



FEMALE PARTICIPATION IN EU EXPORTING ACTIVITIES: JOBS AND WAGES¹

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ABSTRACT

This analysis sheds new insights on the gender-balance of the employment opportunities supported by extra-EU exports. It shows that in 2017 more than 13 million female workers in the EU had jobs thanks to the exports of goods and services to the rest of the world. However, there is a gender gap when it comes to the employment prospects offered by extra-EU exports: only 38% of the jobs dependent on exports to the world are taken up by women. The analysis suggests that such gender gap is largely due to the concentration of female employment in the less export-oriented sectors, notably in services. Furthermore, the current note makes clear that labour compensation for female workers in exports-supported jobs stagnated in comparison to total employment over the time period considered. Although all exports-supported jobs benefit from a wage premium, there is a gender wage gap of 4 p.p.

¹ The views expressed herein are those of the authors and do not necessarily reflect an official position of the European Commission.



INTRODUCTION

The quantification of the number of jobs supported by exports in the EU has provided ample evidence of the importance of trade policy for the creation of employment opportunities in Europe. The most recent analysis by the European Commission² reveals that in 2017 exports are more important than ever, supporting 36 million jobs in the EU. On average each billion euros of extra-EU exports supported more than 13,000 jobs in EU Member States. Compared to the year 2000, the number of jobs dependent on EU exports to the world has increased by two thirds.

Building up on the results from this report and Rueda-Cantuche and Sousa³ (2017), the current paper aims at shedding light into the gender dimension of extra-EU exports. A particular focus of the current note is to provide some insights into the wage related impact on the distribution between male and female export supported employment. For this purpose, the note discusses the trends in labour compensation for female workers in exports-supported jobs and in total employment. Furthermore, the current analysis offers first insights into the gender wage premium gap i.e. the difference between the wage premium for male and female workers in EU Member States.

The current note is structured as follows: Section 1 deals with the gender gap in respect to exports-supported and total employment as well as the evolution thereof. Section 2 provides an analysis of exports-supported employment at sectoral level. The determinants of the change in the female share of exports-dependent jobs are discussed in Section 3. In Sections 4 and 5, we further analyse the gender gap in terms of labour compensation and wage premium, respectively. Section 6 offers a summary of the most important findings in terms of male to female differences in employment and wages of total and exports-supported employment.

² The “EU Exports to the World: Effects on Employment” and “EU Exports to the World: Effects on Income” can be found at: <http://ec.europa.eu/trade/policy/in-focus/trade-and-jobs/>. Their electronic versions with downloadable tables, charts and extended time series can be found at: <https://europa.eu/!Un47Cp>.

³ The results shown in Rueda-Cantuche and Sousa (2017) cannot be directly comparable with ours due to the fact that different data inputs were used for the differentiation between female and male workers. Here, we used the EUKLEMS database while the former report used the EXIOBASE3 database (Stadler et al., 2017). Moreover, the WIOD (release 2016) was produced following the System of National Accounts 2008 while the former report used the System of National Accounts 1993, which would make a difference inter alia in terms of national export values.



1. JOBS OPPORTUNITIES OFFERED BY EXPORTS: A GENDER GAP THAT PERSISTS IN THE EU

In 2017 the employment of 13.5 million female workers depended on extra-EU exports. In spite of this, there is a substantial gender gap in terms of the number of jobs supported by extra-EU exports as 62% of the jobs dependent on exports are occupied by men compared to 38% by women (Table 1). A comparison over the time period 2008-2014 shows that this proportion has remained constant. However, as the number of jobs supported by exports grew from 27 to 36 million jobs, this means that in 2017 the number of female jobs augmented by 3.5 million compared to 2008.

Box 1: Short overview of the methodology

A Multi-Regional Input-Output (MRIO) analysis allows the identification of all industries input requirements and production and trade inter-linkages between different sectors and across economies.

When applied to the quantification of EU employment effects associated to exports to the rest of the world a MRIO can offer a complete and fully consistent picture by allowing for example the identification of all jobs supported in France by the exports of motorcycles to Canada including not only the jobs that are directly supported in France (including those in upstream industries) but also those that are supported by the production of inputs (say steel) in France to be used in downstream activities in other Member States (say a Slovak producer of motorcycle parts), which will ultimately supply the motorcycle exporters in France⁴.

Although the methodology for this type of analysis is quite robust and standard (see Miller and Blair (2009) and Murray and Lenzen (2013)) the lack of appropriate data has for long held back researchers. However, the World Input-Output Database (WIOD) (see Timmer et al. (2016) for a full description) has allowed new work in this area like Arto et al. (2018) that provides a full overview of the employment supported by EU exports to the rest of the world.

The analysis presented in this note builds on that work and relies on the same methodology. Full details are provided in Annex 1. What is new is the combination of the MRIO analysis with data on employment by gender. Although there is earlier work on the

⁴ With a MRIO based analysis all these jobs are allocated to France. They would be part of the total number of jobs in France that are supported by the exports of the whole EU to the rest of the world.



link between trade and gender grounded in the use of Input-Output models it focused on single country settings, like for example Gunluk-Senesen and Senesen (2011), and not on multi-country frameworks. For this work the WIOD database had to be complemented with gender-related information from the EUKLEMS and the International Labour Organisation (ILO) databases.

In 2017 13.5 million female workers were supported by extra-EU exports to the world. However, only 38% of the jobs dependent on exports were taken up by women.

This fact is even more striking given the pattern of total female employment over the same time period. Although female participation in the labour market has increased by more than 1 p.p. the number of female workers in exports depended jobs stagnated (Table 1). This development clearly shows that there is a way to go before one could achieve parity in total and even less so in exports-related employment.

Table 1 also reveals significant heterogeneity among EU Member States in terms of the share of female jobs supported by exports. The countries with the highest proportion of female jobs dependent on exports are Romania (44 p.p.), Bulgaria (43 p.p.), Cyprus (43 p.p.), Lithuania (43 p.p.) and Latvia (42 p.p.). Three of them also have the highest share

The heterogeneity across Member States reflect differences in terms of female participation in the labour market and in in terms of sector specialisation of exports.

of females in total employment Lithuania (51%), Latvia (51%) and Cyprus (48%). On the other side, Finland is the only country in top five with high female employment of 48% and below average females in export-supported employment of 33%.

Between 2008 and 2014 the highest increase (by 3 p.p.) in female jobs in exports activities has been in Belgium from 35% to 38%, followed by Malta from 29% to 32%. At the same time the shares of females in exports-supported employment declined in the Netherlands by 3 p.p. from 39% to 36%, in Estonia by 3 p.p. from 43% to 40% and in various Member States by 2 p.p. Strikingly, although the share of females in total employment increased by 2 p.p in Italy it declined by 1 p.p. in exports supported jobs.



Table 1: Female participation in total employment and in exports-supported employment, in % and percentage points

	Females in total employment			Females in exports-supported employment		
	2008	2014	2008-2014	2008	2014	2008-2014
Austria	46%	48%	+2 p.p.	37%	38%	+1 p.p.
Belgium	44%	47%	+3 p.p.	35%	38%	+3 p.p.
Bulgaria	45%	46%	+1 p.p.	44%	43%	1 p.p.
Cyprus	43%	48%	+5 p.p.	43%	43%	0 p.p.
Czech Rep.	43%	43%	0 p.p.	38%	37%	-1 p.p.
Germany	46%	48%	+2 p.p.	37%	37%	0 p.p.
Denmark	47%	47%	0 p.p.	35%	34%	-1 p.p.
Spain	42%	46%	+4 p.p.	36%	36%	+1 p.p.
Estonia	49%	50%	+1 p.p.	43%	40%	-3 p.p.
Finland	47%	48%	+1 p.p.	35%	33%	-2 p.p.
France	47%	48%	+1 p.p.	39%	39%	0 p.p.
Great Britain	47%	47%	0 p.p.	39%	38%	0 p.p.
Greece	39%	42%	+3 p.p.	36%	37%	+1 p.p.
Croatia	44%	46%	+2 p.p.	40%	42%	+2 p.p.
Hungary	44%	45%	+1 p.p.	39%	38%	-1 p.p.
Ireland	44%	45%	+1 p.p.	40%	41%	+1 p.p.
Italy	41%	43%	+2 p.p.	34%	33%	-1 p.p.
Lithuania	50%	51%	+1 p.p.	44%	43%	-1 p.p.
Luxembourg	40%	38%	-2 p.p.	37%	35%	-2 p.p.
Latvia	51%	51%	0 p.p.	45%	42%	-3 p.p.
Malta	34%	37%	+3 p.p.	29%	32%	+3 p.p.
The Netherlands	46%	46%	0 p.p.	39%	36%	-3 p.p.
Poland	45%	45%	0 p.p.	37%	37%	0 p.p.
Portugal	46%	48%	+2 p.p.	41%	39%	-2 p.p.
Romania	45%	44%	-1 p.p.	45%	44%	-1 p.p.
Slovakia	46%	46%	0 p.p.	42%	40%	-2 p.p.
Slovenia	44%	45%	+1 p.p.	38%	37%	-1 p.p.
Sweden	47%	47%	0 p.p.	34%	34%	0 p.p.
European Union	45%	46%	+1 p.p.	38%	38%	0 p.p.

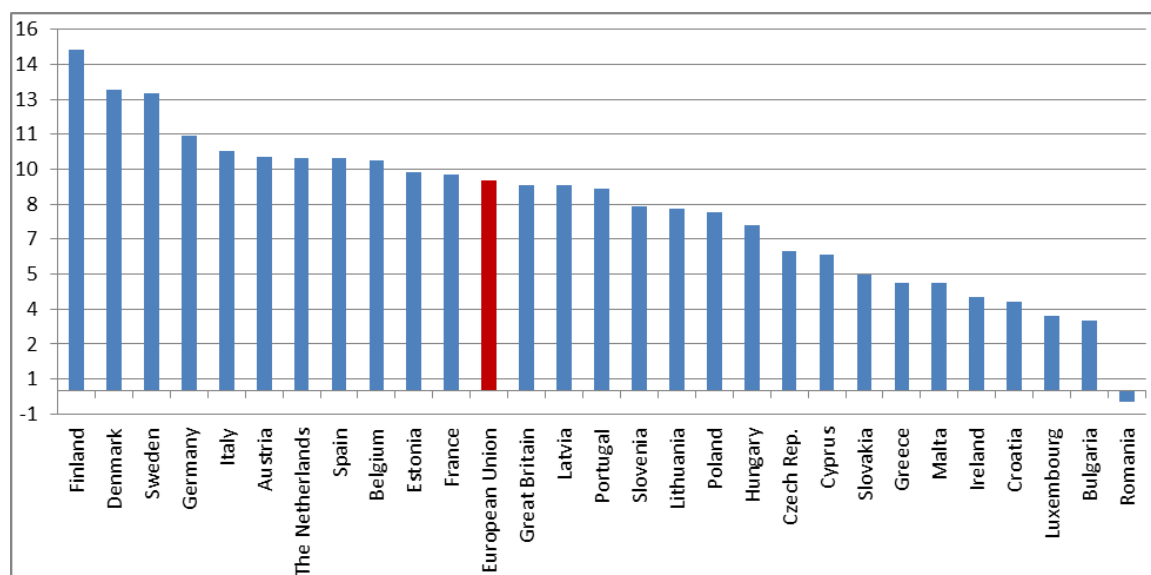
Source: Own calculations

A closer look at the female to male difference in total and exports-supported employment shares reveals that women are less engaged than men in export-related activities in all EU Member States but one (Figure 1). Romania is the only country where the share of females in export-supported employment was higher (although negligibly) than the share of females in total employment. The gender gap in total versus export supported employment was relatively small in Bulgaria (3 p.p.), Luxembourg (3 p.p.), Croatia (4 p.p.) and Ireland (4 p.p.). On the other side, the gender related gap in total



versus exports-supported employment was the largest in Finland, where it amounted to 15 p.p. In other words, with respect to total employment 48 of 100 Finnish workers are females as opposed to only 33 out of 100 workers in job activities supported by extra-EU exports. Other Member States with large gender gaps in total versus exports-supported employment are Denmark (13 p.p.), Sweden (13 p.p.), Germany (11 p.p.) and Italy (10 p.p.).

Figure 1: Gender gap in total versus exports-supported employment shares 2014, in percentage points



Source: Own calculations

2. THE ROLE OF SECTORIAL OPENNESS: A KEY FACTOR EXPLAINING THE GENDER GAP IN THE TRADE-JOBS NEXUS

The data presented in Table 2 and in greater detail in Annex 2 shows that there is no large difference between the sectoral share of females in total employment and in export-supported employment in the time period 2008-2014. The only exception applies to the sectors 'activities of households as employers' and 'fishing and aquaculture' where in 2014 the gap between female employment in total versus exports supported jobs stood at 8 p.p. and -3 p.p., respectively.

However, there is important heterogeneity in terms of the share of females in employment across sectors. In 2014, female employment was below 25% of total employment and exports-supported employment in sectors like mining and quarrying sewage and waste collection, electricity, gas, steam and air conditioning, water



collection and treatment, construction, land transport, water transport, air transport, warehousing and postal and courier services.

In contrast, it was close and/or above 50% in sectors like trade and repair of motor vehicles, wholesale trade, retail trade, accommodation and food services, financial services, insurance services, activities auxiliary to financial and insurance services, real estate, education, human health and social work, other services, and activities of households as employers.

This suggests that the visible gap between women and men in exports-supported aggregate employment may be driven by factors that determine the level of female participation in the workforce across sectors.

The gender gap in employment opportunities offered by exports is largely due to the concentration of female employment in the less export-oriented sectors, notably in services.

In order to understand how much sector differences in female employment affect the take up of export-dependent job opportunities it is important to look into the degree of export openness of the sectors where female employment is concentrated.

As shown in Figure 2 there is a negative relationship between export-orientation of final output and female participation in the workforce at the sectoral level: in other words, women tend to be more intensively employed in less export-oriented sectors, notably in services industries. In 2014, the female share in total employment was above 70% in so-called non-tradable services sectors⁵ like education, human health and social work and activities of households as employers.

Moreover, in 2014 around 46% of total female employment in the EU was concentrated in sectors with very low direct exposure to foreign markets⁶. This concentration has been relatively constant over time since the female employment share was 43% in 2008. In comparison, only 38% of the total employment (men and women) was concentrated in those industries in 2014, up from 37% in 2008.

⁵ Non-tradable at least from the standpoint of "mode 1" services that are captured by the trade data used in this analysis.

⁶ Sectors with a ratio of final exports to output lower than 2%. These are: electricity, gas, steam and air conditioning, water collection and treatment, construction, real estate, public administration and defence, education, human health and social work, other services and activities of households as employers.



Table 2: Women share in total employment and in exports-supported employment per sector in 2008 and 2014

	Females in total employment			Females in exports-supported employment		
	2008	2014	2008-2014	2008	2014	2008-2014
Activities of households as employers	73%	89%	+16 p.p.	69%	97%	+28 p.p.
Human health and social work activities	78%	78%	0 p.p.	80%	79%	-1 p.p.
Education	71%	72%	+1 p.p.	70%	71%	+1 p.p.
Other service activities	48%	58%	+10 p.p.	49%	58%	+9 p.p.
Accommodation and food service activities	55%	54%	-1 p.p.	57%	54%	-3 p.p.
Insurance, reinsurance and pension funding	53%	53%	0 p.p.	52%	51%	-1 p.p.
Financial service activities	52%	52%	0 p.p.	51%	50%	-1 p.p.
Wholesale and retail trade and repair of motor vehicles, etc.	49%	49%	0 p.p.	50%	50%	0 p.p.
Retail trade, except of motor vehicles and motorcycles	49%	49%	0 p.p.	49%	50%	+1 p.p.
Wholesale trade, except of motor vehicles and motorcycles (...)	49%	49%	-0 p.p.	50%	49%	-1 p.p.
Electricity, gas, steam and air conditioning supply	22%	23%	+1 p.p.	22%	23%	+1 p.p.
Warehousing and support activities for transportation	23%	22%	-1 p.p.	23%	23%	-0 p.p.
Postal and courier activities	23%	23%	0 p.p.	23%	23%	-0 p.p.
Air transport	23%	22%	-1 p.p.	23%	22%	-1 p.p.
Land transport and transport via pipelines	22%	22%	0 p.p.	23%	22%	-1 p.p.
Water transport	22%	21%	-1 p.p.	22%	22%	0 p.p.
Water collection, treatment and supply	21%	20%	-1 p.p.	21%	20%	-1 p.p.
Sewerage; waste collection, treatment and disposal activities; etc.	20%	19%	-1 p.p.	20%	18%	-2 p.p.
Mining and quarrying	14%	10%	-4 p.p.	15%	11%	-4 p.p.
Construction	9%	10%	+1 p.p.	9%	9%	0 p.p.
Total	45%	46%	+1 p.p.	38%	38%	0 p.p.

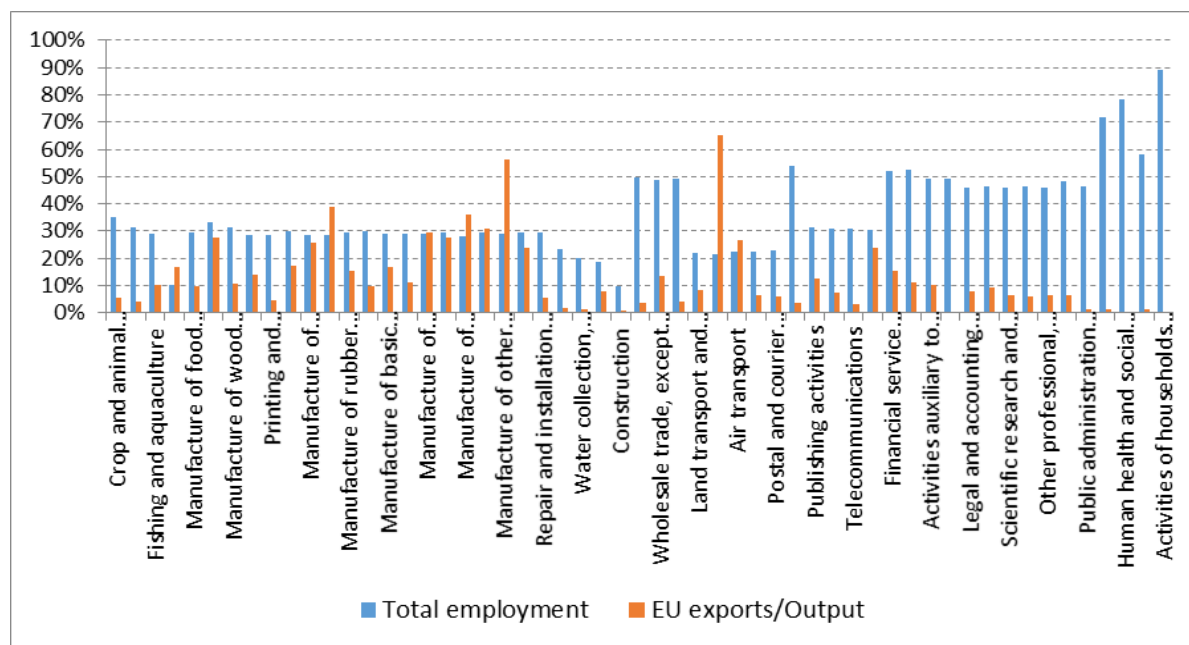
Source: Own calculations (see the full table in the Annex)

However, it is also important to stress the fact that services are also exported indirectly, as part of manufactured products. This also offers opportunities for women to benefit from export-dependent jobs. In absolute terms, in 2014 two services sectors were particularly important for female export-supported employment in the EU: administrative and support services and wholesale trade, which accounted for around 22% of the total.

In fact, additional calculations reveal that in 2014, for the EU, the female share of the employment in services industries (mode 5 services) supporting exports of manufacturing products reached 43.6%, which is nonetheless lower than the women share in total employment (46.3%).



Figure 2: Women share in sector employment vs sector openness (as measured by the ratio of final exports to output) in 2014



Source: own calculations

The analysis above suggests that differences across sectors notably regarding the share of women in total employment and the evolution of exports matter greatly to understand the evolution of exports-supported employment across Member States, albeit in different degrees.

3. SHIFT-SHARE ANALYSIS: DRIVERS OF THE FEMALE SHARE EVOLUTION OF EXPORTS-SUPPORTED EMPLOYMENT?

A shift-share analysis⁷ allows shedding light on the factors leading to the change (increase or decrease) in the female share of exports-supported employment of a specific industry in a given EU Member State. The drivers of that development can be broken down in two effects: EU industry effect and national industry effect. The former indicates by how much the female share in exports-dependent jobs would have changed if national industry changes would follow one to one the EU industry as an aggregate.

⁷ See Annex 2 for details.



The national industry effect, on the other side, reveals specific national industry patterns driving the female share of exports-supported jobs.

Table 3 - The determinants underlying the evolution of female share of export-supported employment between 2008 and 2014, percentage points

	EU industry effect	National industry effect	Total
Austria	0.3	0.7	1.0
Belgium	0.6	1.8	2.4
Bulgaria	-1.2	0.8	-0.4
Cyprus	-1.4	1.1	-0.3
Czech Rep.	-1.1	0.2	-0.9
Germany	0.1	0.3	0.4
Denmark	0.6	-0.8	-0.2
Spain	0.3	0.4	0.7
Estonia	-1.1	-1.1	-2.2
Finland	0.6	-2.5	-1.9
France	-0.8	0.7	-0.1
Great Britain	0.7	-1.2	-0.5
Greece	-2.1	3.1	1.0
Croatia	-0.2	2.1	1.9
Hungary	-0.5	-0.1	-0.6
Ireland	0.4	1.2	1.6
Italy	-0.7	-0.4	-1.1
Lithuania	-0.4	-0.1	-0.5
Luxembourg	-1.0	-1.3	-2.3
Latvia	-1.2	-1.8	-3.0
Malta	-0.2	3.8	3.6
The Netherlands	1.7	-4.7	-3.0
Poland	-1.1	1.5	0.4
Portugal	0.2	-1.9	-1.7
Romania	-2.0	0.7	-1.3
Slovakia	-1.7	0.3	-1.4
Slovenia	-0.3	-0.7	-1.0
Sweden	0.1	0.0	0.1

Source: Own calculations



For example, Table 3 makes clear that in Greece the female share of jobs related to exports would have decreased by 2.1 percentage points had their industries followed the corresponding EU industry trends (EU industry effect). However, nation-wide factors have led to an increase in the same share of 3.1 percentage points (national industry effect) leading to a net difference of 1 percentage point.

In Table 3 we show the results of the shift-share analysis aggregated by EU Member State. The obtained figures make clear that countries such as Malta, Greece, Croatia, Belgium and Poland seem to have stronger national factors leading to an increased participation of women in their exports activities. On the contrary, national industry effects in the Netherlands, Finland, Portugal, Latvia and Luxembourg contributed negatively to their overall changes in the female shares of exports-supported employment.

Regarding EU industry effects, it is worthwhile noting that these were large and positive in the Netherlands, United Kingdom, Finland, Denmark and Belgium. This however means that for example the Netherlands would have increased its female share in exports-supported employment had it followed the same trends as its EU level counterpart industries. On the opposite side, industries in Greece, Romania, Slovakia, Bulgaria and Cyprus would have decreased their female shares of exports-supported employment had they followed the same trends as their EU level counterpart industries.

4. FEMALE VERSUS MALE LABOUR COMPENSATION IN TOTAL AND EXPORTS-SUPPORTED JOBS

The country with the highest share of labour compensation for female workers in exports-dependent jobs is Cyprus where women were as equally compensated as men.

The data presented in Table 4 reveals the share of total and export-supported labour compensation paid to females across EU Member States in 2008 and 2014. The data shows that there is a significant heterogeneity among EU countries in terms of the differences in male versus female

labour compensation. The country with the highest share of labour compensation for female workers in exports-dependent jobs is Cyprus where women were as equally compensated as men. The increase by 10 p.p. in the pay check of the exports-supported jobs in Cyprus in the period 2008-2014 was also the highest among EU Member States. Interestingly, the same applies to total employment labour compensation for women which increased even more i.e. by 13 p.p. in Cyprus (Table 4).



Other EU countries with the highest labour compensation in export-supported jobs were Ireland (41%), Bulgaria (40%), Croatia (40%) and Latvia (39%). On the other hand, female versus male workers labour compensation in exports supported jobs is particularly low Poland (28%), Belgium (28%), Austria (29%), the Netherlands (29%) and Denmark (29%).

Table 4: FEMALE PARTICIPATION IN TOTAL AND IN EXPORTS-SUPPORTED LABOUR COMPENSATION, IN % AND PERCENTAGE POINTS

	Share of labour compensation paid to females			Share of export-supported labour compensation paid to females		
	2008	2014	2008-2014	2008	2014	2008-2014
Austria	40%	38%	-1 p.p.	30%	29%	-1 p.p.
Belgium	39%	38%	-1 p.p.	29%	28%	-1 p.p.
Bulgaria	43%	44%	+1 p.p.	40%	40%	0 p.p.
Cyprus	38%	51%	+13 p.p.	39%	50%	+10 p.p.
Czech Rep.	37%	38%	+1 p.p.	31%	32%	0 p.p.
Germany	38%	39%	+1 p.p.	29%	30%	0 p.p.
Denmark	42%	41%	-1 p.p.	31%	29%	-1 p.p.
Spain	37%	42%	+6 p.p.	28%	32%	+3 p.p.
Estonia	42%	41%	-1 p.p.	36%	32%	-3 p.p.
Finland	41%	42%	+2 p.p.	29%	29%	0 p.p.
France	41%	42%	+1 p.p.	33%	34%	0 p.p.
Great Britain	39%	39%	0 p.p.	31%	32%	+1 p.p.
Greece	37%	39%	+2 p.p.	32%	35%	+3 p.p.
Croatia	43%	44%	+1 p.p.	38%	40%	+1 p.p.
Hungary	42%	44%	+2 p.p.	36%	37%	+1 p.p.
Ireland	41%	44%	+3 p.p.	36%	41%	+5 p.p.
Italy	37%	40%	+3 p.p.	30%	32%	+1 p.p.
Lithuania	42%	46%	+4 p.p.	36%	38%	+2 p.p.
Luxembourg	34%	34%	-1 p.p.	31%	29%	-1 p.p.
Latvia	45%	47%	+2 p.p.	38%	39%	+1 p.p.
Malta	31%	35%	+4 p.p.	23%	29%	+5 p.p.
The Netherlands	40%	39%	-1 p.p.	32%	29%	-3 p.p.
Poland	39%	38%	0 p.p.	29%	28%	0 p.p.
Portugal	40%	40%	0 p.p.	32%	30%	-2 p.p.
Romania	39%	39%	0 p.p.	38%	38%	0 p.p.
Slovakia	39%	39%	0 p.p.	35%	34%	-1 p.p.
Slovenia	43%	43%	0 p.p.	36%	35%	-1 p.p.
Sweden	42%	42%	0 p.p.	32%	31%	-1 p.p.
European Union	39%	40%	+1 p.p.	31%	31%	0 p.p.

Source: Own calculations



The strongest increase in exports-supported labour compensation paid to females after Cyprus has taken place in Malta by 6 p.p., in Ireland by 5 p.p., in Spain by 4 p.p. and in Greece by 3 p.p. On the other hand, females' salaries shares have decreased the strongest in Estonia by 4 p.p., in the Netherlands by 3 p.p., and in Portugal, Luxembourg and Denmark by 2 p.p. in the same period.

On average there is a gap between the share of labour compensation paid to females in the total economy versus the exports-supported jobs of 1 p.p. as the former increased from 39% to 40% and the latter remained unchanged.

5. FEMALE VERSUS MALE WAGE PREMIUM

As shown in a recent analysis⁸ export-supported jobs are better paid than the average jobs in the EU economy. Against this background, it is of great relevance to be able to look into the export related wage premium from a gender perspective. In this respect, Table 4 provides information on the female versus male wage premium and on the gap between the two.

In the EU there is a gender wage premium gap of 4 p.p. corresponding to the difference between the wage premium for males (17%) and females (13%). However, a closer look at Table 5 reveals that there are significant heterogeneities among EU Member States in respect to the male versus female wage premium. For example, this difference is negative in 12 EU Member States and the largest in Cyprus, Italy, Ireland and Latvia where it amounts to 21 p.p., 10 p.p., 7 p.p. and 5 p.p., respectively. This also means that women enjoy a significant wage premium advantage in these countries.

Export-supported jobs are better paid than the average jobs in the EU economy. However, in the EU there is a gender wage premium gap of 4 p.p. corresponding to the difference between the wage premium for females (13%) and males (17%).

On the other side the wage premium difference is positive and favourable to men in 16 Member States. The countries with the highest exports-related male to female wage premium difference are Poland (13 p.p.), Portugal (10 p.p.), Malta (9 p.p.) and Bulgaria (7 p.p.).

⁸ Kutlina-Dimitrova et al (2018).



Table 5: Female versus male wage premium

	Wage female premium	Wage male premium	Wage premium difference
Cyprus	37%	16%	-21 p.p.
Italy	21%	11%	-10 p.p.
Denmark	21%	21%	0 p.p.
Germany	21%	19%	-2 p.p.
Hungary	20%	19%	-1 p.p.
Great Britain	19%	17%	-2 p.p.
France	19%	18%	-1 p.p.
Ireland	19%	12%	-7 p.p.
Slovakia	16%	12%	-4 p.p.
Sweden	14%	10%	-4 p.p.
Latvia	13%	9%	-4 p.p.
Finland	13%	10%	-3 p.p.
Slovenia	13%	14%	+1 p.p.
Austria	12%	13%	+1 p.p.
Lithuania	11%	12%	+1 p.p.
Spain	10%	16%	+6 p.p.
The Netherlands	9%	13%	+4 p.p.
Greece	9%	4%	-5 p.p.
Czech Rep.	8%	11%	+3 p.p.
Luxembourg	8%	14%	+6 p.p.
Romania	7%	12%	+5 p.p.
Belgium	7%	13%	+6 p.p.
Estonia	7%	9%	+2 p.p.
Portugal	4%	14%	+10 p.p.
Malta	4%	13%	+9 p.p.
Bulgaria	4%	11%	+7 p.p.
Croatia	2%	5%	+3 p.p.
Poland	-7%	6%	+13 p.p.
European Union	13%	17%	+4 p.p.

Source: Own calculations



6. CONCLUSIONS

The analysis presented in this note shows that there are more than 13.5 million female workers in the EU whose jobs are supported by EU exports to the world in 2017. The share of women in jobs related to exports has remained constant at 38% in the time period analysed. This points to a substantial gender gap in terms of exports-supported employment of 12 p.p. Moreover, the female share of export-supported jobs is smaller than the share of women in total employment of the EU economy, which stands at 46%.

The current analysis provides first insights into trends in labour compensation for females in exports-supported jobs and gender related wage premiums. As shown in Section 4 aggregate salaries for female workers stagnated at 31% in the period 2008-2014. At the same time, labour compensation for female workers in the total economy increased by 1 percentage point from 39% to 40%.

However, the results presented in this note also show that female workers in exports-supported jobs benefit from a wage premium of 13%. This means that women employed in exporting activities are better remunerated than female workers in the total economy. In spite of this fact, there is a gender wage gap of 4 p.p. to the advantage of male workers in exports-dependent jobs.

The country specific analysis revealed a dearth of heterogeneity across EU Member States in terms of female participation in the labour market on the one side and sectoral specialisation of exports on the other. While some Member States like Belgium and Malta succeeded in increasing their female participation in export-supported jobs by 3 percentage points, others such as the Netherlands, Estonia and Latvia reduced the share of females in jobs dependent on exports by the same amount.

The sectoral results of the current note show that the gender gap in employment opportunities supported by exports is largely due to the concentration of female employment in less export-oriented sectors, notably in services industries such as education, human and health services. Moreover, more than one fifth of the female jobs supported by EU exports consists of administration, supporting services and wholesale trade.

**REFERENCES**

Arto, I., Rueda-Cantuche, J.M., Cazarro, I., Amores, A.F., Dietzenbacher, E., Kutlina-Dimitrova, Z. and Román, M. V. (2018), *EU exports to the World: Effects on Employment*, Luxembourg, Publications Office of the European Union.

Creamer, D. (1943), "Shifts of Manufacturing Industries" in: *Industrial Location and National Resources*, chapter 4. Washington D.C.: US Government Printing Office, pp. 85-104.

Dunn, Jr., E.S. (1960), "A Statistical and Analytical Technique for Regional Analysis", *Papers and Proceedings of the Regional Science Association*, 6, pp. 97 -112.

Gunluk-Senesen, G. and U. Senesen (2011), "Decomposition of Labour Demand by Employer Sectors and Gender: Findings for Major Exporting Sectors in Turkey", *Economic Systems Research*, 23(2), pp. 233-253.

Kutlina-Dimitrova, Z., Rueda-Cantuche, J.M., Amores, A. F. and Román, M. V. (2018), How important are EU exports for jobs in the EU? European Commission's Chief Economist Note, issue 4, November. Brussels.

Miller, R.E. and P. D. Blair (2009), *Input-Output Analysis: Foundations and Extensions*, 2nd Edition, Cambridge University Press: New York, US.

Murray, J. and M. Lenzen, eds. (2013), *The Sustainability Practitioner's Guide to Multi-regional Input-Output Analysis*, Common Ground Publishing LLC: Champaign, Illinois, US.

Rueda-Cantuche, J.M. and Sousa, N. (2017), Are EU exports gender-blind? Some key features of women participation in exporting activities in the EU, DG TRADE Chief Economist Note, 2017-3.

Stadler, K. et al (2017), "EXIOBASE3 - Developing a Time Series of Detailed Environmentally Extended Multi-Regional Input-Output Tables", *Journal of Industrial Ecology*, forthcoming.

Timmer, M. P., Dietzenbacher, E., Los, B., Stehrer, R. and de Vries, G. J. (2015), "An Illustrated User Guide to the World Input-Output Database: the Case of Global Automotive Production", *Review of International Economics*, 23, pp. 575-605.

Timmer, M. P., Los, B., Stehrer, R. and de Vries, G. J. (2016), "An Anatomy of the Global Trade Slowdown based on the WIOD 2016 Release", GGDC research memorandum number 162, University of Groningen.



ANNEX 1: OVERVIEW OF MULTI-REGIONAL INPUT-OUTPUT METHODOLOGY

In order to obtain the EU employment by gender embodied in the EU exports to the rest of the world, we use a methodological approach based on a Multi-Regional Input-Output (MRIO) model together with the information provided by the WIOD-World Input-Output Database (Timmer et al., 2015, 2016) and the EUKLEMS database. We follow a long-standing literature that builds on the use of this type of model to explore the social, economic and environmental consequences of trade. For an extended overview see Miller and Blair (2009) and Murray and Lenzen (2013).

As in Rueda-Cantuche and Sousa (2016) and Arto et al. (2015, 2018), we describe here the methodology for the case of four regions (two EU countries and two non-EU countries) with n industries and one economic dimension (employment). This can be applied to any number of regions, dimensions and industries. The MRIO tables used in the calculations are industry by industry IO tables. Accordingly, all the data reported in this note is reported by industry (e.g. we report the employment supported by the exports of the manufacturing industry and not the employment supported by the exports of manufactured products).

The starting point of the model is a MRIO table at basic prices. This table describes the flows of goods and services from all industries to all intermediate and final users, explicitly broken down by countries of origin and by countries of destination in each flow.

We can distinguish three main components in the MRIO table:

$$\mathbf{Z} = \begin{bmatrix} \mathbf{Z}^{11} & \mathbf{Z}^{12} & \mathbf{Z}^{13} & \mathbf{Z}^{14} \\ \mathbf{Z}^{21} & \mathbf{Z}^{22} & \mathbf{Z}^{23} & \mathbf{Z}^{24} \\ \mathbf{Z}^{31} & \mathbf{Z}^{32} & \mathbf{Z}^{33} & \mathbf{Z}^{34} \\ \mathbf{Z}^{41} & \mathbf{Z}^{42} & \mathbf{Z}^{43} & \mathbf{Z}^{44} \end{bmatrix}, \quad \mathbf{f} = \begin{bmatrix} \mathbf{f}^{11} + \mathbf{f}^{12} + \mathbf{f}^{13} + \mathbf{f}^{14} \\ \mathbf{f}^{21} + \mathbf{f}^{22} + \mathbf{f}^{23} + \mathbf{f}^{24} \\ \mathbf{f}^{31} + \mathbf{f}^{32} + \mathbf{f}^{33} + \mathbf{f}^{34} \\ \mathbf{f}^{41} + \mathbf{f}^{42} + \mathbf{f}^{43} + \mathbf{f}^{44} \end{bmatrix}, \quad \mathbf{x} = \begin{bmatrix} \mathbf{x}^1 \\ \mathbf{x}^2 \\ \mathbf{x}^3 \\ \mathbf{x}^4 \end{bmatrix},$$

where \mathbf{Z}^{rs} is the intermediate matrix with industry deliveries from country r to country s ; \mathbf{f}^{rs} is the column vector of country s ' final demand (including household consumption, government consumption, and investment) for goods produced by country r ; and \mathbf{x}^r is the column vector of industry output for country r . Furthermore, let us assume that the MRIO table is extended to include a vector of employment (by gender) by country and let us denote it as:



$$\mathbf{w} = \begin{bmatrix} \mathbf{w}^1 \\ \mathbf{w}^2 \\ \mathbf{w}^3 \\ \mathbf{w}^4 \end{bmatrix} = \begin{bmatrix} \mathbf{w}_f^1 \\ \mathbf{w}_f^2 \\ \mathbf{w}_f^3 \\ \mathbf{w}_f^4 \end{bmatrix} + \begin{bmatrix} \mathbf{w}_m^1 \\ \mathbf{w}_m^2 \\ \mathbf{w}_m^3 \\ \mathbf{w}_m^4 \end{bmatrix},$$

where $\mathbf{w} = \mathbf{w}_f + \mathbf{w}_m$, is the decomposition of female (\mathbf{w}_f) and male (\mathbf{w}_m) employment.

The relation between \mathbf{x} , \mathbf{Z} and \mathbf{f} is defined by the accounting equation $\mathbf{x} = \mathbf{Z}\mathbf{i} + \mathbf{f}$, where \mathbf{i} is the column summation vector consisting of ones.

Suppose that countries 1 and 2 represent the EU and the remaining countries (3 and 4) are non-EU countries. In such a case we can define the components of the MRIO framework of the EU as:

$$\mathbf{Z}^{\text{EU}} = \begin{bmatrix} \mathbf{Z}^{11} & \mathbf{Z}^{12} \\ \mathbf{Z}^{21} & \mathbf{Z}^{22} \end{bmatrix}, \quad \mathbf{f}^{\text{EU}} = \begin{bmatrix} \mathbf{f}^{11} + \mathbf{f}^{12} + \mathbf{e}^{13} + \mathbf{e}^{14} \\ \mathbf{f}^{21} + \mathbf{f}^{22} + \mathbf{e}^{23} + \mathbf{e}^{24} \end{bmatrix}, \quad \mathbf{x}^{\text{EU}} = \begin{bmatrix} \mathbf{x}^1 \\ \mathbf{x}^2 \end{bmatrix}, \quad \mathbf{w}^{\text{EU}} = \begin{bmatrix} \mathbf{w}^1 \\ \mathbf{w}^2 \end{bmatrix}$$

where $\mathbf{e}^{ij} = \mathbf{f}^{ij} + \mathbf{Z}^{ij}\mathbf{i}$ represents the extra-EU exports from the Member State i to the non-EU country j (with $i \neq j$).

The input coefficient matrix for the EU is defined as $\mathbf{A}^{\text{EU}} = \mathbf{Z}^{\text{EU}} (\hat{\mathbf{x}}^{\text{EU}})^{-1}$, where $(\hat{\mathbf{x}}^{\text{EU}})$ is a diagonal matrix with industry outputs placed along the main diagonal and zero elsewhere. Thus, the accounting equation can now be written as the standard input-output model: $\mathbf{x}^{\text{EU}} = \mathbf{A}^{\text{EU}} \mathbf{x}^{\text{EU}} + \mathbf{f}^{\text{EU}}$. For a certain final demand vector \mathbf{f}^{EU} , the solution to the model is given by $\mathbf{x}^{\text{EU}} = \mathbf{L}^{\text{EU}} \mathbf{f}^{\text{EU}}$, where $\mathbf{L}^{\text{EU}} \equiv (\mathbf{I} - \mathbf{A}^{\text{EU}})^{-1}$ is the Leontief inverse of the EU. Thus, multiplying the Leontief inverse of the EU by the extra-EU exports we obtain the total output in the EU to produce exported goods and services:

$$\mathbf{x}_{\text{exeu}}^{\text{EU}} = \mathbf{L}^{\text{EU}} \mathbf{e}^{\text{EU}} \tag{1}$$

The employment coefficients vector, $\mathbf{v}^{\text{EU}} = (\hat{\mathbf{x}}^{\text{EU}})^{-1} \mathbf{w}^{\text{EU}}$, yields the EU employment per unit of output. These coefficients can be further split into female and male components, as follows:

$$\mathbf{v}^{\text{EU}} = (\hat{\mathbf{x}}^{\text{EU}})^{-1} (\mathbf{w}_f^{\text{EU}} + \mathbf{w}_m^{\text{EU}}) = (\hat{\mathbf{x}}^{\text{EU}})^{-1} \mathbf{w}_f^{\text{EU}} + (\hat{\mathbf{x}}^{\text{EU}})^{-1} \mathbf{w}_m^{\text{EU}} = \mathbf{v}_f^{\text{EU}} + \mathbf{v}_m^{\text{EU}}$$



Hence, the EU employment supported by the production of extra-EU exports (i.e. EU employment embodied in extra-EU exports) is given by:

$$\begin{aligned}
 \mathbf{w}_{\text{exeu}}^{\text{EU}} &= (\mathbf{v}_f^{\text{EU}}) \mathbf{L}^{\text{EU}} \mathbf{e}^{\text{EU}} + (\mathbf{v}_m^{\text{EU}}) \mathbf{L}^{\text{EU}} \mathbf{e}^{\text{EU}} = \\
 &(\mathbf{v}_f^1) \mathbf{L}^{11} \mathbf{e}^{13} + (\mathbf{v}_f^1) \mathbf{L}^{11} \mathbf{e}^{14} + (\mathbf{v}_f^1) \mathbf{L}^{12} \mathbf{e}^{23} + (\mathbf{v}_f^1) \mathbf{L}^{12} \mathbf{e}^{24} + (\mathbf{v}_f^2) \mathbf{L}^{21} \mathbf{e}^{13} + (\mathbf{v}_f^2) \mathbf{L}^{21} \mathbf{e}^{14} + \\
 &+ (\mathbf{v}_f^2) \mathbf{L}^{22} \mathbf{e}^{23} + (\mathbf{v}_f^2) \mathbf{L}^{22} \mathbf{e}^{24} + (\mathbf{v}_m^1) \mathbf{L}^{11} \mathbf{e}^{13} + (\mathbf{v}_m^1) \mathbf{L}^{11} \mathbf{e}^{14} + (\mathbf{v}_m^1) \mathbf{L}^{12} \mathbf{e}^{23} + (\mathbf{v}_m^1) \mathbf{L}^{12} \mathbf{e}^{24} + \\
 &+ (\mathbf{v}_m^2) \mathbf{L}^{21} \mathbf{e}^{13} + (\mathbf{v}_m^2) \mathbf{L}^{21} \mathbf{e}^{14} + (\mathbf{v}_m^2) \mathbf{L}^{22} \mathbf{e}^{23} + (\mathbf{v}_m^2) \mathbf{L}^{22} \mathbf{e}^{24}
 \end{aligned} \tag{2}$$

where $(\mathbf{v}_g^i) \mathbf{L}^{ij} \mathbf{e}^{jk}$ is the EU country i 's employment of gender type g (female/male) supported by the extra-EU exports of an EU Member State j to a non-EU country k .

From expression [1], it can also be derived foreign (female/male) employment embodied in extra-EU exports but these were not reported in this note. For further details on this part of the methodology, see Rueda-Cantuche and Sousa (2016) and Arto et al. (2015, 2018).

Overview of Shift-share analysis

Following up the traditional form of shift-share analysis (Creamer, 1943; Dunn, 1960), this type of analysis decomposes the national industry change in the export-supported female employment participation (in %) between 2008 and 2014, into two components: EU industry effect and national industry effect.

The EU industry effect represents the portion of the change attributed to the performance of the specific industry in the EU as a whole. The national industry effect portrays the portion of the change attributed to the corresponding national specific industry. These are called shift-share effects.

Hence, the national change of the country c and industry i 's female participation ($\mathbf{h}_{c,i}$) in the export-supported employment between 2008 and 2014 can be expressed as:

$$\mathbf{h}_{c,i}^{2014} - \mathbf{h}_{c,i}^{2008} = EU_{c,i} + NAT_{c,i} \tag{3}$$

where the starting and ending values of the female participation (measured in percentages) within a particular industry are $\mathbf{h}_{c,i}^{2014}$ and $\mathbf{h}_{c,i}^{2008}$. Each of the two effects is then defined as a percentage of the starting value, as follows:



$$g_{c,i} = \left(\frac{h_{c,i}^{2014}}{h_{c,i}^{2008}} - 1 \right) = \frac{(h_{c,i}^{2014} - h_{c,i}^{2008})}{h_{c,i}^{2008}}$$

$$G_i = \frac{\sum_c h_{c,i}^{2014}}{\sum_c h_{c,i}^{2008}} - 1$$

being them the variation rate of country c 's industry i and the variation rate of industry i across the EU, respectively. Then, it can be easily proved that [3] holds using the following two definitions for the shift-share effects:

$$EU_{c,i} = h_{c,i}^{2008} G_i$$

$$NAT_{c,i} = h_{c,i}^{2008} (g_i - G_i)$$

That is,

$$h_{c,i}^{2008} G_i + h_{c,i}^{2008} (g_i - G_i) = h_{c,i}^{2008} G_i + h_{c,i}^{2008} g_i - h_{c,i}^{2008} G_i = h_{c,i}^{2008} g_i =$$

$$= h_{c,i}^{2008} \frac{(h_{c,i}^{2014} - h_{c,i}^{2008})}{h_{c,i}^{2008}} = h_{c,i}^{2014} - h_{c,i}^{2008}$$

Eventually, the computation of the shift-share effects by country can be made by summing the female participation changes (measured in percentages) across industries.



ANNEX 2: WOMEN SHARE IN TOTAL EMPLOYMENT AND IN EXPORTS-SUPPORTED EMPLOYMENT PER SECTOR

	Females in total employment			Females in exports-supported employment		
	2008	2014	2008-2014	2008	2014	2008-2014
Crop and animal production, hunting and	39%	35%	-3,8 p.p.	37%	34%	-2,4 p.p.
Forestry and logging	35%	31%	-3,1 p.p.	34%	31%	-3,5 p.p.
Fishing and aquaculture	33%	29%	-4,1 p.p.	31%	26%	-4,7 p.p.
Mining and quarrying	14%	10%	-4,4 p.p.	15%	11%	-4,5 p.p.
Manufacture of food products, beverage	31%	30%	-1,4 p.p.	30%	29%	-0,8 p.p.
Manufacture of textiles, wearing appare	35%	33%	-1,5 p.p.	32%	31%	-1 p.p.
Manufacture of wood and of products of	32%	31%	-1 p.p.	33%	32%	-1 p.p.
Manufacture of paper and paper produc	29%	29%	-0,8 p.p.	29%	29%	-0,5 p.p.
Printing and reproduction of recorded m	29%	28%	-0,5 p.p.	28%	28%	-0,1 p.p.
Manufacture of coke and refined petrole	33%	30%	-3,4 p.p.	34%	30%	-4,2 p.p.
Manufacture of chemicals and chemical	29%	28%	-0,6 p.p.	29%	28%	-0,5 p.p.
Manufacture of basic pharmaceutical pr	29%	29%	-0,4 p.p.	28%	28%	-0,2 p.p.
Manufacture of rubber and plastic produ	30%	29%	-0,6 p.p.	30%	29%	-0,4 p.p.
Manufacture of other non-metallic mine	31%	30%	-1 p.p.	30%	29%	-1 p.p.
Manufacture of basic metals	30%	29%	-1,2 p.p.	30%	29%	-1,4 p.p.
Manufacture of fabricated metal produc	30%	29%	-0,6 p.p.	29%	29%	-0,4 p.p.
Manufacture of computer, electronic and	30%	29%	-1,1 p.p.	29%	29%	-0,4 p.p.
Manufacture of electrical equipment	30%	30%	-0,9 p.p.	30%	29%	-0,9 p.p.
Manufacture of machinery and equipme	29%	28%	-1,1 p.p.	29%	28%	-0,6 p.p.
Manufacture of motor vehicles, trailers &	30%	30%	-0,2 p.p.	29%	29%	-0,3 p.p.
Manufacture of other transport equipme	30%	29%	-1,2 p.p.	29%	28%	-1,1 p.p.
Manufacture of furniture; other manufac	30%	30%	-0,6 p.p.	29%	29%	-0,2 p.p.
Repair and installation of machinery and	30%	29%	-0,2 p.p.	29%	29%	-0,1 p.p.
Electricity, gas, steam and air condition	22%	23%	+1,2 p.p.	22%	23%	+0,8 p.p.
Water collection, treatment and supply	21%	20%	-0,5 p.p.	21%	20%	-0,3 p.p.
Sewerage; waste collection, treatment a	20%	19%	-1 p.p.	20%	18%	-1,2 p.p.
Construction	9%	10%	+0,7 p.p.	9%	9%	-0,1 p.p.
Wholesale and retail trade and repair of	49%	49%	0 p.p.	50%	50%	+0,2 p.p.
Wholesale trade, except of motor vehicle	49%	49%	-0,6 p.p.	50%	49%	-0,7 p.p.
Retail trade, except of motor vehicles an	49%	49%	-0,4 p.p.	49%	50%	+1,1 p.p.
Land transport and transport via pipeline	22%	22%	-0,4 p.p.	23%	22%	-0,5 p.p.
Water transport	22%	21%	-0,5 p.p.	22%	22%	-0,2 p.p.
Air transport	23%	22%	-0,5 p.p.	23%	22%	-0,7 p.p.
Warehousing and support activities for t	23%	22%	-0,4 p.p.	23%	23%	-0,6 p.p.
Postal and courier activities	23%	23%	-0,5 p.p.	23%	23%	-0,5 p.p.
Accommodation and food service activit	55%	54%	-1,4 p.p.	57%	54%	-2,3 p.p.
Publishing activities	33%	31%	-1,9 p.p.	33%	31%	-2,3 p.p.
Motion picture, video and television prog	33%	31%	-2,1 p.p.	33%	31%	-2,1 p.p.
Telecommunications	33%	31%	-2,1 p.p.	33%	31%	-2,1 p.p.
Computer programming, consultancy and	32%	31%	-1,8 p.p.	33%	31%	-1,8 p.p.
Financial service activities, except insura	52%	52%	-0,2 p.p.	51%	50%	-0,8 p.p.
Insurance, reinsurance and pension fund	53%	53%	-0,2 p.p.	52%	51%	-0,8 p.p.
Activities auxiliary to financial services &	51%	49%	-1,2 p.p.	50%	47%	-2,9 p.p.
Real estate activities	49%	49%	-0,4 p.p.	49%	47%	-1,3 p.p.
Legal and accounting activities; activitie	46%	46%	-0,2 p.p.	46%	46%	-0,1 p.p.
Architectural and engineering activities;	47%	46%	-0,5 p.p.	46%	46%	-0,1 p.p.
Scientific research and development	48%	46%	-1,6 p.p.	47%	46%	-0,9 p.p.
Advertising and market research	47%	46%	-0,9 p.p.	47%	46%	-0,9 p.p.
Other professional, scientific and technic	46%	46%	-0,5 p.p.	46%	45%	-0,7 p.p.
Administrative and support service activ	49%	48%	-0,7 p.p.	49%	48%	-0,8 p.p.
Public administration and defence; comp	45%	46%	+0,9 p.p.	47%	47%	+0,5 p.p.
Education	71%	72%	+0,9 p.p.	70%	71%	+1,1 p.p.
Human health and social work activities	78%	78%	0 p.p.	80%	79%	-1,1 p.p.
Other service activities	48%	58%	+9,9 p.p.	49%	58%	+9 p.p.
Activities of households as employers; u	73%	89%	+15,7 p.p.	69%	97%	+28 p.p.
Total	45%	46%	+1 p.p.	38%	38%	0 p.p.

Source: Own calculations