



## ARE EU EXPORTS GENDER-BLIND? SOME KEY FEATURES OF WOMEN PARTICIPATION IN EXPORTING ACTIVITIES IN THE EU<sup>1</sup>

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### ABSTRACT

*This analysis sheds new light on the gender-balance of the employment opportunities supported by extra-EU exports. This is done using a Multi-Regional Input-Output (MRIO) model with the information provided by the WIOD-World Input-Output Database (Timmer et al., 2015) and the EXIOBASE-3 database (Stadler et al., 2017). On that basis we show that in 2011 almost 12 million women in the EU had jobs thanks to the exports of goods and services to the rest of the world. However the data also reveals that a gender gap to the disadvantage of women persisted as these jobs represented only 38% of the total employment in the EU supported by exports to the rest of the world. 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.*

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



### INTRODUCTION

In the past years the European Commission's communication about the benefits of an open trade policy focused on the assertion that exporting activities offer many employment opportunities for EU citizens. A key finding that has been often conveyed is that in 2011 the employment supported by the EU exports of goods and services to the rest of the world totalled 31.2 million jobs across the EU, having grown by 67% since 1995 and outpacing the growth of overall employment in Europe. As a result, by 2011, the jobs supported by EU exports represented as much as 14% of total employment in Europe, up from 9% in 1995<sup>2</sup>.

Against this background and in the spirit of the "Trade for all: Towards a more responsible trade and investment policy"<sup>3</sup> communication of October 2015, which establishes as a main aim of trade policy ensuring that the benefits of openness are shared by all, this note sets out to investigate how gender-balanced the job opportunities supported by exports are throughout the EU. The picture that emerges is mixed and goes in favour of the idea that policy intervention might be required to achieve a more gender equitable outcome. For that policymakers must target the factors that hamper women from benefiting fully from the jobs opportunity offered by exports. More in-depth investigations would be needed but the preliminary insights from this analysis points to the conclusion that also policy areas other than trade should be given priority for efficient policy intervention in this regard.

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

*In 2011 1 in every 9 jobs held by women in the EU depended on EU exports to the rest of the world (11.8 million jobs).*

In 2011 the jobs of 11.8 million women in the EU depended on exports to the rest of the world. The exports of goods from primary and manufacturing sectors made the greatest contribution by supporting around 7.1 million jobs, which included 3.6 million in upstream services inputs suppliers (mode 5 services exports). The direct exports from the services sectors supported around 4.7 million

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<sup>2</sup> For additional information and data see: Arto I., J.M. Rueda-Cantucho, A. F. Amores, E. Dietzenbacher, N. Sousa, L. Montinari and A. Markandya (2015), "EU Exports to the World: Effects on Employment and Income", Luxembourg, Publications Office of the European Union. The report is available at: <http://ec.europa.eu/trade/policy/in-focus/trade-and-jobs/> and at: <https://ec.europa.eu/jrc/en/research-topic/economic-environmental-and-social-effects-of-globalisation>.

<sup>3</sup> [http://trade.ec.europa.eu/doclib/docs/2015/october/tradoc\\_153846.pdf](http://trade.ec.europa.eu/doclib/docs/2015/october/tradoc_153846.pdf).



female jobs. In total, exports-dependent employment represented around 1 in every 9 jobs (11%) held by women in the EU. This illustrates how important exporting activities are as a source of employment prospects of women across the EU.

**Box 1: Short overview of the methodology**

*A Multi-Regional Input-Output (MRIO) analysis allows the identification of all industries input requirements and all the 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 it can offer a complete and fully consistent picture by allowing for example the identification of all the jobs supported in Germany by the exports of cars to Japan including not only the jobs that are directly supported in Germany (including those in upstream industries) but also those that are supported by the production of inputs (say steel) in Germany to be used in downstream activities in other Member States (say a Czech producer of car parts), which will ultimately supply the car exporters in Germany<sup>4</sup>.*

*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. (2015) for a full description) has allowed new work on this area like Arto et al. (2015) that provide 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 the Annex. What is new is the combination of the MRIO analysis with data on employment by gender. Although there is earlier work on the link between trade and gender grounded on 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 EXIOBASE-3 database, which has been compiled on the basis of Eurostat, ILO and OECD data sources, as described in Stadler et al. (2017). More specifically the gender breakdown of the WIOD employment*

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



*data is grounded on the use of country- and industry-specific male and female shares from EXIOBASE-3.<sup>5</sup>*

*In 2011 only 38% of the jobs supported by exports were taken up by women. This contrast with the ratio of females to males in total EU employment that was much closer to parity (46.2%).*

However, the figures in Table 1 reveal a clear gender gap: in 2011 only 37.9% of the EU jobs that were supported by exports to the rest of the world were taken up by women. This share was even lower (35%) in 1995. Moreover, in 2011 the under-representation of women in exports-supported employment was more pronounced than in total employment, as the share of females in total employment (46.2%) was closer to gender parity<sup>6</sup>. Importantly, between 1995 and 2011, more progress was achieved in closing the gender gap in total EU employment (with the female share increasing by 3.4 percentage points) than in exports-supported employment (where the share of women went up by only 2.9 percentage points). These figures suggest that not only is there still some way to go to achieve absolute parity between men and women in overall EU employment but there is an even bigger gender gap when it comes to exports-supported job opportunities.

Another striking fact is that the gender gap in terms of opportunities to benefit from exports-supported employment was visible across the whole of the EU, albeit in different degrees. It was narrowest in Lithuania and Latvia, where in 2011 the shares of females in exports-supported employment were 48% and 47%, respectively. In contrast,

*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.*

the corresponding shares in Malta and Greece were as low as 32% and 33%, respectively. Between 1995 and 2011 the Member States that increased the most the female share in the employment driven by the EU exports to the rest of the world were

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<sup>5</sup> The difference between the total EU employment in the two databases was less than 5%.

<sup>6</sup> Total employment includes all the jobs in the economy, i.e. those that are supported by foreign demand (exports) and those supported by domestic demand.



Spain (+12.1 percentage points), Belgium (+8.3 percentage points), Ireland (+7.2 percentage points) and the Netherlands (+6 percentage points). Conversely, in the Czech Republic, Slovenia and Estonia this share declined over the same period.

**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		
	1995	2011	1995-2011	1995	2011	1995-2011
Austria	44.3%	48.0%	+3.7 p.p.	35.9%	39.7%	+3.8 p.p.
Belgium	41.2%	48.0%	+6.8 p.p.	31.9%	40.2%	+8.3 p.p.
Bulgaria	47.5%	46.7%	-0.8 p.p.	40.7%	42.7%	+2.0 p.p.
Cyprus	41.0%	45.7%	+4.7 p.p.	37.9%	40.4%	+5.2 p.p.
Czech Rep.	43.7%	43.4%	-0.3 p.p.	41.8%	39.0%	-2.7 p.p.
Germany	43.8%	47.9%	+4.2 p.p.	33.9%	36.7%	+2.8 p.p.
Denmark	44.8%	47.4%	+2.6 p.p.	32.1%	34.5%	+2.4 p.p.
Spain	32.8%	45.3%	+12.5 p.p.	25.6%	37.6%	+12.1 p.p.
Estonia	48.2%	50.2%	+2.0 p.p.	40.6%	38.9%	-1.7 p.p.
Finland	47.5%	47.6%	+0.1 p.p.	34.6%	35.5%	+0.9 p.p.
France	44.5%	48.3%	+3.7 p.p.	36.1%	38.9%	+2.8 p.p.
Great Britain	43.6%	45.2%	+1.6 p.p.	33.0%	34.6%	+1.6 p.p.
Greece	35.9%	38.2%	+2.3 p.p.	29.4%	32.8%	+3.4 p.p.
Hungary	44.3%	45.8%	+1.5 p.p.	38.9%	42.4%	+3.5 p.p.
Ireland	38.3%	43.6%	+5.4 p.p.	34.6%	41.7%	+7.2 p.p.
Italy	37.4%	43.3%	+5.9 p.p.	32.1%	34.7%	+2.6 p.p.
Lithuania	49.2%	53.8%	+4.6 p.p.	46.5%	47.9%	+1.4 p.p.
Luxembourg	38.6%	40.0%	+1.4 p.p.	34.5%	35.8%	+1.3 p.p.
Latvia	49.3%	53.6%	+4.3 p.p.	42.2%	46.5%	+4.3 p.p.
Malta	29.1%	33.0%	+3.8 p.p.	29.7%	32.3%	+2.6 p.p.
The Netherlands	41.4%	48.0%	+6.5 p.p.	32.2%	38.2%	+6.0 p.p.
Poland	47.1%	47.1%	-0.1 p.p.	39.5%	39.2%	-0.4 p.p.
Portugal	44.7%	46.7%	+2.1 p.p.	41.3%	40.7%	-0.5 p.p.
Romania	46.6%	44.7%	-1.9 p.p.	38.7%	44.4%	+5.7 p.p.
Slovakia	46.5%	46.2%	-0.3 p.p.	38.3%	41.4%	+3.1 p.p.
Slovenia	45.6%	45.3%	-0.4 p.p.	39.7%	37.7%	-2.0 p.p.
Sweden	48.8%	48.9%	+0.1 p.p.	38.2%	39.6%	+1.4 p.p.
<b>EU</b>	<b>42.8%</b>	<b>46.2%</b>	<b>+3.4 p.p.</b>	<b>35.0%</b>	<b>37.9%</b>	<b>+2.9 p.p.</b>

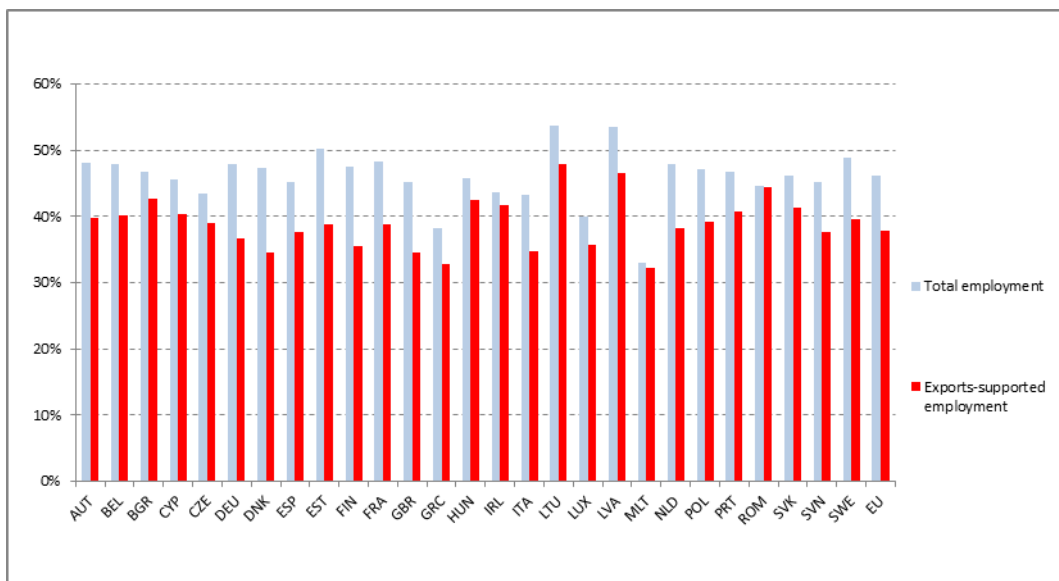
Source: Own calculations

Moreover, the comparison of the gender gaps in total employment and in exports-supported employment across Member States offers a very heterogeneous picture, as shown in Figure 1. While in 2011 in some Member State's full gender parity (50/50) in total employment was within reach (Lithuania and Latvia were even above the 50%



mark) in terms of the job opportunities created by exports, women continued to trail in all countries. Moreover, the gap between the opportunities for women in the job market in general and in the exports-supported employment was widest in western European Member States (e.g. Denmark, Finland, Germany, United Kingdom, the Netherlands, France, Sweden and Italy).

**Figure 1: Female to male ratio in total employment and in exports-supported employment in 2011, in %**



Source: Own calculations; Austria (AUT), Belgium (BEL), Bulgaria (BGR), Cyprus (CYP), Czech Republic (CZE), Germany (DEU), Denmark (DNK), Spain (ESP), Estonia (EST), Finland (FIN), France (FRA), Great Britain (GBR), Greece (GRC), Hungary (HUN), Ireland (IRL), Italy (ITA), Lithuania (LTU), Luxembourg (LUX), Latvia (LVA), Malta (MLT), Netherlands (NLD), Poland (POL), Portugal (PRT), Romania (ROM), Slovakia (SVK), Slovenia (SVN), Sweden (SWE).

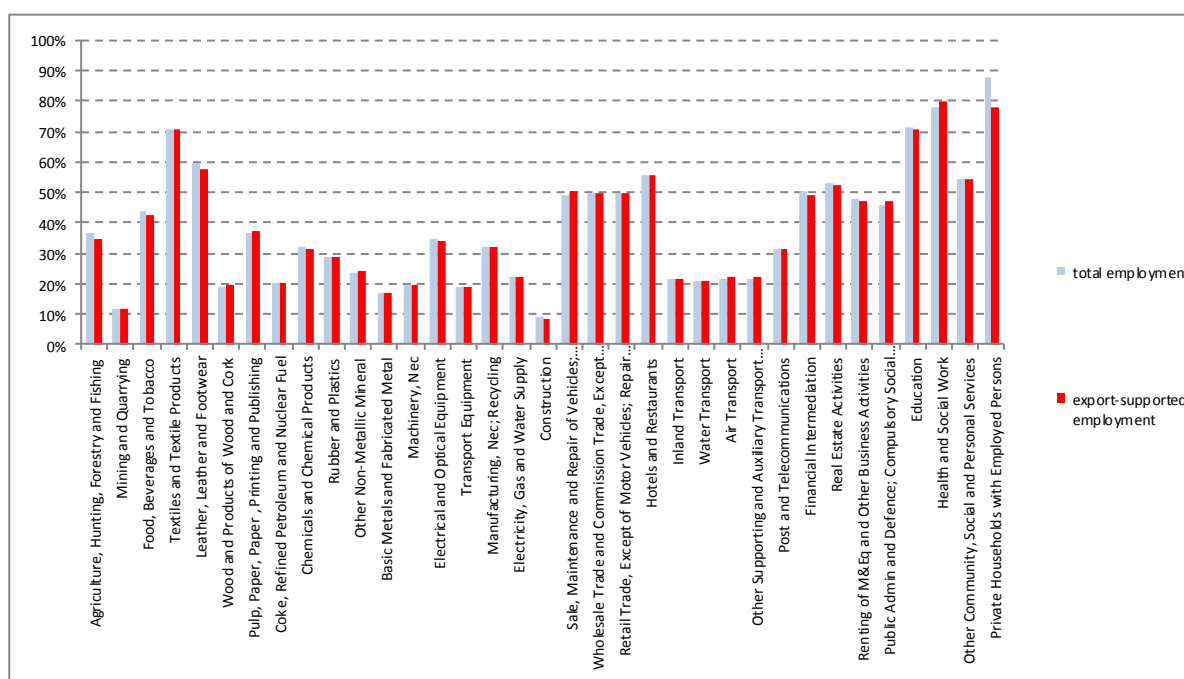
## 2. THE ROLE OF SECTORIAL OPENNESS: A KEY FACTOR EXPLAINING THE GENDER GAP IN THE TRADE-JOBS NEXUS

The data presented in Figure 2 shows very large differences in terms of the share of females in employment across sectors. This suggests that the gap between women and men in exports-supported aggregate employment may be driven by sector-specific factors that determine the level of female participation in the workforce. In 2011, the female employment was below 20% of total employment and exports-supported employment in sectors like “construction”, “mining and quarrying”, “basic metal and fabricated metals”, “transport equipment”, “other machinery” and “wood, wood



products and cork". In contrast, it was above 70% in sectors like "education", "textile and textile products", "personal employed by private households" and "health and social work".

**Figure 2: Women share in total employment and in exports-supported employment per sector in 2011**



Source: Own calculations

In addition, Figure 3 reveals that the participation of women in exports-supported employment was fairly stable between 1995 and 2011 across all sectors despite the accelerated process of technological change associated with digitalisation. This suggests that changes in the nature of the work itself due for example to skill upgrading and the increased IT-intensity do not seem to have increased the opportunities of participation of women in exports-supported employment within each sector.

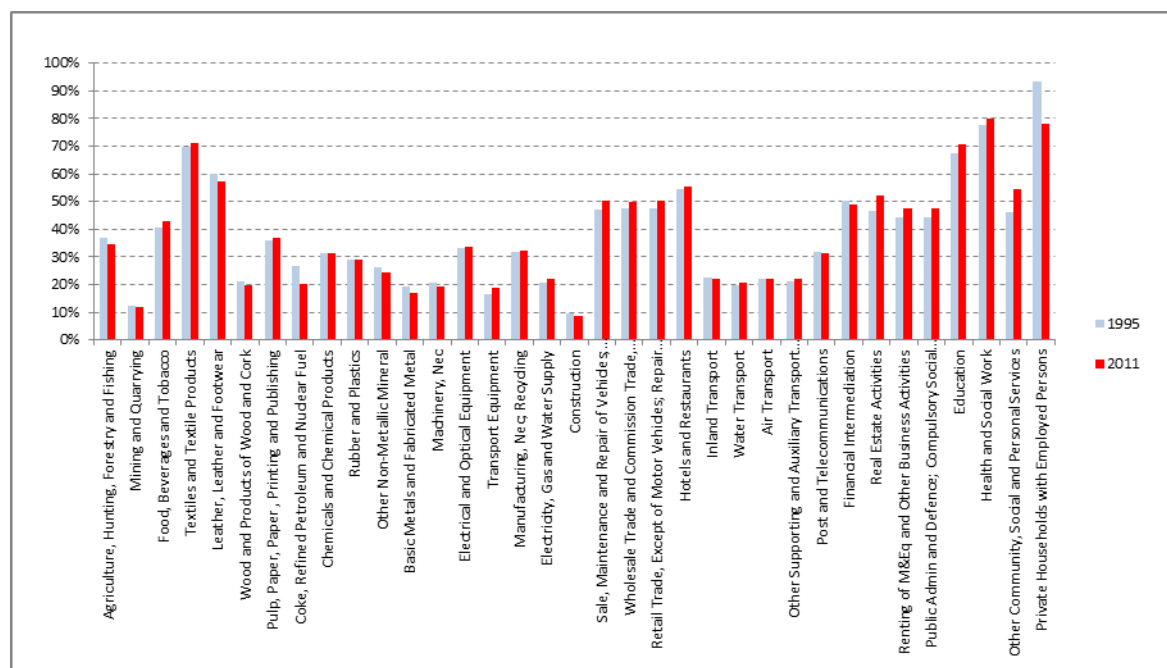
*The gender gap in tapping into employment opportunities offered by exports is largely due to the concentration of female employment in the less export-oriented sectors, notably in services.*

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 openness of the sectors that concentrate the most female employment.





**Figure 3: Evolution of women share of exports-supported employment across sectors 1995-2011**



Source: Own calculations

In fact, as shown in Figure 4 it is striking to see the negative correlation between export-orientation and female participation in the workforce at the sector level: in other words women tend to be more present in the labour force in the less export-oriented sectors, notably in services sectors. The share of female employment is especially high in the so-called non-tradable services sectors<sup>7</sup> like "public administration", "education", "health and social work", "other community, social and personal services" and "private households with employed persons". Moreover, together these five sectors made up around 42% of the total female employment in the EU in 2011 (up from 38% in 1995). In contrast, in "water transport" and "air transport", the two most export-dependent services sectors with exports to output ratios of 77% and 32% respectively, the women share in employment is considerably lower at around 20%.

However, it is also important to account for the fact that services are also exported indirectly, as part of manufactured products. This also offers opportunities for women

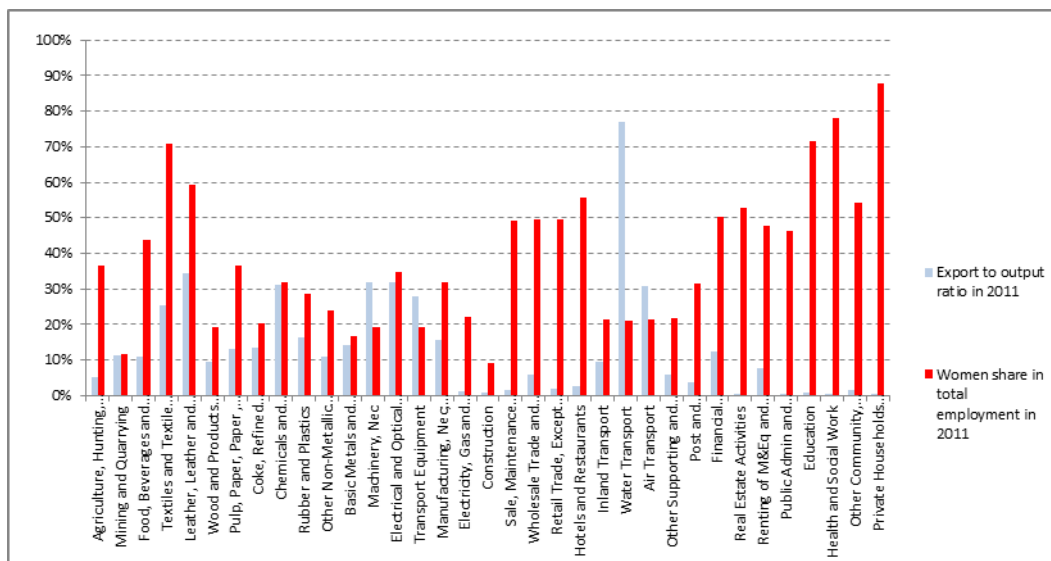
<sup>7</sup> Non-tradable at least from the standpoint of "mode 1" services that are captured by the trade data used in this analysis.





to benefit from export-related jobs. In fact the data show that in 2011 the female share of the employment supported by the exports of "embedded services" (mode 5 services) reached 46%, which is equal to the women share in total employment.

**Figure 4: Women share in sector employment vs sector openness (as measured by the ratio exports to output)**



Source: own calculations

The analysis above suggests that differences across sectors notably regarding the importance 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.

A shift-share analysis allows shedding additional light on this by splitting the evolution of the female share of exports-supported employment between 1995 and 2011 into three components: *i*) an "EU growth effect" picking up the part that was driven by total growth at EU level, *ii*) an "industry mix effect" picking up the part that was driven by the performance of the specific industries at the EU level and a *iii*) "national growth effect" picking up the part that was driven by the growth in the Member State and by the performance of specific industries at national level.

**Box 2: Shift-share analysis**

*Building on the traditional structure of shift-share analysis - see Creamer (1943) and Dunn (1960) – the change in the female share of exports-supported employment between 1995 and 2011 in each Member State is split into three components:*

*1. "EU growth effect", which picks up the part attributable to the total growth of the EU. It corresponds to the growth that would be observed if the female participation in exports-supported employment in the national economy had grown at the same rate as in the EU economy.*

*2. "Industry mix effect", which picks up the part attributable to the performance of specific industries. It corresponds to the growth that would be observed had the female participation in exports-supported employment in the national economy had increased by the same rate as that observed in EU-wide industries, minus the EU growth effect.*

*3. "National share effect", which picks up the part attributable to national drivers. It corresponds to the actual change in the national economy, discounting the two previous effects.*

*Full details on the methodology are provided in the Annex.*

The results in Table 2 show that industry mix effects played an important role in holding back growth of female exports-supported jobs in many Member States. This effect has been particularly strong in countries like Poland, Romania, and Bulgaria. On the contrary it had a clear positive impact in The Netherlands and Belgium. In addition, specific national drivers also played a considerable role: such effects promoted women's access to exports-supported employment opportunities in some Member States (notably in Romania, Spain, and Bulgaria) while they hampered those opportunities in others (notably, Luxembourg, the Czech Republic and The Netherlands).



**Table 2 - The components underlying the evolution of female share of export-supported employment between 1995 and 2011, percentage points**

	EU growth effect	Industry mix effect	National growth effect	TOTAL
Austria	2.90	2.40	-1.48	3.82
Belgium	2.58	7.76	-2.03	8.31
Bulgaria	3.29	-7.82	6.49	1.96
Cyprus	3.07	0.27	-0.85	2.49
Czech Rep.	3.38	0.41	-6.52	-2.73
Germany	2.74	0.70	-0.60	2.84
Denmark	2.60	-1.00	0.79	2.39
Spain	2.07	0.92	9.07	12.06
Estonia	3.28	-5.54	0.52	-1.74
Finland	2.80	-0.81	-1.10	0.89
France	2.92	2.04	-2.18	2.77
United Kingdom	2.67	3.24	-4.27	1.64
Greece	2.37	-2.58	3.60	3.40
Hungary	3.14	-1.20	1.59	3.53
Ireland	2.79	2.37	2.02	7.18
Italy	2.60	-1.76	1.80	2.64
Lithuania	3.76	-5.75	3.40	1.41
Luxembourg	2.79	5.56	-7.09	1.26
Latvia	3.41	-3.52	4.40	4.30
Malta	2.41	-0.02	0.18	2.57
The Netherlands	2.60	9.67	-6.29	5.98
Poland	3.20	-8.79	5.24	-0.35
Portugal	3.34	-5.47	1.59	-0.54
Romania	3.13	-8.13	10.66	5.67
Slovakia	3.10	-2.81	2.82	3.10
Slovenia	3.21	-6.04	0.81	-2.02
Sweden	3.09	1.01	-2.73	1.37

Source: Own calculations



### 3. WHAT KIND OF JOB OPPORTUNITIES DO EXPORTS OFFER WOMEN ACROSS THE EU?

*The available data show that exports-supported female employment in the EU is undergoing a process of skill upgrading. However, it also reveals that these jobs are less grounded on high skilled activities than other jobs held by females in the economy.*

Table 3 shows that in 2009<sup>8</sup> more than half (51.8%) of the jobs supported by exports that were taken up by women in the EU were medium-skilled. This represents a slight increase relative to 1995 (up 2 percentage points). Moreover this share is higher than in total female employment (at 47.1% in 2011). However, in the EU low skilled jobs also weighed more on female exports-supported

employment than on female total employment while the opposite was true for high skilled jobs.

Still it is interesting to note the evolution since 1995: while the share of high skilled jobs in exports-supported female employment increased by almost 10 percentage points (even faster than the increase of high skilled jobs in total female employment) the share of low skilled jobs shrank by almost the same extent. This suggests that exports-supported female employment in the EU underwent a process of skill upgrading.

What is also relevant to highlight is that the skill profile of female exports-supported employment in the EU shown clear similarities to that of male employment. However, as Table 4 shows, there are some differences that are worthwhile highlighting. First, while for women exports-supported employment tended to be slightly more biased in favour of low skilled jobs than total employment this was not the case for men. Second, the gap between the shares of high-skilled jobs in total employment and that of exports-supported employment was clearly wider for women than for men.

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<sup>8</sup> The WIOD database covers the period 1995-2011; however, the employment data by skill levels are limited to the period 1995-2009.



**Table 3: Distribution of female total employment and exports-supported employment by skill levels 1995-2009**

	Employment						Export-supported employment					
	High Skill		Medium Skill		Low Skill		High Skill		Medium Skill		Low Skill	
	1995	2009	1995	2009	1995	2009	1995	2009	1995	2009	1995	2009
AUT	13.6%	18.5%	62.5%	64.3%	23.9%	17.2%	6.0%	13.8%	67.0%	67.4%	27.0%	18.8%
BEL	15.4%	19.8%	51.3%	62.6%	33.3%	17.6%	13.9%	19.2%	48.4%	61.9%	37.8%	18.9%
BGR	13.8%	15.9%	14.5%	17.8%	71.7%	66.2%	4.5%	8.2%	12.7%	18.4%	82.8%	73.4%
CYP	26.9%	35.3%	32.5%	39.4%	40.5%	25.3%	20.4%	23.7%	40.4%	50.2%	39.2%	26.1%
CZE	13.0%	20.6%	75.7%	72.6%	11.3%	6.8%	9.8%	14.2%	77.6%	77.2%	12.6%	8.6%
DEU	21.3%	27.4%	61.0%	57.3%	17.8%	15.3%	15.1%	22.0%	61.8%	60.3%	23.1%	17.7%
DNK	23.5%	32.2%	56.0%	44.4%	20.6%	23.4%	12.8%	21.6%	58.4%	48.7%	28.8%	29.7%
ESP	25.5%	37.0%	16.2%	24.0%	58.2%	39.0%	16.6%	32.8%	16.7%	23.3%	66.7%	43.9%
EST	41.0%	47.1%	48.5%	44.2%	10.5%	8.8%	30.6%	37.5%	56.0%	51.2%	13.4%	11.3%
FIN	31.2%	39.8%	43.3%	45.7%	25.5%	14.5%	23.0%	34.6%	41.6%	45.9%	35.4%	19.5%
FRA	23.1%	33.2%	40.8%	43.9%	36.1%	22.8%	16.8%	30.4%	45.2%	46.2%	38.0%	23.5%
GBR	20.8%	33.2%	44.5%	48.8%	34.8%	18.0%	15.1%	27.6%	50.0%	53.0%	34.9%	19.4%
GRC	18.9%	28.5%	30.5%	42.0%	50.6%	29.5%	11.0%	20.5%	33.9%	47.7%	55.1%	31.7%
HUN	20.3%	28.8%	58.1%	57.9%	21.6%	13.3%	12.7%	18.9%	65.2%	67.4%	22.2%	13.6%
IRL	24.6%	44.3%	45.8%	40.0%	29.6%	15.7%	16.1%	39.4%	49.4%	44.4%	34.6%	16.2%
ITA	11.0%	19.9%	38.3%	48.7%	50.7%	31.4%	4.6%	12.6%	37.3%	50.3%	58.1%	37.1%
LTU	36.3%	43.9%	55.3%	50.6%	8.5%	5.5%	25.6%	31.0%	64.6%	62.6%	9.8%	6.4%
LUX	16.7%	32.2%	28.5%	43.4%	54.8%	24.4%	15.9%	32.5%	33.9%	45.2%	50.1%	22.3%
LVA	29.2%	37.5%	58.6%	53.2%	12.3%	9.3%	21.2%	29.6%	64.9%	59.2%	14.0%	11.2%
MLT	17.5%	20.3%	23.0%	32.9%	59.5%	46.8%	6.3%	13.9%	22.6%	38.5%	71.1%	47.7%
NLD	20.4%	29.4%	51.6%	47.6%	28.0%	23.0%	14.5%	25.3%	49.9%	47.0%	35.6%	27.7%
POL	15.7%	31.5%	67.1%	60.4%	17.2%	8.1%	8.4%	20.1%	72.7%	68.8%	19.0%	11.0%
PRT	8.5%	14.8%	12.5%	18.3%	79.0%	66.8%	4.4%	7.7%	11.4%	17.4%	84.1%	74.9%
ROM	9.6%	13.9%	12.2%	15.3%	78.1%	70.8%	4.7%	8.8%	14.6%	19.2%	80.7%	72.0%
SVK	17.8%	24.2%	71.2%	71.4%	10.9%	4.4%	11.1%	16.9%	77.0%	78.8%	12.0%	4.2%
SVN	16.6%	29.4%	59.4%	55.3%	24.1%	15.4%	10.2%	20.5%	61.7%	59.5%	28.1%	20.1%
SWE	18.9%	33.7%	54.3%	46.3%	26.8%	20.0%	9.7%	23.8%	53.2%	53.5%	37.0%	22.8%
<b>EU</b>	<b>19.0%</b>	<b>28.5%</b>	<b>46.6%</b>	<b>47.1%</b>	<b>34.4%</b>	<b>24.4%</b>	<b>12.6%</b>	<b>22.0%</b>	<b>49.8%</b>	<b>51.8%</b>	<b>37.7%</b>	<b>26.2%</b>

Source: Own calculations; Austria (AUT), Belgium (BEL), Bulgaria (BGR), Cyprus (CYP), Czech Republic (CZE), Germany (DEU), Denmark (DNK), Spain (ESP), Estonia (EST), Finland (FIN), France (FRA), Great Britain (GBR), Greece (GRC), Hungary (HUN), Ireland (IRL), Italy (ITA), Lithuania (LTU), Luxembourg (LUX), Latvia (LVA), Malta (MLT), Netherlands (NLD), Poland (POL), Portugal (PRT), Romania (ROM), Slovakia (SVK), Slovenia (SVN), Sweden (SWE).



The latter point suggests that for women exports-supported jobs were less grounded on high skilled activities than other jobs in the economy. This means that for many highly educated women in the EU more employment opportunities could be found in non-exporting related activities.

**Table 4 - Skill distribution in male and female total employment and total exports-supported employment, 1995 and 2009, in %**

	Employment						Export-supported employment					
	High Skill		Medium Skill		Low Skill		High Skill		Medium Skill		Low Skill	
	1995	2009	1995	2009	1995	2009	1995	2009	1995	2009	1995	2009
<b>Male</b>	17.6	26.5	45.0	46.5	37.4	27.0	15.5	24.9	47.0	50.2	37.5	24.9
<b>Female</b>	19.0	28.5	46.6	47.1	34.4	24.4	12.6	22.0	49.8	51.8	37.7	26.2

Source: Own calculations

Table 5 confirms this conclusion by showing that in 2009 the share of women was substantially higher in total high skilled employment in the EU (at 48.9% it is close to a gender parity situation) than in total high-skilled exports-supported employment (36.1%). This begs the question of whether there is a case for policy intervention in this regard.

**Table 5 - Female share in total employment and in total exports-supported employment per skill category, 1995 and 2009, in %**

	Employment						Export-supported employment					
	High Skill		Medium Skill		Low Skill		High Skill		Medium Skill		Low Skill	
	1995	2009	1995	2009	1995	2009	1995	2009	1995	2009	1995	2009
<b>EU</b>	45.7	48.9	44.7	47.4	41.7	44.5	31.7	36.1	37.9	39.7	36.6	40.1

Source: Own calculations

#### 4. CONCLUSION

This analysis reveals that while exports provide important employment opportunities for women across the EU (almost 12 million jobs in 2011) a gender gap to the disadvantage of women persists. In 2011 only 38% of the jobs supported by exports to the rest of the world were taken up by women: not only was this far from gender parity but it was also below the share of women in total employment (46% in 2011). In addition there is also



evidence that women do not yet have full equal access to the best jobs opportunities that exports offer as their share of highly skilled jobs remained below that of men.

The reasons underlying this gender bias could be multiple and the analysis in the note does not go beyond a first insight. The unequal distribution of male and female employment across sectors and the higher concentration of women jobs in the sectors less dependent on exports point to some clues that would deserve further scrutiny. It suggests that there is scope for policy intervention to promote greater gender equity in the distribution of the employment opportunities offered by exports also in areas other than trade policy. A priori the design of education and vocational training policies could be among the priorities for further scrutiny in this regard.



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**ANNEX: 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) and the EXIOBASE-3 database (Stadler et al., 2017). 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), 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  $\mathbf{f}^{\text{EU}}$ , 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  $k$ . In a similar vein, we have also split high, medium and low skilled embodied employment calculated as in Arto et al. (2015) by gender type.

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).

### 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 change in the export-supported female employment participation (in %) between 1995 and 2011, into three components: EU growth effect; industry mix effect; and national share effect.

The EU growth effect represents the portion of the change attributed to the total growth of the European Union while the industry mix effect, the portion attributed to the performance of the specific industry in the EU, excluding the EU growth effect. The national share effect eventually portrays the portion of the change attributed to national influences, discounting the two previous effects. 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 1995 and 2011 can be expressed as:

$$\mathbf{h}_{c,i}^{2011} - \mathbf{h}_{c,i}^{1995} = EU_{c,i} + IND_{c,i} + NAT_{c,i}, \tag{3}$$



where the starting and ending values of the female participation (measured in percentages) within a particular industry are  $\mathbf{h}_{c,i}^{1995}$  and  $\mathbf{h}_{c,i}^{2011}$ . Each of the three effects is then defined as a percentage of the starting value, as follows:

$$g_{c,i} = \left( \frac{\mathbf{h}_{c,i}^{2011}}{\mathbf{h}_{c,i}^{1995}} - 1 \right) = \frac{(\mathbf{h}_{c,i}^{2011} - \mathbf{h}_{c,i}^{1995})}{\mathbf{h}_{c,i}^{1995}}$$

$$G_i = \frac{\sum_c \mathbf{h}_{c,i}^{2011}}{\sum_c \mathbf{h}_{c,i}^{1995}} - 1$$

$$G = \frac{\sum_c \sum_i \mathbf{h}_{c,i}^{2011}}{\sum_c \sum_i \mathbf{h}_{c,i}^{1995}} - 1$$

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

$$EU_{c,i} = \mathbf{h}_{c,i}^{1995} G$$

$$IND_{c,i} = \mathbf{h}_{c,i}^{1995} (G_i - G)$$

$$NAT_{c,i} = \mathbf{h}_{c,i}^{1995} (g_i - G_i)$$

That is,

$$\mathbf{h}_i^{1995} G + \mathbf{h}_i^{1995} (G_i - G) + \mathbf{h}_i^{1995} (g_i - G_i) = \mathbf{h}_i^{1995} G + \mathbf{h}_i^{1995} G_i - \mathbf{h}_i^{1995} G + \mathbf{h}_i^{1995} g_i - \mathbf{h}_i^{1995} G_i =$$

$$= \mathbf{h}_i^{1995} g_i = \mathbf{h}_i^{1995} \frac{(\mathbf{h}_{c,i}^{2011} - \mathbf{h}_{c,i}^{1995})}{\mathbf{h}_{c,i}^{1995}} = \mathbf{h}_{c,i}^{2011} - \mathbf{h}_{c,i}^{1995}$$

Eventually, the computation of the shift-share effects by country (with all industries aggregated) can be made by using instead industry  $i$ 's female participation (measured in percentages) within a particular country and then, summing the results across their industries.