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▶ The state of the apparel and footwear industry: Employment, automation and their gender dimensions

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▶ Abstract

New technologies have the potential to change how products are made, services are provided and supply chains organized and managed. A good deal of attention has been devoted to studying the impacts of technological upgrading and automation on employment. Many acknowledge that these outcomes are uneven, varying across regions of the world, economic sectors, as well as amongst groups of workers, including women and men. Yet there is little evidence on the processes behind these outcomes and, in particular, why they seem to further reinforce rather than alleviate gender inequalities. The main goal of this paper is to review the state of the apparel and footwear industry as it relates to automation, employment and gender issues in context of the ILO-EU project “Building Partnerships on the Future of Work” project. The paper highlights the importance of the sector for women’s employment and the gendered nature of the industry; summarizes the literature on the effects of industrial automation and digitization on employment in the apparel and footwear industry, in particular their gender dimensions; and presents a brief overview of the apparel and footwear sector in the project countries, namely Germany, Indonesia, Mexico, Romania and Spain.

Keywords: automation, employment, industry 4.0, apparel, footwear, gender

JEL: J11, J16, O33

► Introduction

Apparel and footwear manufacturing have historically been instrumental in industrialization and structural transformation processes. These industries have fostered economic growth, provided entry points into the global economy and supply chains, and offered opportunities for formal jobs to workers, particularly women, in developing countries. To date, there is limited automation in apparel and footwear manufacturing, with some automation in certain operations while others, like sewing, remain largely labour intensive. In this context, the extent to which new and emerging technologies related to automation and digitization of production and supply chains transform the industry has important implications for workers and countries' development trajectories.

Although the impacts of technology on the world of work have garnered attention in academia and beyond, these efforts have largely focused on the quantity of jobs and on workers occupations, tasks and skills profiles. Less research has been devoted to unravelling the interaction between new technologies and local social structures, cultural norms and institutional systems, and structures of industrial relations and workplace organization. All of these factors imply that the outcomes of automation vary across regions of the world, economic sectors, and across groups of workers, including women and men. Moreover, some research on structural transformation and technological upgrading (measured as productivity growth) suggests that there is a negative relationship between women's share in manufacturing employment and labour productivity (Kucera and Tejani 2014; Tejani and Kucera 2021).

Several studies have wrestled with an explanation of employers' seeming preference for men workers in the context of technological upgrading (Tejani and Milberg 2016; Tejani and Kucera 2021; Seguino and Braunstein 2018; Caraway 2006; Kucera and Tejani 2014). These studies invoke the lesser importance of low-wage women's labour in more capital-intensive production; gender norms designating men as breadwinners and women as secondary workers, with men more likely to be hired for higher paying jobs; and the different skills requirements of new industrial jobs combined with the purportedly different skills of men and women workers – regardless of whether these differences are real or perceived (Tejani and Kucera 2021). And yet there is very little research that directly provides evidence for these as well as other competing hypotheses, as the evidence is often collected and analysed at the aggregate comparative level. Little is known about the decision-making processes behind those outcomes, and the role of different actors and institutions in shaping them. There is also little research that assesses how the gendered impacts of automation might vary across industries, depending, for example, on the capital-intensity of production, the amenability of production to automation, and the share of women's employment. This paper is a first step towards building new knowledge and informing future evidence-based policies that address the effects of automation technologies on women and men employed in the apparel and footwear sector. The analysis is embedded in the global value chain (GVC) framework and linked to a Kaldorian perspective on endogenous demand-led growth¹ in order to examine the effects of automation on employment. This is combined with a feminist conceptual framework that helps to shed light on the gendered consequences of these shifts in employment.

The main goal of this paper is to review the state of the apparel and footwear industry as it relates to automation, employment and gender issues in context of the ILO-EU project "Building Partnerships on the Future of Work" project. In doing so, the next sections highlight the importance of the sector for women's employment and the gendered nature of the industry; summarize the literature on the effects of industrial automation and digitization on employment in the apparel and footwear industry, in particular their gender dimensions; and present a brief overview of the apparel and footwear sector in the project countries, namely Germany, Indonesia, Mexico, Romania and Spain.

¹ Previous studies such as Kucera and Tejani (2014; 2021) employ a Kaldorian perspective to investigate the gendered impacts of structural change and labour productivity growth.

► 1. The state of the apparel and footwear industry

1.1 An important sector for women's employment

The global supply chain in the apparel and footwear sector has been an important source of employment. This has been especially so for women who may have previously had difficulties accessing paid employment, and particularly wage work. In 2019, the textiles and garment sectors combined employed approximately 91 million workers globally, 50 million of which were women (ILO 2020b). In garment manufacturing more specifically, it has been estimated that women account for about 80 per cent of employment (ILO 2019). Not only are women prevalent in the industry's workforce, but this sector also often accounts for a large share of women's total employment, particularly in developing economies. In Asia and the Pacific, for instance, more than 5 per cent of working women engaged in this industry in 2019, making it the largest employer of women among all industrial sectors and fourth largest overall (ILO 2020b; Lowell Jackson, Judd, and Viegelahn 2020).

Employment in the apparel and footwear industry is associated with both benefits as well as challenges. On the one hand, the sector is one of the largest providers of formal employment for women – and arguably often their first opportunity for paid work in many developing countries. On the other hand, poor working conditions and violations of labour rights are well documented (ILO and IFC 2018; BSR 2017; Anner 2018; Barrientos, Gereffi, and Rossi 2011). Although many of these issues affect all workers in the sector (including both men and women), it is women who are the majority in low-skilled, low-wage jobs, and who also face additional challenges related to social norms and power dynamics that disadvantage them (ILO and IFC 2018; BSR 2017).

According to the literature, the main benefits of employment in the garment industry for women include opportunities to earn an income, particularly where formal employment opportunities are limited, and social safety nets are weak (ILO 2021). Where this employment is formal, it also provides rights and protection to workers, as well as skilling opportunities to at least some of the workforce (Barrientos, Gereffi, and Rossi 2011). This access to paid employment increases women's bargaining power within the household and is critical for enhancing women's economic and social status and women's empowerment (Bárcia de Mattos and Dasgupta 2017). But there are several deficits associated with garment work. These encompass low pay, long working hours, poor working conditions, lack of access to benefits (such as health insurance and maternity leave), gender-based harassment and violence, systemic discrimination (including on the grounds of pregnancy), limited opportunities for skills development and career advancement, and barriers to participation in leadership positions and decision-making (ILO 2021; ILO and IFC 2018; BSR 2017). In addition, employment for many women in the sector is frequently informal, piece-rate and hourly work performed outside of factories, often home-based, with even less income, legal and social security (Anner 2019). Moreover, there are several persistent gender gaps in the industry. On average, women earn less than men, are segregated in the lowest skill, lowest wage occupations and are underrepresented in supervisory and management roles relative to their share in total employment in the sector (ILO and IFC 2018). A critical question is whether these decent work deficits and gender gaps will be exacerbated by technological upgrading or whether developments in the industry hold promise towards greater gender equality, and how best to harness this potential and capitalize on change.

These benefits and deficits are also linked to the structure of the global industry. Generally, the establishment and expansion of global and regional supply chains and production networks have been associated with opportunities for economic and social upgrading. However, the value chains' structure and the power dynamics across firms, particularly in buyer-driven chains such as garments, have been the subject of debate to the extent that they shape, to a large degree, working conditions and labour standards (Barrientos, Gereffi, and Rossi 2011; Kucera 2021; Bamber and Staritz 2016). The debate was particularly intense following the collapse of Rana Plaza in Bangladesh in 2013 (Kucera 2021). One strand of literature suggests that there is an opposition between participation in global supply chains and trade on the one hand, and labour standards, on the other, especially in labour-intensive and price-sensitive industries like garments (Kucera 2021; Kabeer 2004). Some argue that the garment sector has benefitted many, particularly poorer women from rural areas in developing countries, and that it provides better wages and working conditions than most available alternatives for

employment (Kabeer 2004; Kabeer and Mahmud 2004). Others, while recognizing that the sector has generated many jobs, suggest that competitiveness could be maintained with better working conditions and wages (through the coordinated implementation of international labour standards across competing countries) by offsetting associated cost increases with industrial policy-enabled reductions in other production costs (Berik 2017; Seguino 2006). In this context, the importance of freedom of association and networking with international unions is underscored (Berik 2017). This literature recognizes that there are critical issues related to purchasing practices of brands and retailers in supply chains, which frequently prioritize lower costs and shorter delivery times, thus pressuring suppliers (Kucera 2021; Berik 2017). It also stresses the social and institutional embeddedness of production and power relations across actors in the supply chain (Barrientos, Gereffi, and Rossi 2011).

Power relations became clear in 2020, when orders abruptly cancelled by brands, led to factory closures, layoffs and wage cuts (Tejani and Fukuda-Parr 2021). The COVID-19 pandemic resulted in millions of temporary and permanent jobs being lost, which compromised women's ability to meet basic needs and threatened their bargaining power and status in the household, particularly in contexts of limited social protection and unequal access to public and financial services (ILO 2020c; 2020a; Tejani and Fukuda-Parr, 2021). Moreover, those women who do return to factories face risk of infection at the workplace, during commutes and in employer-provided dormitories (Tejani and Fukuda-Parr 2021). Business has yet not returned to pre-crisis levels, resulting in uncertain prospects for women. Fewer opportunities in apparel and footwear could lead to women being pushed into informal employment (in and outside of the industry) due to their status as secondary earners, with employers often giving preference to male workers in periods of retrenchment (ILO 2020c). There is also a risk of women leaving the labour force, given that finding alternative employment can be particularly challenging as a result of skills mismatches and social norms and expectations in regard to what constitutes appropriate work for women. A critical concern for the future relates to the potential acceleration of technological upgrading and the adoption of automation, and the associated impacts on the low-skilled jobs of many women in apparel manufacturing. More specifically, and particularly for developing regions where the industry is characterized by labour-intensive processes, a key issue relates to the potential defeminization of the workforce which often accompanies increases in capital intensity and productivity (Kucera and Tejani 2014; Tejani and Kucera 2021).

1.2 Technology and employment in apparel and footwear manufacturing

The future of the apparel and footwear industry, its supply chain, its geography of production, and workforce depend not only on the capabilities of new technologies, but on a host of other factors such as relative capital and labour costs, labour availability, skills, infrastructure, logistics, trade policies, and the broader institutional setting where production takes place. Nevertheless, literature on automation and employment often focuses solely on the availability of technology and its potential to displace workers, leaving aside other factors that would lead to (or hinder) the adoption of different technologies and other dimensions that also contribute to employment outcomes.

Technology is quickly changing and is increasingly able to automate work previously performed by workers, yet employment impacts are uncertain. Some empirical studies examining recent data associate technology adoption with negative employment impacts (Acemoglu and Restrepo 2017; Chiacchio, Petropoulos, and Pichler 2018), while others do not find automation to be labour-displacing (Dauth et al. 2017; Graetz and Michaels 2018; Autor and Salomons 2018). Forward-looking attempts to assess potential future impacts of emerging technologies based exclusively on technical feasibility and task characteristics tend to indicate a high degree of risk of worker displacement – particularly in routine repetitive work (Frey and Osborne 2013; World Bank 2016; McKinsey Global Institute 2017; Arntz, Gregory, and Zierahn 2016; Nedelkoska and Quintini 2018). However, historically, automation has not led to higher long-term unemployment, but rather to a new composition of employment (Levy and Murnane 2005; Minian and Martinez Monroy 2018; ADB 2018; Nubler 2016). This is because job destruction dynamics coexist with job creation dynamics. For instance, new technologies could result in less new hires rather than job loss, could result in the emergence of new occupations, and could trigger job creation elsewhere in the economy (Acemoglu and Restrepo 2018; Gregory, Salomons, and Zierahn 2019; Kucera 2017; Nubler 2016). Adjustments are not, however, instantaneous or costless, and impacts are uneven.

Another layer of complexity in assessing technology impacts on employment is added when one considers the implications of human agency and social and organizational aspects of production (Fernández-Macías 2018; Fana, Villani, and Bisello 2021; Anzolin 2021). In addition to impacts on the number of jobs, tasks and occupations, new technologies affect conditions of work and employment, workers' autonomy and dynamics of control as well as industrial relations. While tasks and occupations impacts are more easily observable, technology impacts on conditions of employment and institutions are less direct and harder to determine (Fernández-Macías 2018). Moreover, issues related to social structures may be of particular concern when viewed through a gendered lens. Fana, Villani, and Bisello (2021) find disparities between the tasks performed by women and men in similar jobs even after controlling for characteristics such as education and seniority. They also find that gender matters in regard to work organization and distribution of power, identifying gender asymmetries in autonomy and authority.

The digitization and automation of industrial processes interact with local social structures, cultural and institutional systems, and structures of industrial relations and workplace organization to produce uneven employment outcomes. There is a growing literature indicating that automation affects women and men's employment differently, associating technological upgrading with the defeminization of employment. A number of studies show that feminized sectors of manufacturing experience declines in the proportion of women workers as production becomes more technologically advanced (Tejani and Milberg 2016; Tejani and Kucera 2021; Seguino and Braunstein 2018; Caraway 2006; Kucera and Tejani 2014). In regard to apparel and footwear manufacturing specifically, Tejani and Kucera (2021) find negative impacts of labour productivity increases on women's employment within the industry.

This outcome has been attributed to the systematic effects of gendered norms and institutions in the economy. These studies invoke the lesser importance of low-wage women's labour in more capital-intensive production; gender norms designating men as breadwinners and women as secondary workers, with men more likely to be hired for higher paying jobs; and the different skills requirements of new industrial jobs combined with the purportedly different skills of men and women workers – regardless of whether these differences are real or perceived (Tejani and Milberg 2016; Tejani and Kucera 2021; Seguino and Braunstein 2018; Caraway 2006; Kucera and Tejani 2014). For instance, breadwinner norms tend to award men with higher value-added jobs that have the potential for wage increases while women are preferred for labour-intensive jobs as they are considered secondary workers. Gender stereotypes about workers' abilities, or tropes of "feminine productivity" about women's suitability for labour-intensive, routine and manual work (Salzinger 2003) disadvantage women during technological upgrading. Institutional factors such as gender segregation in vocational training and technical education place women at a disadvantage even before they enter the labour market and intensify unequal outcomes in the context of automation (Tejani and Milberg 2016). These studies link up to the broader debate in the GVC literature on whether technological upgrading within GVCs leads to social upgrading, including in garments (Barrientos 2019). At the level of the firm, Tomascovic-Devey (2014, p. 52) reminds us that: "...organizations are inequality regimes embedded in social structures populated by culturally infused people".

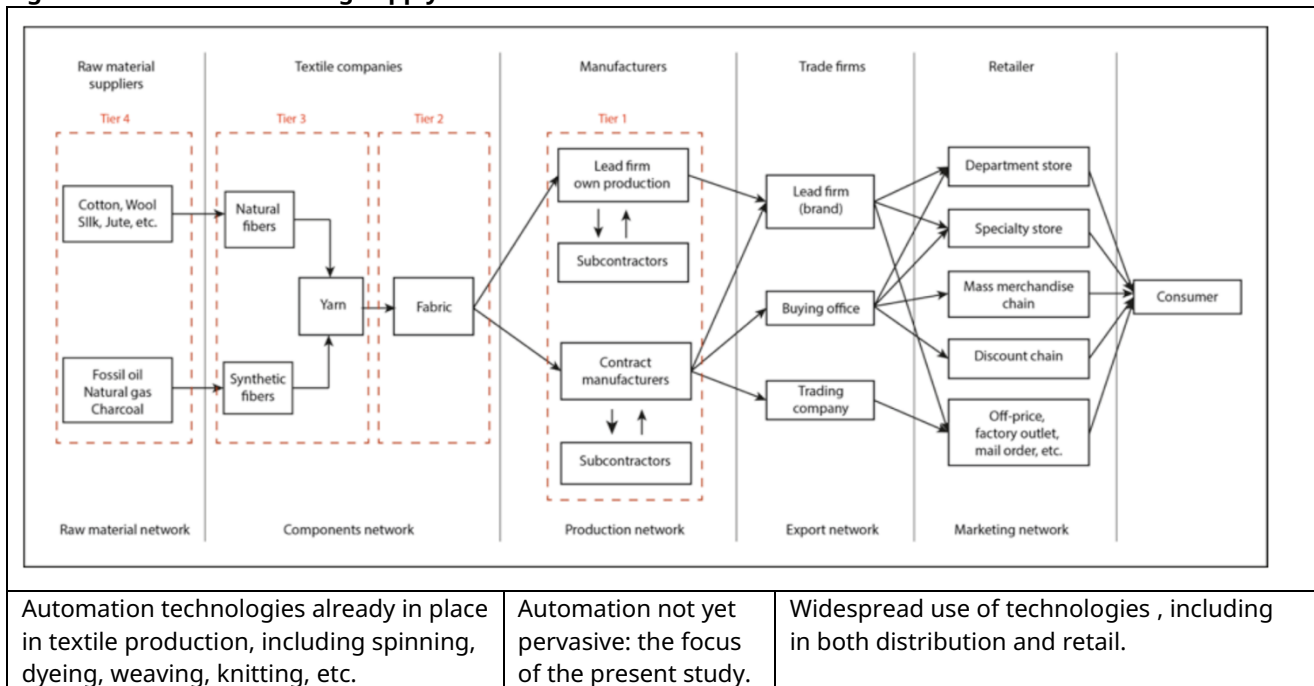
There is limited research directly examining evidence for the competing hypotheses outlined above, and little is known about the decision-making process behind these gendered outcomes, including the role of different actors and institutions in shaping them. There is also little research assessing the gendered impacts of automation in specific industries and how this may vary according to the capital intensity of production, the amenability of production to automation and the prevalence of women in the workforce. The main goal of this project is to address some of these knowledge gaps.

1.3 Technology advances in apparel and footwear manufacturing

As Altenburg et al. (2020) summarize, new technologies will change the way in which companies produce goods and services, compete with one another, engage in international trade and supply chains, adapt business models, and interact with consumers. Yet, for the foreseeable future, technical bottlenecks suggest that new and old production systems in apparel and footwear manufacturing will coexist (Altenburg et al. 2020; Bárcia de Mattos et al. 2021; Kucera and Bárcia de Mattos 2020).

So-called factory 4.0 innovations comprise enabling digital technologies (such as big data and cloud computing) as well as new production systems, including digital sensors, sophisticated vision systems, advanced material handling tools, robotics and many other technologies, operating either autonomously or in collaboration with workers (Nayak and Padhye 2018; Altenburg et al. 2020). Usage and availability of manufacturing technology varies across the different stages of the apparel and footwear supply chain (figure 1). Automation technologies are predominantly present at the ends of the supply chain, particularly in textile manufacturing on one end, and logistics and retail on the other (Bárcia de Mattos et al. 2020). The focus of this study (and research project) is apparel and footwear manufacturing, which remains labour-intensive with little presence of advanced manufacturing technologies, despite some variations, as footwear lends itself more easily to automation. In addition, this research project will explore digitization in the management of supply chains and how this affects work organization and intensity, with potentially differential employment impacts on women and men. It is posited that technologies focused on the automation of production processes, digitization of processes and supply chain management, and reshoring not only are themselves interrelated, but they are also alternative approaches to the same end goal: to increase speed to market, reduce excessive inventories and price markdowns, and to respond to the growing demand for customized products. Moreover, this would also mean addressing greater concerns over environmental sustainability while at the same time responding to increased public awareness over human rights and working conditions in garment manufacturing.

Figure 1. Textile and clothing supply chain



Source: Obser 2015, in Bárcia de Mattos et al. 2020.

It is in sewing that labour inputs remain concentrated, engaging about two-thirds of workers (Chang, Huynh, and Rynhart 2016). It is, therefore, advancements in sewing technology that hold the most promise in terms of reducing labour (and production) costs in apparel manufacturing – estimated at about 20 per cent of total costs in developing Asia and 30 per cent in the US (Chang and Rynhart 2017). It is also sewing which remains most challenging to automate. Despite being considered a routine repetitive task (characteristics associated with amenability to automation), handling pliable fabrics of various weights and grades and perfectly aligning them for sewing remains a challenge to existing machinery (Kucera 2020; Kucera and Bárcia de Mattos 2020; Bárcia de Mattos et al. 2021). It has been estimated that material handling accounts for about 80 per cent of overall production time and cost in apparel assembly (Gries and Lutz 2019). However, there have been noteworthy advancements in recent years.

Technology developers endeavouring to sew with robots are dealing in very different ways with common technological challenges. In this regard, it is worth reviewing the characteristics of Sewbo, SoftWear Automation and Grabit (Kucera and Bárcia de Mattos 2020; Kucera 2020). At the same time, a high degree of automation is possible in apparel sewing even

when fabric handling remains largely done by hand. In this regard, we also consider below MAICA, one of the companies producing semi-automated machinery to sew shirts (Kucera and Bárçia de Mattos 2020; Kucera 2020).

Sewbo's approach makes use of conventional, off-the-shelf collaborative robots and sewing machines. Its innovation is not with automation machinery but rather in the treatment of pieces of fabric, making them temporarily rigid with a water-soluble chemical. That is, Sewbo's approach is to make pieces of fabric similarly manipulable to pieces of metal, thus making apparel sewing akin to a conventional assembly operation that is able to take advantage of the ready reprogrammability of state-of-the-art collaborative robots. In contrast with Sewbo, SoftWear Automation designs and builds robots specifically for sewing – Sewbots, the company calls them. The company deals with the challenges posed by the pliability of fabrics through the development of sensors and accompanying visual enhancement software that count individual threads and intersections of threads in fabric. These sensors enable its robots to guide fabrics through conventional sewing machines with a high degree of precision, and the company has also developed robotic sewing machines. Grabit developed a robotic hand that uses electroadhesion (a type of static electricity) and can pick up and handle a wider range of objects – including fabrics – than conventional robotic grippers or suction cup hands. When combined with a customized Toshiba Machine robot, Grabit's hand is reportedly able to arrange the pieces for a sports shoe upper 20 times faster than a human, after which the pieces are heat-fused. Rather than attempting to overcome the challenges posed by the pliability of fabrics, as with Sewbo and SoftWear Automation, MAICA's strategy is to work within these constraints, with workers hand-feeding fabrics into a series of machines that break down the shirt-making process into discrete steps. Each machine is specialized for each step, with some of the steps using conventional sewing machines integrated with MAICA's auxiliary machinery.

Other technologies, like 3D sewing machines have also been developed to overcome barriers to automation resulting from handling various types of fabric. 3D sewing machines are complementary to sewbots in that they allow the garments to be placed on a 3D mould which enables automated sewing to autonomously move around it. This type of technology can be used to manufacture wearing apparel, such as trousers, jackets and shirts, as well as other products like car seats, even if limited to certain applications within these production processes (Nayak and Padhye 2018; Gries and Lutz 2019). Still, to date, producing garments necessitates many semiautomatic machines and steps, and it remains therefore difficult to achieve economical and flexible production with automated systems (Gries and Lutz 2019).

An area in which automation is largely absent is fabric pressing, although different kinds of automated machinery with varying degrees of autonomy have been developed in recent years. As noted by Fergusson (2015), pressing requires full and precise control of different factors (i.e. heat, moisture and pressure) and significant risks of error persist. Within this context, automation in the pressing stage could improve quality and consistency (Nayak and Padhye 2018).

Original design manufacturers may use 3D printing for rapid prototyping, while this may not be the case for cut-make-and-trim companies. According to the qualitative study conducted by Bárçia de Mattos et al. (2021), 3D printing appears as "a good option for prototyping, sample development and product customization" and its diffusion should spread in the future as the technology is still rapidly evolving. Yet, the technology is still not able to deal with high volumes and a wide range of materials.

There are several other new technological advancements. This includes, for instance, new technologies in laser cutting, radio-frequency identification (RFID) technologies to trace production through the entire manufacturing process, digital design and sampling technologies, as well as in ancillary operations in warehousing, distribution, marketing and sales. The push towards a digital transformation has been renewed in the context of COVID-19, with the need to improve management and forecasting capabilities to ensure business continuity, as well as to stay connected and engaged with consumers virtually (Gonzalo et al., n.d.).

Digitization and automation development in apparel and footwear manufacturing is currently rife with experimentation. With no clear dominant approach, as evidenced by the company examples above, future pathways are still to be defined. In addition, qualitative studies with informants from the industry (such as Kucera 2020; Bárçia de Mattos et al. 2021;

Altenburg et al. 2020) indicate that automation adoption is likely to be a gradual and incremental process, rather than a sudden and radical disruption.

The question of technological upgrading is closely linked to that of the geography of production and the landscape of the supply chain. A critical concern is whether automation will erode the labour cost advantage that led to the development of apparel and footwear manufacturing in developing and emerging regions, creating millions of jobs for women. And if that is the case, whether this is likely to lead to a reversal of offshoring processes, to the detriment of women workers who may be constrained in accessing other employment opportunities. In such a scenario, automation technologies implemented in developed countries – which are home to lead brands and central destinations of exports from manufacturing regions – could lead to job-displacement in developing and emerging economies.

However, decisions regarding automation and the geography of production are not solely reliant on the relative costs of capital and labour, or on the unit of production. Speed to market, consistent quality, environmental sustainability, customization, and the availability of material inputs are amongst many of the other factors affecting the uptake of new technologies and the location of production (Bárcia de Mattos et al. 2021).

► 2. An overview of the apparel and footwear industry in the project countries

Prospects are different across the supply chain, and the question of automation is closely linked to the structure of production networks. Apparel and footwear is a highly international industry, with manufacturers mainly located in emerging and developing economies producing for local as well as global brands, often headquartered in advanced countries (Azmeah and Nadvi 2014; Gereffi and Memedovic 2003; Gereffi and Frederick 2010).

Table 1 provides a snapshot of the global industry today, and trends in the past 10 or so years (UNCTADSTAT 2021). The table shows export values, shares of global exports, and employment for the top ten exporters in 2020. The top exporters, in export value, comprise a mix of high-income and middle-income countries. An examination of the data by income group reveals that together, the five middle-income countries accounted for 51 per cent of global apparel and footwear exports in 2020 – Chinese exports alone corresponded to nearly 31 per cent of the world's total – and their global share has been increasing since at least 2000. Between 2000 and 2010, shares of global exports increased in all of these middle-income countries, though trends varied since then. The combined share of apparel and footwear exports for the high-income countries within the top exporters was equivalent to 19.3 per cent of the world's total in 2020. This is much lower than that of middle-income top exporters, but has also been increasing. This suggests greater concentration of apparel and footwear exports. In terms of employment, the number of workers in the middle-income group increased since 2010, while that of high-income exporters declined.

Table 1. Exports and employment in the top ten apparel and footwear exporters in 2020

	Rank in 2020	Apparel and footwear exports in 2020 (US\$ million)	Share of global exports (%)			Employment (000)	
			2000	2010	2020	2010 or closest [^]	2020 or latest [*]
Middle income countries		297,358	26	48	51	14,570	17,858
China	1	179,702	17.9	35.7	30.8
Viet Nam	2	58,528	1.3	3.4	10	2,150	4,375
Bangladesh	5	27,814	1.9	3.4	4.8	3,088	3,454
Turkey	7	16,425	2.6	2.8	2.8	904	946
India	9	14,888	2.6	2.8	2.6	8,429	9,082
High income countries		112,825	16	18	19	632	569
Italy	3	33,013	8	6.4	5.7	332	314
Germany	4	32,305	3.2	4.7	5.5	100	71
Netherlands	6	17,031	1.2	2	2.9	8	7
France	8	15,629	2.4	2.6	2.7	80	82
Spain	10	14,847	1.5	2.2	2.5	112	94
Total top 10		410,183	42.7	66.1	70.3		
World		583,518	100	100	100		

Note: Apparel and footwear exports refer to SITC 84 and 851; apparel employment refers to ISIC Rev 3 14 and 15. * Bangladesh (2017), Indonesia (2015), Mexico (2019). [^] Bangladesh (2013), India (2012), Indonesia (2012).

Source: Exports from UNCTADSTAT database, "Merchandise trade matrix in thousand United States dollars, annual", accessed 20 Aug 2021. Employment data from ILOSTAT database, "Employment by sex and economic activity - ISIC level 2 (thousands)", accessed 30 July 2021.

Although these aggregate trends in exports and employment give a sense of offshoring of production from high- to lower-income countries documented in literature (Gereffi and Frederick 2010; Gereffi 1999; Gereffi and Memedovic 2003; Barrientos, Gereffi, and Rossi 2011), developments have not been uniform across countries. Moreover, this project focuses on five countries, two traditionally thought of as headquarters for global brands, Germany and Spain, and three manufacturing countries which produce for the domestic and international markets, Indonesia, Mexico and Romania (table 2). They were chosen to represent at the same time differences in terms of the specialization and position in the global supply chain as well as a wide geographic coverage. The rest of this section will provide an overview of trends in exports, value added and employment in the project countries.

Table 2. Exports and employment in 2020

	Rank in 2020 global exports	Exports in 2020 (US\$ million)	Share of global exports (%)			Employment (000)	
			2000	2010	2020	2010 or closest [^]	2020 or latest [*]
Germany	4	32,305	3.2	4.7	5.5	100	71
Spain	10	14,847	1.5	2.2	2.5	112	94
Mexico	26	3,887	3.5	1	0.7	1,086	1,036
Indonesia	11	12,851	2.5	2	2.2	2,832	2,974
Romania	30	3,117	1.2	1	0.5	315	254

Note: Apparel and footwear exports refer to SITC 84 and 851; apparel employment refers to ISIC Rev 3 14 and 15. *Indonesia (2015), Mexico (2019).

[^]Indonesia (2012).

Source: Exports from UNCTADSTAT database, "Merchandise trade matrix in thousand United States dollars, annual", accessed 20 Aug 2021. Employment data from ILOSTAT database, "Employment by sex and economic activity - ISIC level 2 (thousands)", accessed 30 July 2021.

2.1 Exports, markets and product specialization

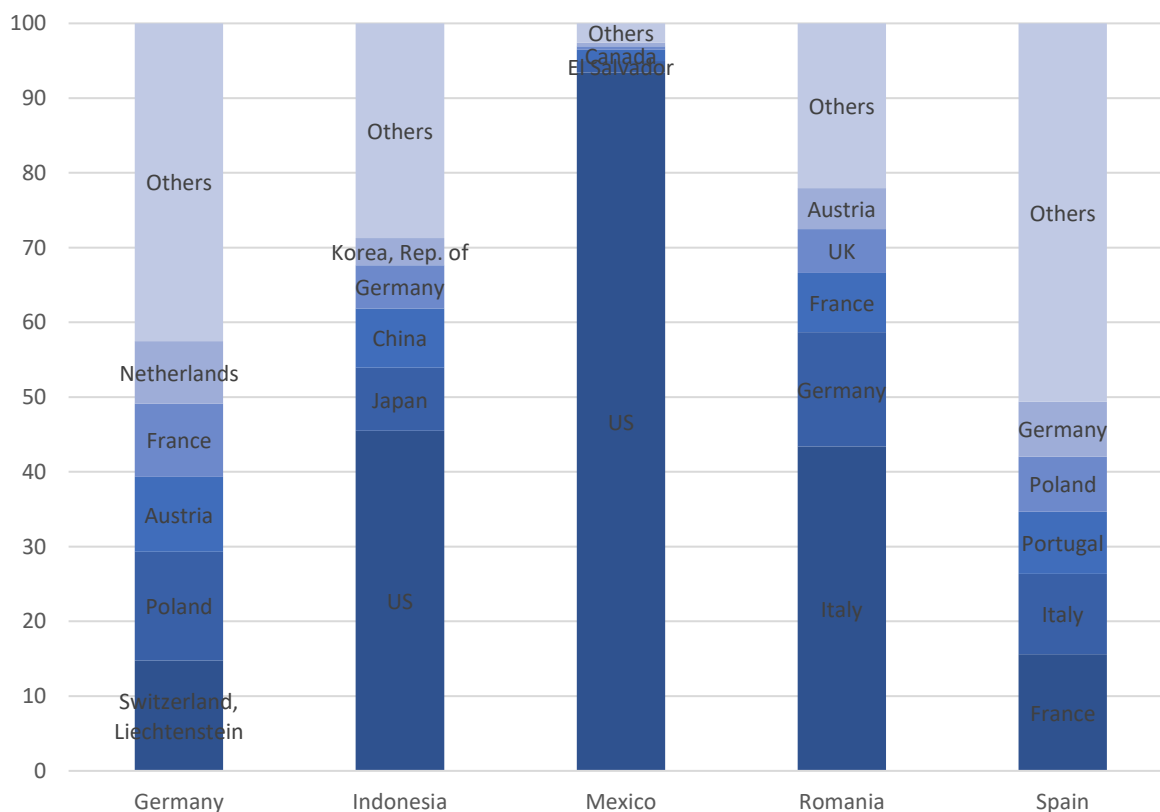
Germany exported just over \$32 billion in apparel and footwear in 2020, making it the world's fourth largest exporter of these goods, behind only China, Viet Nam and Italy. Spain's exports amounted to \$15.8 billion, making it the 10 largest exporter globally. Although this was equivalent to less than half of Germany's apparel and footwear export value, it was higher than those of Indonesia, Mexico and Romania. At odds with the general perception of the industry in advanced countries being uncompetitive on international markets, Germany's and Spain's global export shares of apparel and footwear increased from 2010 to 2020, from 4.7 to 5.5 per cent and 2.2 to 2.5 per cent, respectively.

Indonesia exported over \$12.8 billion in 2020, 2.2 per cent of the world total, a share that has stayed more or less stable over time. Export values were much lower for Mexico and Romania, \$3.9 and \$3.1 billion, respectively, equivalent to 0.7 and 0.5 per cent of the global exports. Looking back, Mexico was the fifth largest exporter in 2000, when it exported 3.5 per cent world's total. The country's decline coincided with the end of the Multifiber Arrangement, the ascension of China to the WTO and increases in taxes in the context of NAFTA, suggesting that the competitiveness of the Mexican apparel and footwear industry relied on trade agreements (Minian, Martínez, and Ibáñez 2017; Moreno-Brid et al. 2021). Over this period, the market share of many emerging and developing Asian exporters increased, including those of Bangladesh, Indonesia and Viet Nam. In 2020, Indonesia's share of global exports was below the 2000 level, but higher than in 2010. Although the Multifiber Arrangement was critical in the apparel industry's expansion in Indonesia, its competitiveness improved despite the phase-out of quotas and export volumes were substantially higher in 2010 than in the 1990s (Kadarusman and Nadvi 2013, p. 1013).

The top five export markets for Germany and Spain as of 2020 were all within Europe (UNCTADSTAT 2021). No one country accounted for over 16 per cent of exports and, combined, the top five markets for Germany and Spain received 57.5 and 49.4 per cent of these countries apparel and footwear exports, respectively (figure 2). Concentration was much greater for the apparel and footwear exports from Indonesia, Mexico and Romania. In 2020, the United States was the destination of 45.5 per cent of Indonesian apparel and footwear exports, and 93.4 per cent of Mexico's. In both cases, the second largest

destination market was a far second. In the case of Indonesia, Japan and China received about 8 per cent of sectoral exports each. In turn, Canada and El Salvador accounted for 1.5 per cent, each, of Mexican exports of apparel and footwear. In regard to Romanian apparel and footwear exports, Italy accounted for 43.4 per cent of total, and Germany for 15.3 per cent.

Figure 2. Distribution of exports of apparel and footwear by destination in 2020 (%)



Note: Apparel refers to SITC 84 and footwear to SITC 851.
 Source: UNCTADSTAT database, "Merchandise trade matrix in thousand United States dollars, annual", accessed 20 Aug 2021.

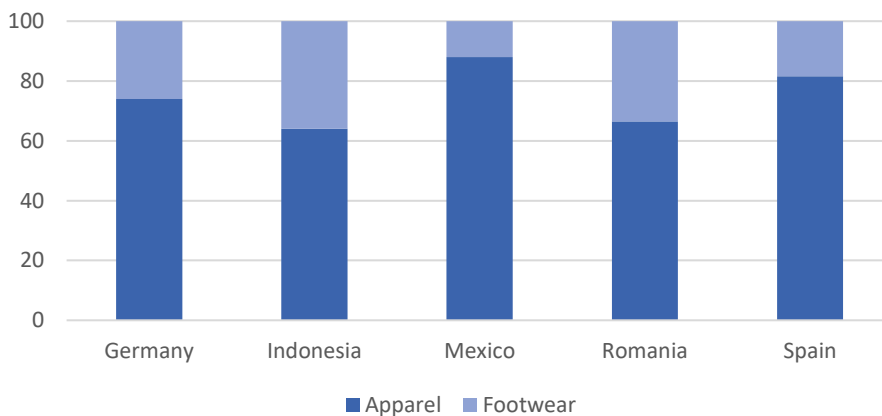
There are also significant differences in the export performance of apparel and footwear exports relative to other industries within these countries. In Germany, while the share of apparel and footwear exports in manufacturing exports declined somewhat between 1995 and 2007, from 2.0 to 1.8 per cent, it increased thereafter to a peak of 2.8 per cent in 2020. There are closely parallel trends for the share of apparel and footwear exports in total exports, with the share increasing from 1.5 to 2.3 per cent from 2007 to 2020. In Spain too the sectoral share of exports was on the rise for about a decade or so, relative to total exports and manufacturing exports. The share of apparel and footwear exports declined slightly in 2018, and although it picked up again in 2019, it declined further in 2020, likely a consequence of the COVID-induced global contraction in demand. As a result, between 2010 and 2019, the contribution of apparel and footwear to total and manufacturing exports in Spain rose from 4.2 to 5.3 per cent (down to 4.8 per cent in 2020) and 5.8 to 7.9 per cent (7.2 per cent in 2020), respectively.

In Indonesia, the importance of apparel and footwear in manufacturing exports has declined as the latter have diversified; their share was still significant at 17 per cent of the total in 2019 and 2020, but lower than the 23.7 per cent share in 1995. A similar trend is seen in the share of apparel and footwear in total exports, which contracted from 12 per cent in 1995 to 7.8 per cent in 2019, and 7.9 per cent in 2020. Domestically, the importance of Mexican apparel and footwear exports has been declining since the late 1990s. At its peak, in 1998-99, the industry's share of total exports was 6 per cent, and it accounted for 7.1 per cent of manufacturing exports. In 2019, the respective shares had fallen to 1 and 1.3 per cent, with a further 0.1 per cent decline in 2020. The export performance of apparel and footwear relative to manufacturing and

overall exports has also been declining in Romania. In 2020, apparel and footwear accounted for 5.3 per cent of manufacturing exports and 4.4 per cent of total exports, in sharp contrast to 39.1 and 30 per cent, respectively, in 2000.

Examining apparel and footwear separately, we see that apparel exports account for much higher shares of combined apparel and footwear exports than footwear exports in all five countries, and globally (figure 3) (UNCTADSTAT 2021). However, the share of footwear exports as a proportion of total sectoral exports has been increasing in three of the five countries under study and remained stable in one: In 2020, apparel exports accounted for 64 per cent of total apparel and footwear exports from Indonesia. Footwear comprised the other 36 per cent, from 26.8 per cent in 2010. In Romania, footwear exports represented one-third of apparel and footwear exports in 2020, with apparel accounting for the other two-thirds, a split that has been stable in the past decade or so. Footwear's share of Mexican sectoral exports increased nearly 50 per cent between 2010 and 2020 – from 8 to 12 per cent – but remains small relative to apparel's share of exports, 88 per cent. The share of footwear in exports has also risen in Germany, from 18.6 to 26 per cent between 2010 and 2020. Apparel predominates with 74 per cent. In contrast, footwear's share of Spanish apparel and exports has been decreasing; its share fell from 25 per cent in 2010 to 18.4 per cent in 2020. This trend has been ongoing since at least the mid-1990s. In 2020, apparel accounted for 81.6 per cent of total Spanish apparel and footwear exports.

Figure 3. Apparel and footwear exports in 2020 (%)



Note: Apparel refers to SITC 84 and footwear to SITC 851.

Source: UNCTADSTAT database, "Merchandise trade matrix in thousand United States dollars, annual", accessed 20 Aug 2021.

Data from the Observatory for Economic Complexity (OEC) provides insights in regard to product specialization (OEC 2021). It provides information on exports disaggregated at the product level for apparel and textiles combined, and footwear and headwear.

In 2019, a somewhat higher share of Germany's apparel exports were of non-knit apparel than knit apparel. Non-knit suits, knit sweaters, knit t-shirts, non-woven textiles and knit women's suits were the main export categories. For footwear, the most important product categories were leather footwear, textile footwear, and rubber footwear. For Spain, non-knitted apparel and clothing accessories was the biggest export product in 2019, followed by knitted or crocheted apparel and clothing accessories; non-knit women's suits stood out with double the share of exports as knit sweaters, the second main export good. In the footwear and headwear sector, leather footwear accounted for more than half of Spanish exports in 2019.

OEC data for Mexico, 2019, indicates that non-knit or crocheted apparel and clothing accessories were the main category of textiles and apparel exports, followed by knitted or crocheted apparel and clothing accessories. At a more detailed level, the main export goods in 2019 were non-knit men's suits, knit t-shirts and other cloth articles. Regarding footwear and headwear, just over half of Mexican exports in 2019 comprised leather footwear. This is in line with data on the economic contributions of apparel products; 2018 data from INEGI and CANAIVE (2019) indicate that wearing apparel accounted for about 70 per cent of the industry's production value, while knitted apparel accounted for 7.5 per cent. Other apparel goods accounted for 18.5 per cent.

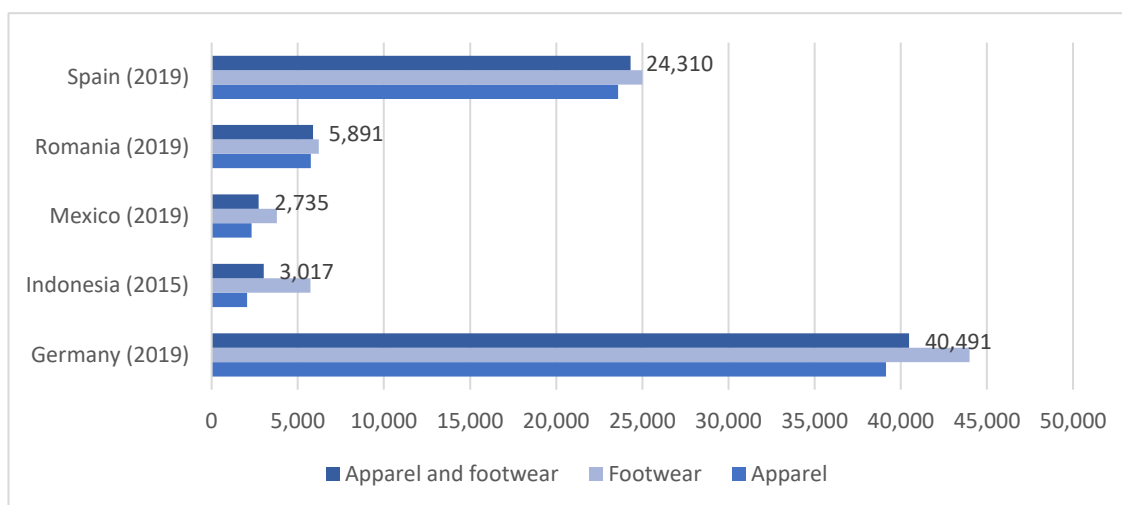
In 2019 in Indonesia, exports of non-knit or crocheted apparel and clothing accessories and knitwear and crocheted apparel and clothing accessories stood out as important categories as opposed to man-made staple fibres and cotton. Knit sweaters and non-knit and knit women’s suits, and non-knit men’s suits were the main export goods. In terms of footwear and headwear, there is greater specialization in textile and leather footwear as compared to rubber. Non-knitted or crocheted apparel and clothing accessories accounted for nearly half of Romanian textiles and apparel exports in 2019. Women’s and men’s suit stood out among these, followed by women’s and men’s coats. The biggest product group within footwear and headwear exports was leather footwear, followed by rubber footwear.

2.2 Production and productivity

In Germany and Spain, while the share of apparel and footwear exports increased relative to other exports for other industries in recent years, the share of apparel and footwear production declined relative to other industries. Specifically, between 2000 and 2019, the share of apparel and footwear value added in manufacturing value added nearly halved in Germany, from 1 to 0.5 per cent, and Spain, from 3.8 to 2 per cent (UNIDO 2021). Similarly, the apparel and footwear value added contribution to GDP declined from 0.2 to 0.1 percent in the former and from 0.6 per cent to 0.2 per cent in the latter (UNIDO 2021). These downwards trends were also observed in Romania, where the apparel and footwear’s share of manufacturing value added contracted from 8.2 per cent in 2000 to 7.3 per cent in 2019, and the sector’s value added in GDP declined from 1.8 to 0.7 per cent. In contrast, in Mexico and Indonesia, although the share of apparel and footwear exports decreased relative to exports of other industries in recent years, the share of apparel and footwear production increased relative to other industries. In Indonesia, the share of apparel and footwear value added in manufacturing value added rose from 6.6 to 8.6 per cent from 2000 to 2019, as the share of apparel and footwear value added in GDP increased from 1 to 1.8 per cent. In Mexico, the sector’s share of manufacturing value added increased from 1.2 per cent to 1.7 per cent, while the sector’s share of GDP rose from 0.1 to 0.2 per cent.

Productivity levels, measured as value added per worker, vary widely among the five countries under study (figure 4). In 2019, the German apparel and footwear sector had considerably higher labour productivity than the other four countries considered in this project, with a ratio of value added per worker just over \$40,000. This compares with ratios of value added per employee ranging from just over \$24,000 for Spain – second to German but still about 40 per cent lower – and \$2,700 for Mexico – lowest among the five countries. Examining apparel and footwear separately, productivity levels are higher in footwear than apparel manufacturing across countries.

Figure 4. Apparel and footwear value added per employed person, latest available year (current US\$)



Note: Labour productivity defined as value added at factor values in current US\$ per person employed. Value added refers to ISIC Rev.3 groups 18 and 19; employment refers to ISIC Rev. 4 groups 14 and 15.

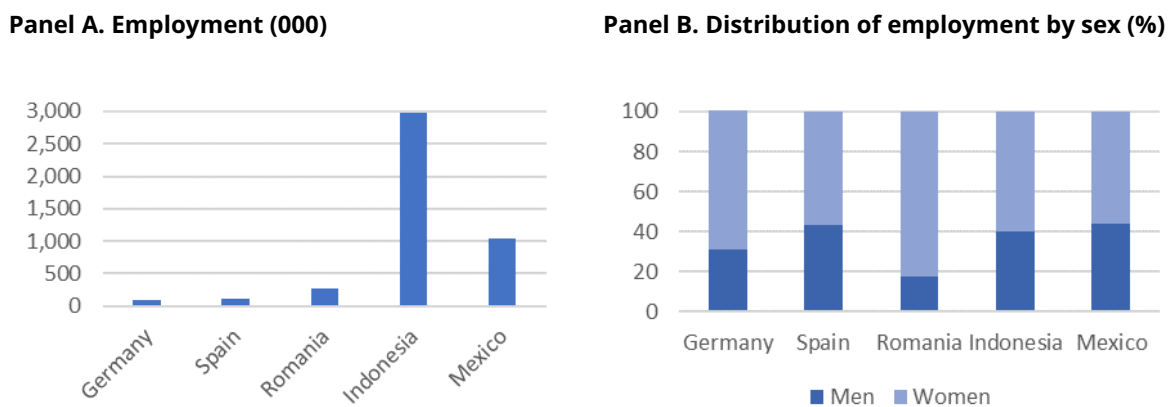
Source: Estimates based on value added data from UNIDO INDSTAT 2 - 2021 edition at the 2-digit level “Value added at factor values, US\$” and employment data from ILOSTAT database, “Employment by sex and economic activity - ISIC level 2 (thousands)”, accessed 30 July 2021.

Gross exports and value added provide an informative yet incomplete overview of trends in the industry. Given the international character of the apparel and footwear supply chain and fragmentation of production, these data may overestimate the role of the last exporting country and they do not provide information concerning the distribution of value added across the supply chain. A complementary and richer picture would emerge from an analysis of trade in value added and other supply chain indicators. Brondino (forthcoming) reviews and assesses the evolution of the apparel and footwear supply chain for the selected countries, including employment dynamics, value added and costs composition (wages versus profits) with a focus on gender differences

2.3 Employment

In terms of employment, the size of the apparel and footwear industry is markedly different across the countries under study, as is the importance of the industry in manufacturing and total employment. Women’s preponderance is, however, marked in all countries, as they account for the majority of industry workers (figure 5) (ILOSTAT 2021). Women are overrepresented in apparel and footwear relative to their share in total and in manufacturing employment.

Figure 5. Employment in apparel and footwear, 2019 or latest



Note: Apparel and footwear refer to ISIC Rev. 3 groups 14 and 15. Indonesia (2015).

Source: Estimates based on employment data from ILOSTAT database, “Employment by sex and economic activity - ISIC level 2 (thousands)”, accessed 30 July 2021.

In Germany, the industry employed 87 thousand workers in 2019, a decline from 2008. The share of women’s employment held steadily over these years, at just over 69 percent in the endpoint years, in sharp contrast to their 27 per cent share of manufacturing and 46.6 per cent of the total workforce. These trends indicate both women’s disproportionately high employment in the industry as well as that employment declines in the industry affected women and men similarly. The decline in total employment for the apparel and footwear industry contrasts with the comparative stability of total employment for the manufacturing sector as a whole in Germany, leading to a contraction in the industry’s share of manufacturing workers, from 1.3 to 1.1 percent over these years, somewhat less than the decline in the corresponding share of value-added noted above.

In terms of employment, the apparel and footwear industry in Spain engaged 111 thousand workers in 2019. Women accounted for 57.1 per cent of these, or 63 thousand workers. This was equivalent to 9.3 per cent of women in manufacturing and 0.7 per cent of all working women. While manufacturing was more important for men’s employment, 16.8 per cent of total employment, apparel and footwear accounted for smaller shares of men’s total and manufacturing employment than women’s, 0.4 per cent and 2.6 per cent respectively. Overall, apparel and footwear employment contracted in the aftermath of the 2008 global crisis and has not recovered to pre-crisis levels. In 2019, Spanish apparel and footwear employment was 24 per cent lower than in 2008. This decline disproportionately impacted women – women’s apparel and footwear employment declined 30 per cent between 2008 and 2019, versus 15 per cent for men, leading to a decline in women’s share of workers from 61.8 per cent in 2008 to 57.1 per cent in 2019. In relative terms, apparel and

footwear share of manufacturing employment declined from 4.9 per cent in 2008 to 4.4 per cent in 2019 overall, a trend parallel to the decline in the sector's value-added contribution to manufacturing.

In Indonesia, the latest available data (2015) indicate that approximately 3 million workers were employed in the apparel and footwear industry, with a 60 per share of women. This is higher than women's share in manufacturing and total employment, 41.5 and 38.2 per cent respectively. Apparel and footwear accounted for more than one in four women working in manufacturing, in contrast to 12.7 per cent of men. Relative to total employment, apparel and footwear corresponded to 3.9 per cent of all women in employment and 1.6 per cent of men.

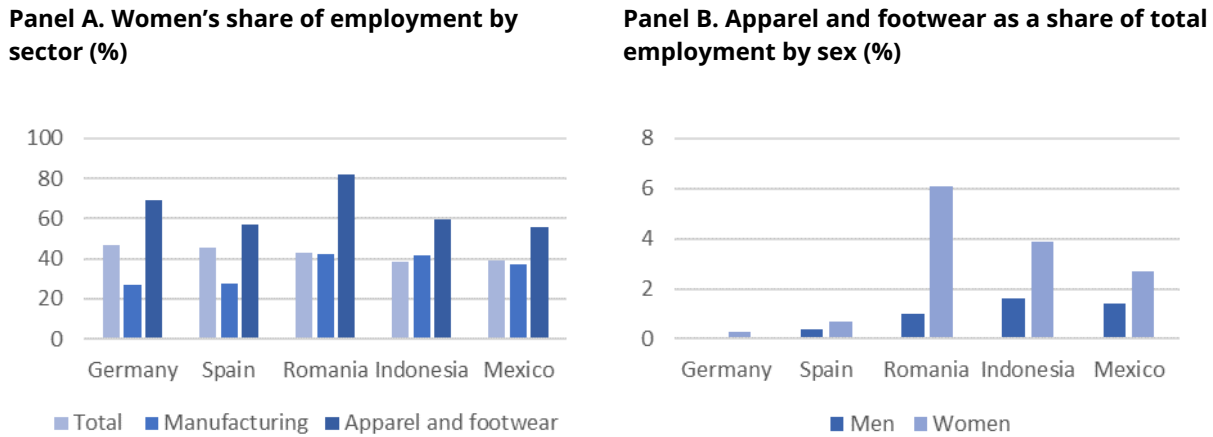
In 2019, Mexico's apparel and footwear industry employed 1 million workers, equivalent to 11.4 per cent of manufacturing employment. Although women accounted for 37-39.1 per cent of manufacturing and total employment in the Mexican economy in 2019, they comprised a much higher share of workers in the apparel and footwear industry, 56 per cent. Apparel and footwear accounted for 17 per cent of all women in manufacturing and 2.7 per cent of women's total employment; in comparison, the industry employed 8 per cent of men in manufacturing and 1.4 per cent nationally. Employment in the Mexican apparel and footwear industry has been declining, and disproportionately so for women. Between 2008 and 2019, the number of women workers contracted 11 per cent compared to 4 per cent for men. This contraction took place despite the increase in the industry's value-added contribution to GDP and manufacturing value added.

The importance of apparel and footwear manufacturing for women's employment is highest in Romania. In 2019, the sector employed 279 thousand workers, significantly lower than the 2008 level (430 thousand), a downward trend also reflected in the industry's share of manufacturing value added and contribution to GDP. The share of women in the industry's employment remained stable throughout the period, at roughly 83 per cent. This is nearly double women's share in total employment, 42.9 per cent, and their share in manufacturing, 42 per cent. Apparel and footwear employed one-third of all women working in manufacturing in Romania in 2019, relative to 5 per cent of men. In relation to total employment, in 2019, apparel and footwear responded for 6.1 per cent of working women and 1 per cent of the male workforce.

In sum, women are overrepresented in apparel and footwear production, with employment shares ranging from 56 per cent in Mexico to 83 per cent in Romania – between 11 percentage points (in Spain) and 39 points (in Romania) higher than their share in national employment (figure 6). In some countries, like Spain and Mexico, as apparel and footwear employment contracted, so did women's share in the industry. In others, women's shares remained stable despite a contraction in the number of persons employment in the industry, the case in Germany and Romania. Indonesia was the only country where apparel and footwear employment increased in recent years, a trend accompanied by a slight decline in women's share, despite the absolute increase.

Looking at apparel and footwear separately, it becomes clear that apparel is a bigger employer, in line with trends in exports and value added. It accounts for 74 per cent of the industry's employment in Indonesia, 72 per cent in Mexico and Germany, 71 per cent in Romania, and 54 per cent in Spain. Although apparel remains prevalent, its share of sectoral employment has been declining in all countries. Moreover, women are particularly overrepresented in apparel, where value added per worker is lower than in footwear manufacturing. In Indonesia, women's share in apparel was 63 per cent, about 12 points higher than their share of footwear employment. In Romania, while 87.2 per cent of apparel employment was comprised of women, the share was 69.5 per cent of footwear employment. The difference was even higher in Mexico, where women accounted for 64.6 per cent of apparel employment in contrast to 34 per cent of footwear's. Similarly, in Spain and Germany in 2019, women's share in apparel (69.6 per cent and 73.8 per cent, respectively) were much higher than their share in footwear (44.9 per cent and 57.6 per cent).

Figure 6. Women are overrepresented in apparel and footwear employment, 2019 or latest



Note: Apparel and footwear refer to ISIC Rev. 3 groups 14 and 15. Indonesia (2015).
 Source: Estimates based on employment data from ILOSTAT database, “Employment by sex and economic activity - ISIC level 2 (thousands)”, accessed 30 July 2021.

Data on earnings at the industry level are limited, however, manufacturing earnings can give us a sense of the range of wage levels across countries and gender wage gaps in manufacturing provide an indication of those that can be expected in the apparel and footwear industry. As expected, average monthly earnings of employees were higher in Germany (\$5,573 overall and \$6,024 in manufacturing in 2019) and Spain (\$2,815 overall and \$3,240 in manufacturing in 2018) than in Indonesia (\$385 overall and \$351 in manufacturing in 2015), Mexico (\$616 overall and \$639 in manufacturing in 2019) and Romania (\$2,517 overall and \$2,184 in manufacturing in 2019).² The ratio of women’s to men’s average earnings in manufacturing was about 0.8 in all five countries, while the national gender ratio ranged from 0.79 in Spain to 0.98 in Romania. Where there were differences in the ratio – in Germany, Indonesia, Mexico and Romania – the gender gap was greater in manufacturing than in the rest of the economy. Still, in Germany, Spain and Mexico, average monthly earnings of female employees in manufacturing surpassed those of the economy overall. Conversely, in Indonesia and Romania, average monthly earnings were higher for women employees generally than in manufacturing. Available industry level data for hourly earnings in Mexico indicate that the gender gap for employees in apparel and footwear is in line with that in manufacturing.

2.4 COVID-19 impacts

As mentioned previously, the COVID-19 pandemic has had significant impacts on the global economy and garment industry. The industry, and workers, in the project countries have not been immune to the global crisis.

In Mexico, in March 2020, business closures and restrictions on the movement of people were set in place to address the global pandemic. Several labour market indicators worsened, with greater unemployment, underutilization and inactivity (Feix 2020). In June 2020, unemployment had reached 5.5 per cent, and workers’ underutilization surpassed 20 per cent (Feix 2020). Between May and July, it was estimated that over 1.1 million formal jobs had been lost, this is to say that in five months of 2020 more formal jobs were destroyed than were created in all of 2019 (Feix 2020). By the end of April 2020, according to the Cámara Nacional de la Industria del Vestido (CANAIIVE), sales had declined 95 per cent (Rodríguez Ceballos 2020). It has been reported that by the end of 2020, the annual contraction in apparel manufacturing had been 34.4 per cent (Alegría 2021). Another report indicates that between May 2019 and 2020, 350 firms closed and 36,000 jobs were lost

² Mean monthly earnings of employees in 2017 PPP \$. Data refers for the latest available year for each country. Source: ILOSTAT, accessed 30 July 2021.

in the apparel industry (González 2020). In April 2019 alone, 12,000 jobs were lost in the footwear industry when economic activity was 87 per cent lower than in the same period of 2019 (González 2020).

Indonesia did not impose a general lockdown like many other countries; rather, some social restrictions were imposed in the country on a provincial basis (Lowell Jackson, Judd, and Viegelahn 2020). Still a survey of 216 Better Work (BW) factories in Indonesia in May 2020 found that 28 per cent of firms faced a reduction or hold on their orders, 18 per cent of them had orders cancelled altogether, while 24 per cent faced shortages in supplies and raw materials (Lowell Jackson, Judd, and Viegelahn 2020). Around 70 per cent of BW factories were closed for less than one month and firms reported losing about \$70 million in lost or delayed business. Firms proceeded to furlough and layoff workers without any agreement with unions and 40 per cent of furloughs were unpaid or at reduced pay, which was often lower than half the regular wage (Clean Clothes Campaign 2020, p.21). Just for the months of March to May 2020, Clean Clothes Campaign estimated that \$4 million were owed to workers in wage payments (Clean Clothes Campaign 2020, p.22). There were also reports of mandatory overtime work and an increased cost burden for workers who were required to purchase face masks and sanitisers and pay for their own Covid-19 tests if they became ill (Johnson 2021). The Indonesian government did offer cash aid to workers who were laid off if they completed online training programmes but apparel workers were not among the priority beneficiaries. It was also hard for workers without smartphones and internet connections—often the poorest—to access the programme (BHRC n.d.).

The Romanian apparel and footwear industry witnessed a 40 per cent cut in orders since the start of the pandemic and production capacity at factories was reduced by 30 per cent due to massive layoffs (Fair Wear 2021b). There were delays in procuring raw materials and accessories from China early in the pandemic and the restriction of transport links with Italy, and closure of Italian firms, had a major impact on the apparel and footwear industry for which Italy is the main trading partner (Fair Wear 2021b). Where employees were not laid off, reports emerged of workers receiving only part of their monthly salaries as well as of other violations of workers' rights, such as intimidation, harassment and non-payment of overtime and social insurance contributions (Sanders 2020). The government took various steps to address the impacts of COVID-19 though there were no targeted schemes for apparel and footwear. These included the institution of wage replacements for workers temporarily laid off or who were not able to work as a result of the pandemic, tax deferrals, loan guarantee and subsidized interest rates to small and medium enterprises, among other measures (SETU 2020; Fair Wear 2021b)s. The apparel and footwear industry has yet not recovered, and factories are struggling to keep business going (Fair Wear 2021a).

Reports of COVID-19 impacts on the textiles, apparel and footwear industry in Spain indicate that the economic impacts of the global pandemic on the sector were greater than those on the Spanish economy overall – whereas 79 per cent of textiles, apparel and footwear companies maintained operations in September 2020, the share in the total economy was nearly 83 per cent (De Angelis 2021). The report indicates that firms in the textile sector withstood the crisis to a greater extent than those in apparel and footwear manufacturing. About 21 per cent of apparel manufacturing firms with at least one employee stopped activities as a result of COVID-19, the share in the footwear sector was higher, 40 per cent. Unemployment is declining but has been persistent. A news article from May 2021 indicates that although the level of unemployment in textiles, apparel and footwear has been declining and was, at the end of the first quarter of 2021, the lowest number since the onset of the pandemic, it has not yet reached the pre-pandemic levels of February 2020 (Modaes 2021).

Although we were unable to find any studies focusing on the impacts of COVID-19 in the apparel and footwear industry in Germany, a wealth of information is available in company annual reports. Information from selected company annual reports for 2020 addressing COVID-19 impacts, including impacts on these companies' supply chain where such information is available, indicate that impacts were severe and quick (Adidas 2020; Hugo Boss 2020; Puma 2020; Zalando 2020). This includes the temporary closure of company stores and other points of sale. All of these firms had to adapt operations in order to secure the health and safety of workers, while striving to minimize negative business impacts and manage their relationships with suppliers.

2.5 Strategies and policies for the future of work and apparel and footwear

Technological progress is a constant through history, and often incremental rather than disruptive. It is not, however, without challenges and its impacts are invariably uneven across economic sectors and groups of workers. Countries often use industrial and sectoral strategies and policies to manage and facilitate structural change and transitions in employment. The next paragraphs outline some of the main plans and initiatives that the five countries in this project have developed to guide the ongoing transformation of economies and the world of work.

In November of 2019, Germany launched a new industrial strategy, titled “Industrial Strategy 2030” aimed at strengthening the competitiveness of the industrial sector in Germany and Europe (BMW 2019). The Strategy is structured around three pillars, namely improving the overall conditions for entrepreneurship, mobilizing private capital to strengthen new technologies, and protecting technological expertise. Several measures outlined in the document are particularly relevant regarding employment and technological innovation. This includes, among others: reducing bureaucracy; making corporate taxes competitive; expanding infrastructure; securing raw material supply and promoting a circular economy; promoting investments in technologies (including improving access to financing); activating the value creation potential of digitization in the areas of artificial intelligence, Industry 4.0, sovereign and trustworthy data infrastructure, digital platforms and mobility of the future; as well as capping social security contributions, making the labour market more flexible and mobilizing skilled labour. One issue of possible concern is that making the “labour market more flexible” can mean weakening protection for workers, depending on the specifics of the labour market policies. Germany’s Industrial Strategy 2030 calls for the European Commission “to present a comprehensive and long-term EU industrial strategy with concrete measures.”

Industrial policy guidelines for Spain to 2030 include the objectives of reindustrializing the economy and transforming industry to adapt to new technologies and greater international competition, and at the same time promote environmental sustainability (Ministerio de Industria, Comercio y Turismo 2019). Ultimately, industrial policy in Spain, like elsewhere, aims at improving productivity and international competitiveness, as well as increasing industry’s contribution to GDP and employment. However, in Spain, public initiative has been limited and industry’s contribution to GDP, including that of apparel and footwear, has declined. Spain has a national strategy for industry 4.0 since 2015, named “Estrategia Nacional IC 4.0”, to support the modernization of processes, products and business models (Ministerio de Industria, Comercio y Turismo n.d.). The strategy aims at increasing value-added and skilled employment in the industrial sector, increase competitiveness and foment exports. In regard to the apparel and footwear industries specifically, a 2019 publication with guidelines for the development of Spain’s industrial policy to 2030 indicated that sectoral agendas were being developed for various industries, including textiles and apparel (Ministerio de Industria, Comercio y Turismo 2019). A preliminary report of the national strategy for industry 4.0 included an appendix profiling the textiles, apparel and footwear manufacturing, logistics and retail sector, including challenges and priorities for the digital transformation. It highlighted that it is hard to compete with labour costs from lower-income countries, but that there may be niche markets for Spain such as bridal, footwear and leather goods (*marroquinería*) manufacturing. In contrast, logistics and design have thrived in Spain (e.g. Inditex). Challenges identified in this report included ensuring flexibility in production, quickly responding to demand, customized offers and others.

The Indonesian Ministry of Industry launched a strategy in 2017 called “Making Indonesia 4.0” intended to serve as a roadmap to implement Industry 4.0 technologies to increase automation, expand exports, raise labour productivity and revitalize the manufacturing sector (BKPM n.d.; Kementerian Perindustri n.d.). The strategy was intended at addressing premature deindustrialization in the country and feed into the government’s vision of making Indonesia one of the world’s ten largest economies by 2030. It was prepared with assistance from the consulting firm AT Kearney.³ The new strategy

³ See <https://www.kearney.com/operations-performance-transformation/indonesia-4.0-the-transformation-opportunity#:~:text=The%20Making%20Indonesia%204.0%20roadmap.more%20than%2014%20million%20people> for more information and videos on the strategy.

focuses on the early application of industry 4.0 technologies in five key industries, namely food and beverages, automotives, electronics, chemicals and textiles (including apparel and footwear), and intends to drive greater domestic and foreign investments to them through the Indonesia Investment Coordinating Board (BKPM). The strategy envisions the application of five technologies – internet of things, artificial intelligence, human-machine interface, robotic and sensor technology and 3D printing – across value chains rather than only in the production process. The roadmap envisages spending 2 per cent of GDP on research and development annually and involves a range of stakeholders including government institutions, businesses, industry associations, technology providers and research and educational institutions (Kementerian Perindustri n.d.).⁴ It should be noted that the stakeholders mentioned do not include labour unions or employee associations. Regarding the clothing industry, the strategy aims at increasing productivity in manufacturing and labour through the application of technology, optimizing factory locations and improving skills. The government has introduced a “super tax deduction” for greater investment in R&D, innovation and technical and vocational educational training (Prospera and AlphaBeta Advisors 2019). It is also focusing on building science, technology, engineering and mathematics (STEM) skills in the population by overhauling the curriculum to meet the needs of industry, improving the quality of education and building new polytechnic universities (Kementerian Perindustri n.d.; A.T. Kearney 2018). The Industry 4.0 strategy was to be implemented starting in 2018 with the setting up of industry-specific task forces that would contribute to a master plan (Kementerian Perindustri n.d.). More research is needed to examine whether and in what way this policy initiative is being implemented.

In Mexico, the “Programa de Desarrollo Innovador 2013-2018” established the goal of facilitating access to innovation and technologies to foment productivity in mature industrial sectors (including textiles and apparel), lowering costs, increasing efficiency and competitiveness, and improving human capital. In December 2014, the government published a decree establishing measures to support productivity, and competitiveness in the textile and apparel sectors (INEGI and CANAINTEX 2020). The decree outlined, among others, measures to facilitate access to finance, to support innovation and greater integration in value chain and capacity building (Diario Oficial de la Federación 2014). It also focused on the need to address unfair imports, priced below real values. Towards the end of 2019, the Mexican Government announced a new industrial policy which aims to, among others, foster competitiveness, strengthen supply chains, improve the business environment to attract greater (foreign and domestic) investment and encourage the digitalization of manufacturing and Industry 4.0 (Secretaría de Economía 2019).

No information was found on specific industrial or technology policies instituted by the government of Romania for the apparel and footwear industry.

⁴ It should be noted that the report is published in the Indonesian language only. Google translate was used to read its contents.

► Summing up and next steps

New technologies have the potential to change how products are made, services are provided and supply chains organized and managed. Still, the future of the apparel and footwear industry and its workers depend not only on the availability of technologies but its affordability relative to labour, business models, the availability of workers, skills, infrastructure, logistics, trade policies and the broader institutional context in which production takes place. Change is most often incremental rather than a sudden radical transformation, and although some technological advances have been made, challenges remain. In this context, new and old production systems in apparel and footwear manufacturing are likely to coexist in the short to medium-term, suggesting the opportunity, today, to shape a future that promotes quality jobs and protects people.

The apparel and footwear industry has been an important source of employment opportunities, particularly for young women in low and middle-income countries. As a source of wages, the sector has been a strong contributor to women's economic and social empowerment. Where this work takes the form of formal wage employment, it is also associated with access to improved legal and social protection. But for many workers, employment in apparel and footwear remains informal, insecure and unprotected. Moreover, poor labour standards and working conditions are well documented.

In this context, a central concern for the future relates to the potential acceleration of technological upgrading and the adoption of automation, and associated impacts on jobs in apparel and footwear manufacturing. More specifically, and particularly for developing regions where the industry is characterized by labour-intensive processes, a key issue relates to the potential defeminization of the workforce which often accompanies increases in capital intensity and productivity (Kucera and Tejani 2014; Tejani and Kucera 2021). Another critical question is whether the decent work deficits and gender gaps which characterize the industry today will be exacerbated by technological upgrading or whether developments in the industry hold promise towards greater gender equality, and how best to harness this potential and capitalize on change.

Prospects are different across the supply chain, and the question of automation is closely linked to the geography of production and structure of production networks. Countries fit differently within it, including the countries in this project. On the one hand, Germany and Spain largely host lead firms, which design, market and sell garments and footwear, offshoring and largely outsourcing production. On the other hand, Indonesia, Mexico and Romania host apparel and footwear manufacturing, including for external markets.

A brief overview of key economic and employment indicators helps set the stage for future project research. Trade data show that Germany and Spain account for large shares of global exports today. Indonesia is, likewise, a large exporter with a global share increasing between 2010 and 2020, but lower today than in 2000. Mexico and Romania saw their share of global exports contract. These trends are indicative of the current state of the global industry, but a closer examination, particularly of trade in terms of value-added is needed. Regarding employment, between 2010 and 2020, the apparel and footwear workforce contracted, in absolute terms, in four of the five countries under study. Indonesia is the only country where employment expanded. This is to say that employment and share of global exports moved in the same direction (down) for Mexico and Romania, while for Germany and Spain, employment contracted despite an increase in these countries' share of global apparel and footwear exports. In this regard, future research should investigate whether, and to what extent, gains in productivity are associated with automation technologies.

The size of the apparel and footwear industry is markedly different across the countries under study, as is the importance of the industry in manufacturing and total employment. Women's preponderance is, however, marked throughout. Critically, access to and benefits from participation in employment in global supply chains including that of apparel and footwear are closely related to gender issues, with different opportunities available to women and men as a result of gender-based segregation across and within industries, social and cultural constraints (Bamber and Staritz 2016). A good deal of attention has been devoted to studying the impacts of technological upgrading and automation on employment. Many acknowledge that these outcomes are uneven, varying across regions of the world, economic sectors, as well as

amongst groups of workers, including women and men. Yet there is little evidence on the processes behind these outcomes and, in particular, why they seem to further reinforce rather than alleviate gender inequalities.

The main goal of this research project is to gain a better understanding of how processes of industrial automation (in particular those using digital technologies) interact with local social structures, cultural norms (including gender norms) and institutional systems (including educational systems) in selected European and non-European countries, in the context of the apparel and footwear global supply chains. In particular, the project seeks to shed light on issues related to technological impacts on the organization of the global value chains, including work organization, flows and processes, working conditions, and the occupational composition and job profile of workers, as well as implications for the number of workers and composition of the workforce, particularly the gender balance in the industry. To this end, this desk research will be complemented by case studies based on qualitative data collection through semi-structured interviews with employers, managers, factory workers, and other key informants. This research aims to improve the knowledge base on the employment impacts of automation, particularly differences amongst women and men, to inform social dialogue and employment policies towards workable and sustainable solutions to some of the key challenges related to the future of work.

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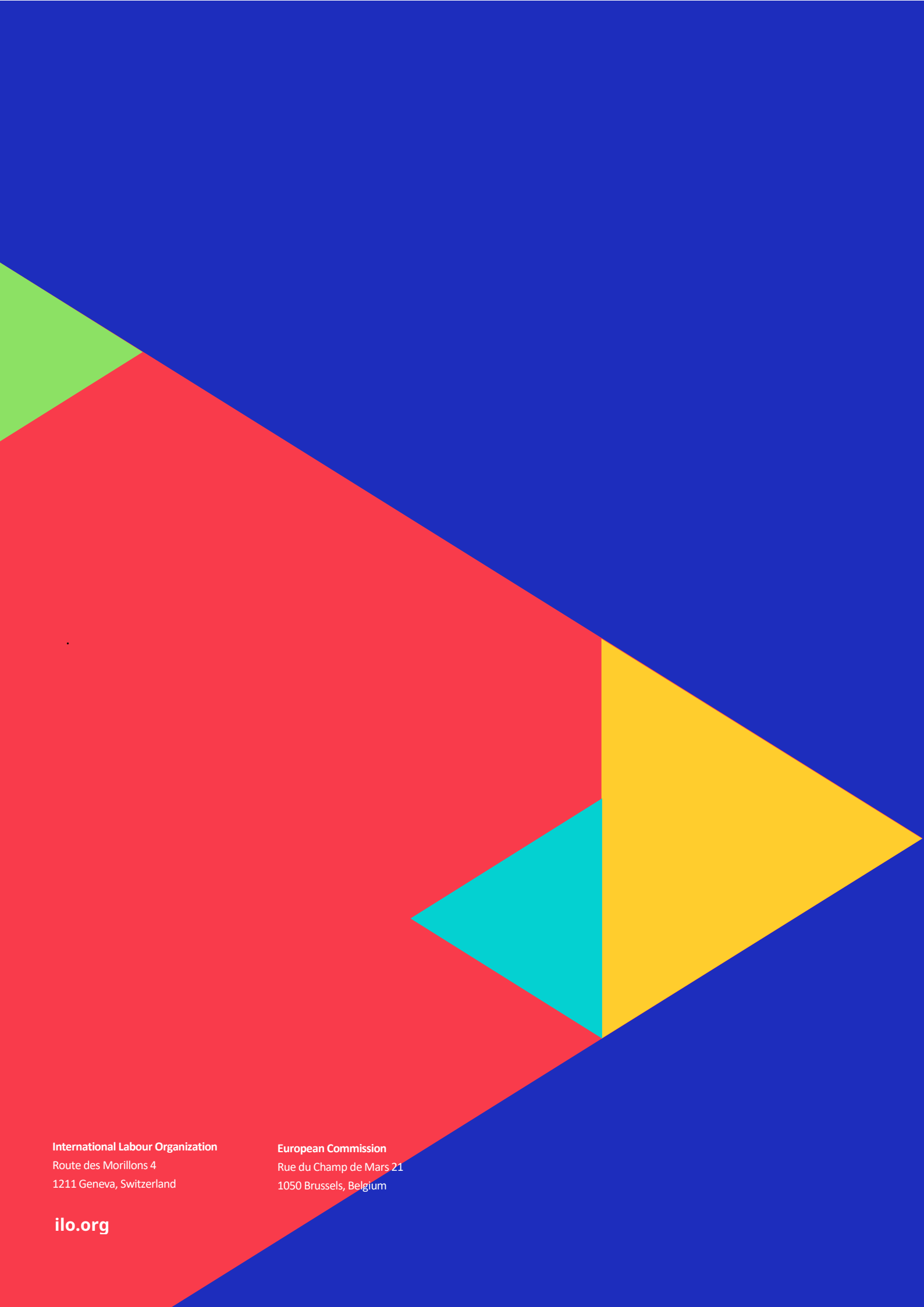
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