▶ Technical workshop on the effects of automation in the apparel and automotive sectors and their gender dimension

Meeting report

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Technical workshop of the joint EU-ILO project "Building Partnerships on the Future of Work"

15 April 2021

▶ Background and objectives

The *Technical Workshop on the Effects of Automation in the Apparel and Automotive Sectors and their Gender Dimension* was held online on 15 April 2021.

The Workshop was the first technical meeting held under *Research Activity N.2* of the International Labour Organization (ILO) and the Joint Research Center of the European Commission (EC-JRC) project "Building Partnerships on the Future of Work", funded by the European Union (EU). This research activity aims at building new knowledge and informing future evidence-based policies addressing the effects of automation technologies in the apparel and automotive sectors on employment and their gender dimension. More specifically, the main goal of this research activity 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 EU and non-EU countries, in the context of global supply chains.

To this end, this technical workshop brought together the research teams from the ILO and the JRC, colleagues from the EC and the ILO, and external experts to discuss the conceptual framework and research design of this project.

Meeting objectives included:

- Present the project and its conceptual framework;
- Listen and learn from the research of selected subject matter experts; and
- Discuss research design and next steps for the ILO-JRC research on automation in the apparel and automotive sectors, and its gender dimension.

More specifically, points for discussion included:

- Production stages and different technologies in relation to labour impact (employment, tasks, work organization);
- Different business models' implications for technology adoption and impacts on employment and labour conditions; and
- How to tackle the gender dimension within the automotive and garment sectors.

▶ Notes on the proceedings

Introductory remarks

Ms. Sukti Dasgupta and Mr. Enrique Fernández-Macías opened the meeting with notes on the project and its objectives, background concepts and definitions, and points for discussion.

Motivation and goal

- There are several forces transforming the world of work, with implications for job opportunities, transitions and job quality, amongst other issues. Changes have been accelerated by the COVID-19 pandemic - with particularly severe impacts on women workers – and decisive and prompt action is critical to shape the future of work we want. The nature of these transformations imply that no single national or regional strategy would be sufficient, but rather that a coordinated global effort is necessary.

- Research and knowledge development are needed to inform social dialogue, build capacities of national and regional counterparts, and support the design of policies towards workable and sustainable solutions to key challenges related to the changing nature of work, from both an EU and global angles. The research will focus on the automotive and apparel sectors in five countries, namely Germany, Romania, Spain, Mexico and Indonesia, with an additional study on the automotive sector in South Africa.

- The main goal of this research project is to better understand the effects of industrial automation in the apparel and automotive sectors, including how different categories of workers are affected, with particular focus on gender dimensions. It will strive to understand how technologies interact with different local social structures, cultural norms and institutional systems, in the context of global supply chains.

- The project will enable the EU and the ILO to reinforce alliances with each other and other international and multilateral actors, non-EU countries and social partners in the area of future of work.

Project design

- This research project will encompass the collection and analysis of information on economic and production processes, the use of technologies in the automative and apparel industries in the five countries, and the employment composition and characteristcs in each industry-country pair. Gender aspects will be mainstreamed throughout.

- The apparel and automotive industries were chosen due to their relevance and integration in global supply chains, while at opposite ends of the spectrum in terms of use of automation technologies and women's representation. The automotive sector is male-dominated and at the forefront of automation. Conversely, production processes in apparel manufacturing remain much more traditional and labour-intensive, particularly reliant on workers for sewing activities, and the industry is highly feminized.

- The study was designed such that gender emerges as a significant factor in terms of the implications of automation for employment, partly due to the contrasting profiles of the automotive and apparel industries. A key question of the project is: why is there a gender bias in employment which seems to be linked to automation?

- The goal is to have two case studies per country per sector to allow for variation in business models, with the workplace/factory as the unit of analysis. The research design will exploit two sources of heterogeneity across sectors, comparing business models within and across socioeconomic (country) contexts.

- The analysis will explore the impacts of automation on the task content of jobs and work organization (social relationships). The purpose is to look at how all these factors are affected by automation but also, at the same time, how different work organizations affect or drive the incentive to innovate as well as to introduce and adopt automation processes.

- The next step in the research process is desk research aimed at reviewing general automation developments in these industries as well as country and firm specific information, including employment and trade patterns, and

firms' marketing, investment and location strategies in addition to technological developments. Later, interviews with workers and employers in selected lead and supply firms will inform in-depth case studies.

- Altough the project is focused on automation it will not strictly exclude other processes such as digitization and platformization.

Concepts and definitions

It is importat to clearly define concepts to ensure precision in the research project.

- Automation can be defined as the replacement of labour input by relatively autonomous machine input for the performance of some types of tasks in production and distribution processes. Automation is equivalent to the dependent variable in this project.

- Within this broader concept of automation, one can more specifically refer to robotization and mechanization, which are related but not interchangeable concepts. Robotization is a particular type of automation involving robots, very precisely defined as ISO 8373:2012. Mechanization relates to any kind of technology implemented in production that replaces labour input and has some degree of autonomy but does not qualify as a robot. These definitions are important because while there are many robots in car manufacturing, technologies used in the garment sector more readily fit within the concept of mechanization.

- Productivity-enhancing technical change is defined as the introduction of any tools and machines which increase the productivity of labour in production. Automation is one kind of productivity-enhancing technical change.

- Digitization and platformization are strongly linked to automation in practice but remain analytically distinct and, unlike automation, do not require replacement of labour input. Digitization relates to the use of sensors and digital devices to translate parts of the physical production process into digital information (strings of bits), and vice-versa. Platformization relates to the use of digital networks to coordinate work processes in an algorithmic way.

- Three main concepts of work organization will be investigated. First, authority in terms of direct and personal control and forms of command. Second, workers autonomy in establishing working times, pace of work, breaks, etc. Third, the concept of routine, looking at tasks, repetitiveness as well as standardization, which is considered an indirect form of control.

Automotive industry

Ms. Marta Fana, moderated the automotive section of the workshop. She opened the section with a contribution about the project's design, concepts and definitions. This was followed by presentations by Mr. Krzywdzinski and Mr. Andreoni, and an open discussion.

Mr. Martin Krzywdzinski is the head of the research group "Globalization, Work and Production" at the WZB. He presented one of his latest papers looking at automation trends comparing the US, Japan and Germany. Key points from his presentation include:

- Many processes in the automotive production have been automated for a while, what is increasing is the complexity of automation technologies as a result of technonological progress and changing requirements such as those related to auto safety and sustainability. Overall, change is small and gradual, and largely in already highly automated areas. Assembly is an exception, with limited automation to date.

- The emergence of electromobility could be (but is not yet) a game changer. Simpler powertrains could allow for an increase in the automation of assembly processes. Together with electromobility, autonomous driving is changing hiring and processes in companies as well as occupational structures.

- Efforts related to Industry 4.0 are often related to digitalization to increase efficiency in product and process development, which is increasingly the most expensive part of the production, as cars are getting more complex. This has different employment implications from automation, as workers are needed to run simulations and so on.

- There are issues related to the measurement of automation. First, examining robot intensity can be mislieading given that changes are observed in the complexity instead of volume of machines. There are also limitations to

the analysis of occupation statistics, especially in regard to cross-country comparability and time series analysis at a disaggregated level. There is also no real indicator of skill level available to assess trends in up- or de-skilling. Finally, analysing the task content of jobs can be misleading because even tasks that are classified as highly routinized actually involve a lot of non-routine activities. The feasibility of automation is much more dependent on process complexity which can relate to different factors like variety of products, product variants, number of parts, number of machines or processes involved.

- In Germany, white-collarization of the automotive industry did not take place at the expense of production employment. Rather than employment losses, there was a shift toward high-tech with increasing employment in the fields of engineering and computer science. In addition, manual assembly work remained resilient even though it has a nearly 98% probability of being automated according to the Frey and Osborne classification. There was also no significant reduction in manual work within blue-collar jobs.

Mr. Antonio Andreoni is Head of Research at the UCL Institute for Innovation & Public Purpose (IIPP). He focused on digitization and automation of processes across business models in the automotive industry. Key points from his intervention include:

- Automation is not a new phenomenom. Indeed, it is not the individual technologies that are new but rather the way in which they are fused and integrated that makes them revolutionary.

- It is critical to understand that changes at the shop floor level and the organization are complimentary and interdependent. Examining the country context, and the business and infrastructure environment is critical, particulalry in a comparative approach. For instance, energy supply has been an issue for energy-intensive industries in South Africa.

- The choice of technologies is very much the result of a process of technological and organizational integration at firm level. Two drivers of automation should be considered: structural drivers related to technical feasibility, engineering, the features of technologies and of products; and economic drivers related to the economic opportunity that the technology offers, linked to issues such as capital investments, production volumes, retroffiting factories and redesigning production processes, and so on.

- One can have a better sense of how companies are automated and robotized by simultaneously looking at the organization, the technology and the product characteristics.

- Mr. Andreoni and his team found striking differences, within South Africa, in terms of how robotization was used comparing Japanese and German manufacturers.

- Key issues to consider in designing the project and selecting case studies include, among others: identifying the type of automation observed, its functional area and relationship with employment; comparability across factories and OEMs; whether and how to include tier-one suppliers closely integrated with OEMs.

The presentations were followed by an open discussion. Discussion points included:

- Industrial relations, collective bargaining and social dialogue must be considered in the research of automation adoption and employment impacts.

- The focus on issues related to employment quality was welcomed, and it was highlighted that automation impacts will be uneven across groups of workers.

- Automation is a gradual process; there will not be a radical jump of automation levels in the short term.

- Care should be taken when selecting companies: different product strategies and different organizational cultures (also different labour relations) lead to different strategies regarding automation of OEMs. It might be helpful to try to compare the same companies (with comparable products) in the various countries.

- In terms of gender, it was remarked that there is some selectivity in educational systems, with fewer women going into engineering/technical tracks of both vocational education and university education. So, it might be good idea to include the educational system in the analysis.

Apparel industry

Ms. Valeria Esquivel moderated the apparel section of the workshop and introduced Ms. Sheba Tejani and Mr. David Kucera who presented findings from previous research and the conceptual framework and scope of the ILO-JRC research.

Ms. Tejani is an economist and lecturer in international development at the University of Birmingham and Mr. Kucera, is a senior economist at the ILO Employment Department.

- Previous research indicates that there is significant variation in trends of feminization and defeminization of employment in the apparel industry, which does not always follow the trend observed in manufacturing employment overall. At the same time, Ms. Tejani and Mr. Kucera found a systematic negative relationship between women's share in manufacturing employment and labour productivity between 1990 and 2014 in 12 countries.

- Several questions emerge from these findings: what accounts for differences across industries and countries? How do we interpret these differences? Why are women not preferred for technically advanced jobs? Why are they retained in some cases but not others? Either women are not hired (automotive industry) or women are not retained when upgrading occurs (garment industry). Several hypotheses have been put forth in literature, largely related to gender norms and stereotypes

- An additional question for this research relates to how to map categorical distinctions onto a division of labour in practice, including not only gendered sectors but also processes and tasks.

- Analyses relying on supposedly routine tasks would suggest work in apparel is highly automatable but, in practice, very little automation is seen in many parts of the industry due to technological and/or economic feasibility. There are also differences in terms of full- and semi-automation (analogous to co-bots).

- The ILO-JRC research will focus on apparel and footwear sewing and fabric handling as well as 3D printing with an effort to focus on processes and products where there are some observable developments regarding automation.

- Several questions still need addressing, including firms' selection process, whether "extreme case" sampling is the best suited strategy, the inclusion of technology producing firms and industry associations in the study as well as how to best address sensitivities regarding current and prospective investment strategies and links between automation and job loss. Another concern relates to the possibility of addressing workers who have experienced job loss due to automation, such as through interviews with workers' organizations, employment agencies or other key informants.

After the initial presentation, Ms. Esquivel presented the first of the two invited discussants, Mr. Mark Anner. Mr. Anner is professor of labour and employment relations and director of the Center for Global Workers' Rights at the Pennsylvania State University. Key points from his intervention include:

- There is some technology in the apparel sector. Most garments today are made by women operating sewing machines, which has been the case since the 1850s.

- In the past decades, a move from cut-make-trim towards full package operations brought in more male workers, such as the cutters who also sorted the fabric.

- Automation is seen *around* the final assembly.

- Automation has been slow largely due to the pliable nature of cloth and the quickly changing nature of fashion – which would require automated machinery to be recalibrated frequently. Another factor relates to the low wages and low unionization rates, indicating limited cost incentives to automation.

- Reflecting on the future, several technological upgrading processes (including digitization, big data analytics, artificial intelligence and others) are interrelated, and digital technologies have been gaining space. Digital technologies are an additional (or alternative) avenue for firms to increase speed to market and lower inventories, critical automation drivers.

- Other drivers for technology upgrading that may help understand future trends include hyper competition, buyer consolidation, environmental sustainability, human rights due diligence, and COVID-19, which increased the importance of forecasting and digitization.

- It is critical to examine not only how technologies affect production processes but also work intensity and jobs which may be indirectly impacted by automation, through changing expectations in regard to work intensity and quality. Home-based and informal workers are also impacted by automation.

- Concerning the project design, several points should be considered: firms of various sizes, degrees and types of automation could be selected for case studies; cases of "automation around the edges" (as technologies advance elsewhere in the supply chain) related to indirect changes to assembly workers whose jobs are not automated are also important; government representatives, technology producers and industry associations may provide information complementary to that collected from workers and employers.

The next intervention was delivered by Ms. Arianna Rossi, senior research and policy specialist in the ILO-IFC Better Work programme. Ms. Rossi provided comments on the project design:

- The key research question on why there is a gender bias in employment linked to automation and the focus on the automotive and garment industries, is both original and fundamental.

- A lot of the automation technologies are yet to be implemented in the apparel industry and thus gender biases preceding technological upgrading merit attention. Possible questions that can speak to the overarching research objectives do not necessarily explicitly mention automation, but by understanding the answers to these questions, one can draw conclusions about it.

- It is important to focus on uncovering biases and stereotypes from both managers and workers perspectives, i.e. those demanding and supplying labour. On the labour demand side, potential questions include perceptions on the recruitment and promotion of workers, such as which worker profile management is interested in recruiting and supporting in career paths in their factories. On the labour supply side, workers can be asked about their aspirations, growth prospects, desire to learn new skills, as well as how these issues intersect with unpaid household and care work. Such questions would reveal layers of intrinsic and systemic barriers that, particularly, women workers face and that preempt the moment automation comes into the factory.

- Care is needed to avoid veering towards questions that may make more sense for the automotive industry where technology is widely used, but that may not be so applicable to the reality of the garment industry.

Ms. Esquivel thanked Mr. Anner and Ms. Rossi for their remarks. She quickly reacted to the presentations before opening the floor for discussions. Key discussion points included:

- It is crucial to investigate the underlying structure of employment that results in such (persistent) unequal gender outcomes, leading to women's exclusion from the most dynamic and well-paying jobs.

- The issues raised by Ms. Rossi highlight that some of the key hypotheses of this research can be addressed even in the absence of automation.

- The sector is rapidly changing, affected by COVID-19, the regionalization of supply chains and a push for environmental sustainability, among other factors. These also influence automation decisions.

- On the one hand, there is not yet much automation in garment manufacturing. On the other hand, one could argue that there is not much automation happening in the automotive sector either, because automation processes happened some time ago. And this may be precisely why examining these two sectors is valuable, with the possibility of analyzing impacts of levels of automation.

- There is a need to be clear about definitions to be precise in the research (e.g. mechanization vs automation) but not necessarily use narrow concepts like robotization. Digitization, which is just as if not more prevalent than automation, warrants analysis. Precision is also critical in terms of the work processes under examination and type of automation.

- Nearshoring and reshoring go together with automation, reducing the importance of labour cost, but there has been limited action on this front because production often takes place where there is a cluster of industries, including fabric, buttons, zippers, thread and so on. If the cluster is not present near the factory site, logistics (and forecasting) remain a challenge.

- In addition to asking about impacts of automation and why there are changes, we need to also focus on understanding why we do not see change in some instances. One should not assume that automation will necessarily happen in the garment sector.

▶ Participants list

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