stands and holders for household appliances and utensils
		10	Cooling and freezing devices and isothermal containers
		99	Miscellaneous
08	Tools and hardware	01	Tools and implements for drilling, milling or digging
		02	Hammers and other similar tools and implements
		03	Cutting tools and implements
		04	Screwdrivers and other similar tools and implements
		05	Other tools and implements
		06	Handles, knobs and hinges
		07	Locking or closing devices
		08	Fastening, supporting or mounting devices not included in other classes
		09	Metal fittings and mountings for doors, windows and furniture, and similar articles, not included in other classes or subclasses
		10	Bicycle and motorcycle racks

Class Number	Class Heading	Subclass Number	Subclass Heading
		11	Hardware for curtains
		99	Miscellaneous
09	Packaging and containers for the transport or handling of goods	01	Bottles, flasks, pots, carboys, demijohns, and pressurized containers
		02	Storage cans, drums and casks
		03	Boxes, cases, containers, tin cans
		04	Hampers, crates and baskets
		05	Bags, sachets, tubes and capsules
		06	Ropes and hooping materials
		07	Closing means and attachments
		08	Pallets and platforms for forklifts
		09	Refuse and trash containers and stands therefor
		10	Handles and grips for the transport or handling of packages and containers
		99	Miscellaneous
10	Clocks and watches and other measuring instruments, checking and signalling	01	Clocks and alarm clocks
		02	Watches and wrist watches
		03	Other time-measuring instruments
		04	Other measuring instruments, apparatus and devices
		05	Instruments, apparatus and devices for checking, security or testing
		06	Signalling apparatus and devices
		07	Casings, cases, dials, hands and all other parts and accessories of instruments for measuring, checking and signalling
		99	Miscellaneous
11	Articles of adornment	01	Jewellery
		02	Trinkets, table, mantel and wall ornaments, flower vases and pots
		03	Medals and badges
		04	Artificial flowers, fruit and plants
		05	Flags, festive decorations
		99	Miscellaneous
12	Means of transport or hoisting	01	Vehicles drawn by animals
		02	Handcarts, wheelbarrows
		03	Locomotives and rolling stock for railways and all other rail vehicles
		04	Telpher carriers, chair lifts and ski lifts
		05	Elevators and hoists for loading or conveying
		06	Ships and boats
		07	Aircraft and space vehicles
		08	Motor cars, buses and lorries
		09	Tractors
		10	Road vehicle trailers
		11	Cycles and motorcycles
		12	Perambulators, invalid chairs, stretchers
		13	Special-purpose vehicles
		14	Other vehicles
		15	Tyres and anti-skid chains for vehicles
		16	Parts, equipment and accessories for vehicles, not included in other classes or subclasses
		17	Railway infrastructure components
		99	Miscellaneous
13		01	Generators and motors
		02	Power transformers, rectifiers, batteries and accumulators

Class Number	Class Heading	Subclass Number	Subclass Heading
	Equipment for production, distribution or transformation of electricity	03	Equipment for distribution or control of electric power
		04	Solar equipment
		99	Miscellaneous
14	Recording, telecommunication or data processing equipment	01	Equipment for the recording or reproduction of sounds or pictures
		02	Data processing equipment as well as peripheral apparatus and devices
		03	Telecommunications equipment, wireless remote controls and radio amplifiers
		04	Screen displays and icons
		05	Recording and data storage media
		06	Holders, stands and supports for electronic equipment, not included in other classes
		99	Miscellaneous
15	Machines, not elsewhere specified	01	Engines
		02	Pumps and compressors
		03	Agricultural and forestry machinery
		04	Construction and mining machinery
		05	Washing, cleaning and drying machines
		06	Textile, sewing, knitting and embroidering machines, including their integral parts
		07	Refrigeration machinery and apparatus
		09	Machine tools, abrading and founding machinery
		10	Machinery for filling, packing or packaging
		99	Miscellaneous
16	Photographic, cinematographic and optical apparatus	01	Photographic cameras and film cameras
		02	Projectors and viewers
		03	Photocopying apparatus and enlargers
		04	Developing apparatus and equipment
		05	Accessories
		06	Optical articles
		99	Miscellaneous
17	Musical instruments	01	Keyboard instruments
		02	Wind instruments
		03	Stringed instruments
		04	Percussion instruments
		05	Mechanical instruments
		99	Miscellaneous
18	Printing and office machinery	01	Typewriters and calculating machines
		02	Printing machines
		03	Type and type faces
		04	Bookbinding machines, printers' stapling machines, guillotines and trimmers (for bookbinding)
		99	Miscellaneous
19	Stationery and office equipment, artists' and teaching materials	01	Writing paper, cards for correspondence and announcements
		02	Office equipment
		03	Calendars
		04	Books and other objects of similar outward appearance
		06	Materials and instruments for writing by hand, for drawing, for painting, for sculpture, for engraving and for other artistic techniques
		07	Teaching materials and apparatus

Class Number	Class Heading	Subclass Number	Subclass Heading
		08	Other printed matter
		99	Miscellaneous
20	Sales and advertising equipment, signs	01	Automatic vending machines
		02	Display and sales equipment
		03	Signs, signboards and advertising devices
		99	Miscellaneous
21	Games, toys, tents and sports goods	01	Games and toys
		02	Gymnastics and sports apparatus and equipment
		03	Other amusement and entertainment articles
		04	Tents and accessories thereof
		99	Miscellaneous
22	Arms, pyrotechnic articles, articles for hunting, fishing and pest killing	01	Projectile weapons
		02	Other weapons
		03	Ammunition, rockets and pyrotechnic articles
		04	Targets and accessories
		05	Hunting and fishing equipment
		06	Traps, articles for pest killing
		99	Miscellaneous
23	Fluid distribution equipment, sanitary, heating, ventilation and air-conditioning equipment, solid fuel	01	Fluid distribution equipment
		02	[Vacant]
		03	Heating equipment
		04	Ventilation and air-conditioning equipment
		05	Solid fuel
		06	Sanitary appliances for personal hygiene
		07	Equipment for urination and defecation
		08	Other sanitary equipment and accessories, not included in other classes or subclasses
		99	Miscellaneous
24	Medical and laboratory equipment	01	Apparatus and equipment for doctors, hospitals and laboratories
		02	Medical instruments, instruments and tools for laboratory use
		03	Prosthetic articles
		04	Materials for dressing wounds, nursing and medical care
		99	Miscellaneous
25	Building units and construction elements	01	Building materials
		02	Prefabricated or pre-assembled building parts
		03	Houses, garages and other buildings
		04	Steps, ladders and scaffolds
		99	Miscellaneous
26	Lighting apparatus	01	Candlesticks and candelabra
		02	Torches and hand lamps and lanterns
		03	Public lighting fixtures
		04	Luminous sources, electrical or not
		05	Lamps, standard lamps, chandeliers, wall and ceiling fixtures, lampshades, reflectors, photographic and cinematographic projector lamps
		06	Luminous devices for vehicles
		99	Miscellaneous
27	Tobacco and smokers' supplies	01	Tobacco, cigars and cigarettes
		02	Pipes, cigar and cigarette holders
		03	Ashtrays

Class Number	Class Heading	Subclass Number	Subclass Heading
		04	Matches
		05	Lighters
		06	Cigar cases, cigarette cases, tobacco jars and pouches
		07	Electronic cigarettes and other electronic smoking supplies
		99	Miscellaneous
28	Pharmaceutical and cosmetic products, toilet articles and apparatus	01	Pharmaceutical products
		02	Cosmetic products
		03	Toilet articles and beauty parlor equipment
		04	Wigs and false beauty articles
		05	Air fresheners
		99	Miscellaneous
29	Devices and equipment against fire hazards, for accident prevention and for rescue	01	Devices and equipment against fire hazards
		02	Devices and equipment for accident prevention and for rescue, not elsewhere specified
		99	Miscellaneous
30	Articles for the care and handling of animals	01	Animal clothing
		02	Pens, cages, kennels and similar shelters
		03	Feeders and waterers
		04	Saddlery
		05	Whips and prods
		06	Beds, nests and furniture for animals
		07	Perches and other cage attachments
		08	Markers, marks and shackles
		09	Hitching posts
		10	Grooming articles for animals
		11	Litter boxes and devices for removing animal excrement
		12	Toys for animals
		99	Miscellaneous
31	Machines and appliances for preparing food or drink, not elsewhere specified	00	Machines and appliances for preparing food or drink, not elsewhere specified
32	Graphic symbols and logos, surface patterns, ornamentation	00	Graphic symbols and logos, surface patterns, ornamentation

WOMEN IN DESIGN