



UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION



INCLUSIVE AND SUSTAINABLE  
INDUSTRIAL DEVELOPMENT:  
THE GENDER DIMENSION

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Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process.







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|   |    |
|---|----|
| List of abbreviations   | 2  |
| Executive summary   | 4  |
| 1. The gender equality-industrial development nexus                                 | 9  |
| 1.1. Inclusive and sustainable industrial development (ISID) and why gender matters | 9  |
| 1.2. A two-way relationship   | 10 |
| 1.2.1. From industrialization to gender relations                                   | 13 |
| 1.2.2. From gender relations to industrialization                                   | 15 |
| 2. Gender patterns in manufacturing employment                                      | 20 |
| 2.1. Regional patterns over the last few decades: feminization and defeminization   | 20 |
| 2.2. Selected country cases   | 25 |
| 2.3. Gender and ISID-related indicators, data and gaps                              | 37 |
| 3. Looking ahead: the new industrial revolution and gender equality                 | 42 |
| 3.1. Emerging trends in industry  | 42 |
| 3.2. Gender implications: new challenges and opportunities                          | 43 |
| 4. Policy lessons for gender-equitable ISID   | 48 |
| References  | 54 |
| Annex 1: Country Profile Statistics Notes   | 59 |

# List of abbreviations

|             |  |
|-------------|--|
| <b>ACET</b> | African Centre for Economic Transformation             |
| <b>ATC</b>  | Agreement on Textiles and Clothing                     |
| <b>EU</b>   | European Union   |
| <b>GDP</b>  | Gross Domestic Product                                 |
| <b>GTP</b>  | Growth and Transformation Plan                         |
| <b>ICT</b>  | Information and Communication Technology               |
| <b>IDR</b>  | Industrial Development Report                          |
| <b>IFC</b>  | International Financial Corporation                    |
| <b>ILO</b>  | International Labour Organization                      |
| <b>IR</b>   | Industrial Revolution                                  |
| <b>ISDS</b> | Institute for Social Development Studies               |
| <b>ISID</b> | Inclusive and Sustainable Industrial Development       |
| <b>KILM</b> | Key Indicators of the Labour Market                    |
| <b>KT</b>   | Kucera and Tejani                                      |
| <b>LFS</b>  | Labour Force Survey                                    |
| <b>MENA</b> | Middle East and Northern Africa                        |
| <b>MVA</b>  | Manufacturing Value Added                              |
| <b>NGO</b>  | Non-Governmental Organization                          |
| <b>NIC</b>  | Newly industrialized Country                           |
| <b>OECD</b> | Organisation for Economic Co-operation and Development |
| <b>QIZ</b>  | Qualifying Industrial Zone                             |
| <b>SDG</b>  | Sustainable Development Goal                           |
| <b>SME</b>  | Small and Medium Enterprise                            |
| <b>SIEO</b> | Semi Industrialized Export Oriented                    |
| <b>SSA</b>  | Sub-Saharan Africa                                     |

|                |  |
|----------------|--|
| <b>STEM</b>    | Science, Technology, Engineering and Mathematics                 |
| <b>TM</b>      | Tejani and Millberg  |
| <b>TVET</b>    | Technical Vocational Education and Training                      |
| <b>UAE</b>     | United Arab Emirates   |
| <b>UIS</b>     | UNESCO Institute for Statistics                                  |
| <b>UN DESA</b> | United Nations Department of Economic and Social Affairs         |
| <b>UNECA</b>   | United Nations Economic Commission for Africa                    |
| <b>UNESCO</b>  | United Nations Educational, Scientific and Cultural Organization |
| <b>UNCTAD</b>  | United Nations Conference on Trade and Development               |
| <b>UNIDO</b>   | United Nations Industrial Development Organization               |
| <b>UNRISD</b>  | United Nations Research Institute for Social Development         |
| <b>VWEC</b>    | Vietnam Women’s Entrepreneurs Council                            |
| <b>VWU</b>     | Vietnam Women’s Union  |
| <b>WDI</b>     | World Development Indicators                                     |
| <b>WEF</b>     | World Economic Forum   |







## Executive summary

Industrialization can significantly contribute to poverty reduction and shared prosperity by promoting structural change, generating employment and facilitating more efficient use of resources. Its benefits however, have not historically been enjoyed equally by all segments of the population. Women are often precluded access to secure and well-paid jobs in manufacturing industries and related service sectors, and their participation in the development of technologies remains limited. Recognizing this, UNIDO is committed to a policy agenda that promotes inclusive and sustainable industrial development (ISID) as well as gender equality.

This working paper contributes to the advancement of the twin policy agenda of ISID and gender equality by providing a conceptual framework and a sound empirical base from which to understand the linkages between gender equality and various aspects of industrial development. This is an important first step for identifying policy measures to redress gender-based bottlenecks preventing women in different parts of the world from fully participating in, and benefitting from, industrial development and technological change. In this paper, gender equality means equality in rights, responsibilities, and opportunities. It is about ensuring that the interests and needs of women and men are given equal weight in industrial policy design and implementation. Inclusiveness in this paper is understood in terms of the quality of employment available to both women and men (not just its quantity) as well as in terms of the availability of affordable goods that meet basic needs for all. The paper focuses on social inclusiveness and what forms of industrial development can lay the foundation for economic growth that is gender-equitable and sustained over the long run. The paper is organized in three main chapters. Chapter I develops an analytical structure for thinking about the multiple mechanisms through which gender relations interact with industrialization. Chapter II analyses empirical evidence through the examination of three country case studies. Chapter III explores potential gender

implications of the Fourth Industrial Revolution. Policy suggestions and recommendations are offered throughout the paper and summarized in its last chapter.

Chapter I highlights that there is a two-way interaction between industrial development and gender equality/inequality and spells out the mechanisms involved in this interaction. It identifies three main channels: the employment channel, the consumption channel and the public infrastructure channel. Industrialization and industrial policies are gendered processes because economies are gendered structures, in the sense that both the paid market sphere and the unpaid non-market sphere are characterised by gender inequalities. Basic statistics on gender-based sectoral and occupational segregation, women's under-representation in technical fields, and unequal distributions of unpaid domestic work and care are presented to corroborate this point. Industrial development can reduce gender inequality when it contributes to quality job creation in sectors previously precluded to women, but it can reinforce gender inequalities when industrial expansion is based on increasing jobs for women while at the same time maintaining gender-based sectoral segregation and large gender wage gaps. Industrial development can reduce gender inequalities when it promotes infrastructure and services that facilitate redistribution of responsibilities for care (such as electricity and labour-saving household appliances), but it reinforces gender inequality when it favours diffusion of technologies that further exclude disadvantaged women.

Chapter II reviews empirical evidence over the last few decades with the purpose of examining the terms under which women have been included in the industrialization process across regions and countries with different production structures. The analysis largely focuses on gender-differentiated employment effects associated with manufacturing sector development. This is the dimension of the gender-industrialization nexus that can be more easily and systematically documented. There

are, however, also data gaps when it comes to documenting gender employment effects. This is particularly true regarding the quality of jobs available to women.

When looking at manufacturing employment data from the 1970s through to the 2000s, the first identifiable pattern is feminization in the early stages of industrialization followed by de-feminization in the more advanced stages. Women's participation in manufacturing employment is closely associated with the expansion of a few specific, generally low-tech, sectors. Women are over-represented especially in apparel and textiles, but also in footwear, food processing, and electronics and these patterns of women's representation across manufacturing are similar across countries in any region. Not all the so-called 'female sectors' are labour-intensive (e.g. electronics), and not all labour-intensive sectors are female intensive (e.g. wood and paper). In all of these female sectors, women seem to be preferred as semi-skilled assembly operators, but are largely excluded from higher skills roles. The association of women workers with particular tasks and industries appears very rigid even in the face of significant achievements made by women. This association appears in countries at different levels of industrial development and is attributable to a range of factors, including persistent gender stereotyping and women's lower social and economic status.

The three cases of Vietnam, Jordan and Ethiopia represent different geo-economic regions, production structures and industrialization trajectories. They illustrate different circumstances and policy environments surrounding the incorporation of women workers into the industrialization process. In all countries, however, women are included into manufacturing employment mostly as factory workers in the apparel and textiles sectors, although in Vietnam the picture is somewhat more diversified.

Chapter II concludes by discussing data gaps and provides suggestions for gender-industrialization specific SDG indicators. These include: female shares of manufacturing employment; measures of gender segregation in employment such as the gender dissimilarity index; and sex-disaggregated indicators on SME

survival rates, their key constraints and the extent of technology adoption, among others.

Chapter III moves on to the Fourth Industrial revolution -or Industry 4.0-, briefly exploring the potential gender implications of the spread of the new technologies. There is no clear-cut evidence given that the effects are context-specific and depend on a range of factors. Based on past trends and policy lessons from similar experiences, it can be predicted, however, that the 'disruption' in production processes and living standards caused by the Fourth Industrial Revolution will likely bring with it both opportunities and challenges for the promotion of gender equality. For example, technology could change both the costs and nature of public services provision, through gender-sensitive innovations in transportation infrastructure or new monitoring systems for out-patient care by public health care providers. But it could also reinforce, rather than challenge, ideas and expectations about women's and men's roles, for example through the creation of humanoid robots and devices that embody 'feminine' or 'masculine' characteristics, depending on the functions they are built to perform. The final outcome for gender equality and inclusiveness more broadly will ultimately reflect political decisions and possible reconfigurations of social norms, including gender norms.

Chapter IV summarises relevant policy recommendations in terms of horizontal/broad measures and vertical/specific measures. Horizontal measures include promoting gender-aware skill development and training as well as gender-aware upgrading of physical and social infrastructure. Vertical measures include fostering the regular use of gender statistics to inform targeting and paying special attention to the plight of women migrant workers and women micro-entrepreneurs. The main policy lesson to take away is that promoting gender equality within an ISID agenda needs to involve efforts not only directed at strengthening the competitiveness of economic sectors where women already work in significant numbers, but also towards enabling them to participate in new sectors and roles. The inclusion of women in new sectors and occupations previously precluded to them will in turn allow emerging sectors to thrive by making full use of richer and



more diverse skill sets. In the early stages of industrialization, growing demand for relatively cheaper female labour due to the expansion of labour-intensive manufacturing might, under certain circumstances, have (limited) positive empowering effects for a few groups of women. It is crucial, however, that countries move away from industrial strategies where women are used as a source of cost advantage and support instead a more equitable and progressive strategy that expand women's economic opportunities and quality of employment in the long run. As the role of manufacturing for social inclusiveness and improved living standards evolves, there is also a need to pay greater attention to the likely gender-differentiated effects of changes in the availability of new affordable goods and infrastructural development, and not just to employment.









# 1. The gender equality-industrial development nexus

## 1.1. Inclusive and sustainable industrial development (ISID) and why gender matters

UNIDO's overarching mandate of inclusive and sustainable industrial development (ISID) recognizes that, although industrialization can significantly contribute to poverty reduction by promoting structural change, generating employment and facilitating more efficient use of resources, its benefits have not historically been enjoyed equally by all segments of the population. Women often have limited access to secure and well-paid jobs in manufacturing industries and related service sectors, and are insufficiently represented in scientific and technical fields. This undermines the inclusiveness and sustainability of economic growth. UNIDO therefore advocates for increasing women's equitable participation in the industrial workforce and the development of technologies, fostering multiplier effects on households and communities.

UNIDO conceptualizes inclusive and sustainable industrial development in terms of three key complementary objectives: sustained economic growth, social inclusiveness and environmental sustainability (UNIDO, 2016a; 2018). More specifically, ISID is defined as including the following aspects: '[...] creating shared prosperity (offering equal opportunities and an equitable distribution of benefits to all), advancing economic competitiveness, and safeguarding the environment (addressing the need to decouple generated prosperity of industrial activities from excessive natural use and negative environmental impacts)...' (UNIDO, 2018, p. xx). The Lima Declaration, adopted by UNIDO's Member States in December 2013, set the foundation for this vision (UNIDO, 2018). Social inclusiveness is further defined as requiring that '... incomes generated by industrialization flow to the poorest in society, increasing welfare at the bottom of the pyramid ... and the removal of constraints to participation

in the market for women, youth, persons with disabilities, members of minority groups and others belonging to traditionally marginalized groups ...' (UNIDO, 2018, p. 79).

The ultimate objective is thus to foster a model of economic growth that is simultaneously sustainable; promotes structural change; reduces inequality; generates jobs, particularly for the most vulnerable groups; and makes careful use of natural resources. This conceptualization implicitly recognizes that **many industrialization trajectories are possible, and governments and businesses have the option of choosing between more or less inclusive and gender-equitable pathways**. UNIDO (2016) notes that the challenges in promoting ISID vary for countries at different stages of development. The main challenge for low-income countries is sustaining the process of industrialization itself. For middle-income countries, it is the trade-off between job generation and environmental sustainability. And for deindustrializing, high-income countries, the challenge is ensuring continued employment generation and shared prosperity in the face of growing inequalities and skill-biased technological change.

*Women often have limited access to secure and well-paid jobs in manufacturing industries and related service sectors, and are insufficiently represented in scientific and technical fields. This undermines the inclusiveness and sustainability of economic growth.*

Both the 2016 *Industrial Development Report* and the 2018 *Industrial Development Report* (UNIDO, 2016a; 2018) note the role that manufacturing development can play in generating good jobs for women, but acknowledge that the terms of

inclusion in industrial sectors and global value chains are often more unfavourable for women than for men. Moreover, the 2018 *Industrial Development Report* observes that technological advances are reducing the importance of manufacturing as a source of employment, but highlights manufacturing's potential to foster inclusiveness via the consumption channel. In other words, inclusiveness can be achieved by increasing the production and availability of those goods that respond to basic needs and bring a better quality of life to the 'lower-income segments of society' (UNIDO, 2018, p. 9). Possible gender-differentiated effects related to the diffusion of affordable goods, in particular household appliances, are noted. However, these reports do not provide an in-depth analysis of the gender dimensions of ISID. ISID now has a dedicated SDG (SDG 9: *Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation*) but the indicators for Goal 9 are not disaggregated by sex.

*There is a two-way interaction between industrial development and gender equality/inequality. This needs to be acknowledged to achieve long-term, sustainable growth.*

There is therefore a need to provide both a conceptual framework and a sound empirical base from which to better understand the linkages between gender equality and various aspects of industrial development, as well as to refine policies and indicators. The present paper constitutes a first step towards these aims. As used in this paper, **gender equality** means equality in rights, responsibilities, and opportunities for women and men. Gender equality does not necessarily mean parity, but does involve ensuring that the interests, needs, and priorities of women and men are given equal weight in industrial policy design and implementation (UNDP, 2013; UN Women, 2017a). **Inclusiveness** in this paper is understood not only in terms of the availability of employment, but also in terms of the quality of the employment available to

both women and men. It is also understood in terms of the availability of affordable goods that meet basic needs for all.<sup>1</sup> Chapter I outlines analytical structure for examining the multiple mechanisms through which gender relations interact with industrialization. This is a necessary step identifying policy measures that can redress gender-based bottlenecks preventing women in different parts of the world from fully participating in, and benefitting from, industrial development and technological change. Chapter II analyses empirical evidence. Chapter III explores potential gender implications of the Fourth Industrial Revolution. Policy suggestions and recommendations are developed throughout the paper and summarized in the chapter IV.

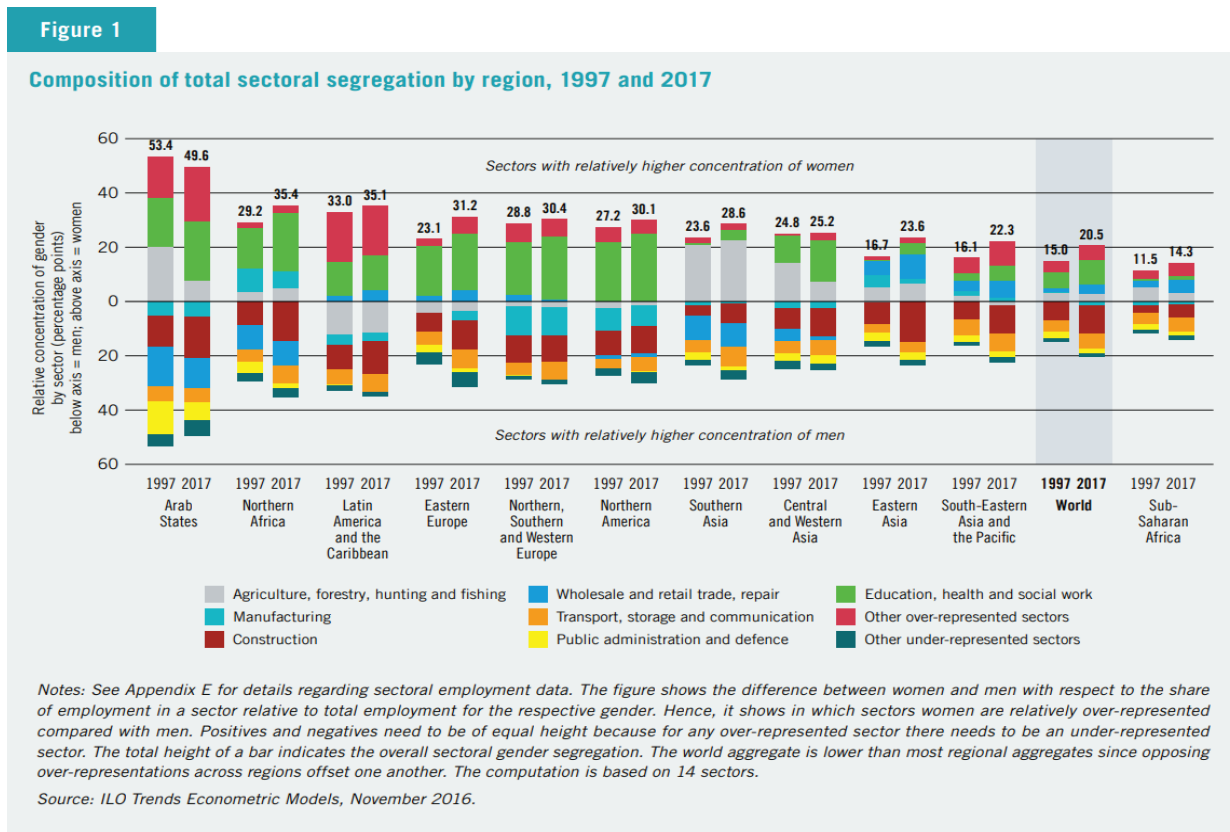
## 1.2. A two-way relationship

Industrialization and industrial policies take place in the context of economic structures characterized by marked gender bias in several dimensions. In turn, they can further shape gendered economic structures by either reducing or reinforcing gender inequalities. **Thus, there is a two-way interaction between industrial development and gender equality/inequality. This must be acknowledged to achieve long-term, sustainable growth, by implementing policies that address gender bias and promote broad social investment as well as women's specific access to skills, entrepreneurial capacity, infrastructure and innovation.**

Gender-aware economics draws attention to the key structural features of economies, including not only a country's structure of production and stage of development, but also its gendered distribution of work and resources, in both paid and unpaid sectors. It exposes the effects of gender norms, biases and stereotypes in mediating the impact of macro-economic policies. Women have less access overall to productive assets, services and technology,

<sup>1</sup> The paper will not discuss issues of environmental sustainability but will rather focus on what forms of industrial development can lay the foundation for economic growth that is gender-equitable and can be sustained in the long run.

**Figure 1: Composition of total sectoral segregation by region, 1997 and 2017**



Source: ILO, 2017a

compared to men. These inequalities in access are compounded by social norms and ideas about what is men’s work and what is women’s work. These factors combined result in **fewer paid jobs and occupations available to women as compared to men in the labour market, and their disproportionate responsibility for care work at the household level.** The ability of women to become financially independent, as well as their overall well-being, is undermined as a result. This fact tends to hold true in both low and high-income countries, although the extent and form that gender inequalities take can vary over time and across different institutional contexts and structures of production.

**Gender biases in the economy: key statistics on aggregate patterns**

An illustration of these biases in access and opportunities can be found in employment data. Recent ILO statistics (ILO, 2017a) show that women remain overrepresented as ‘contributing

family workers’ in all regions of the world.<sup>2</sup> This employment status involves work on either farms or small businesses in manufacturing or services, and is the most vulnerable form of work since it implies little independent access to income or meaningful say in the way the family business is managed. The gender gap for contributing family work is widest in developing countries, where 37 percent of women and 17 percent of men were engaged as contributing family workers in 2017. This gap of almost 20 percentage points represents a deterioration relative to the gap recorded in 2007. In emerging countries, 16 percent of employed women were contributing family workers, compared to 5 percent of men. Developed countries have seen a marginal narrowing of this gap over the last decade: the female share of contributing family work was 2 percent, compared to 0.4 percent for men (ILO, 2017a). At the other end of the

<sup>2</sup> Contributing family workers are self-employed persons working in an establishment operated by a relative.

spectrum of employment status, very few self-employed persons are ‘employers’<sup>3</sup>, and even fewer are women: globally, about 3 percent of men and 1 percent of women were in this category in 2017.

*Unequal gender patterns in the labour market are also closely interrelated with marked gender differences in unpaid domestic work and care burdens, which fall disproportionately on women everywhere and are particularly resistant to change.*

ILO data (ILO, 2017a) also confirm persistent gender segregation in terms of both occupational and sectoral distribution of employment. This segregation is highest in the Arab States, followed by Northern Africa. **Manufacturing is a sector with a relatively higher concentration of women in some regions, such as Eastern Asia and South-Eastern Asia as well as Northern Africa, but with a relatively higher concentration of men in other regions, such as Northern America, Northern, Southern, Western and even Eastern Europe, and the Arab States.** As illustrated in later sections, this is largely a reflection of the specific industries that dominate manufacturing in each region.

Eastern Asia and South-Eastern Asia tend to have an over-representation of women in wholesale and retail trade as well as manufacturing. The highest relative concentration of women in agriculture is in South Asia and to a lesser extent in sub-Saharan Africa, the Arab states and Central and West Asia. Northern America and Northern, Southern, and Western Europe have similar sectors and levels of segregation per sector: predominant female concentration in education, health and social work, and

<sup>3</sup> An ‘employer’ is a self-employed person whose remuneration depends largely on profits and who engages employees on a regular basis. ‘Own-account’ workers are also self-employed, but do not engage employees on a regular basis or at all. The vast majority of women who are self-employed are ‘own-account workers’ (ILO, 2017a).

relative male concentration in manufacturing, construction and transport, storage and communication.

Another indication of the limited opportunities available to women relative to men is the fact that, on average, women work fewer hours for pay or profit when in paid employment (ILO, 2017a). In the EU, involuntary part-time work (of less than 30 hours per week) as a share of total employment stood at 8 percent in 2015 for women, compared to 3 percent for men (ILO, 2017a). In developing countries with available information, time-related underemployment measured as ‘persons working fewer hours than they would like to’, can be as high as 40–50 percent among women. Another gender pattern emerging in low-income countries recording data on both principal and secondary jobs is that more women than men must rely on multiple (precarious) jobs for survival, particularly in deprived areas. This often reflects the fact that the types of work available to women are especially poorly paid and one job is therefore not sufficient to lift them out of poverty (UN Women Viet Nam, 2016; ILO, 2018).

As noted, the difficulties that women often have in accessing paid work for both an adequate level of pay and an adequate number of hours result from a range of factors. Gender stratification theory, for example, stresses **the role that employers’ stereotypes, and societal gender norms at large, play in limiting women’s access to good jobs, particularly when high quality jobs are scarce** (Seguino and Braunstein, 2017; Blumberg, 1984). Education also matters, but it is becoming a less plausible explanation for gender differences in access to good jobs since gender gaps in formal education are narrowing in most regions.

**Unequal gender patterns in the labour market are also closely interrelated with marked gender differences in unpaid domestic work and care burdens, which fall disproportionately on women everywhere and are particularly resistant to change.** These interlinkages must be considered when designing policy. Reports and statistics in the past years (Budlender, 2009; United Nations DESA, 2015; UN Women,



2015 among others) consistently find significant gender gaps in hours spent on unpaid work across all regions of the world. Recent data (United Nations DESA, 2015) confirm women spend, on average, three hours more per day than men on unpaid work in developing countries and two hours more per day than men in developed countries. Importantly, there tends to be an income-poverty dimension and a gender dimension to the unequal distribution of unpaid work: it is usually women of lower income and education who tend to do more domestic work, especially of the drudgery kind (Fontana and Elson, 2014).

Gender gaps have been narrowing in recent years in some dimensions, but remain significant in others. As noted, **gender gaps have narrowed for all levels of formal education in most regions, but fields of study and access to specialized vocational training remain highly gender stratified.** Technical and vocational education and training (TVET) programmes develop skills in a wide range of fields, including industry and engineering. UNESCO data (UNESCO, 2014) show that between 1990 and 2012, the share of girls enrolled in TVET programmes fell slightly in developed regions, Latin America and South-Eastern Asia. This share increased, however, in Eastern Asia, Sub-Saharan Africa, and Southern and Western Asia, but remains below 40 percent almost everywhere. For the period 2005–2012, young women were especially underrepresented in TVET in countries including Afghanistan, Bangladesh, Nepal, Bahrain, Saudi Arabia, the United Arab Emirates and Yemen. More women than men were enrolled in TVET in only very few countries in Latin America. In a similar vein, even in tertiary education women continue to face challenges when participating in fields of study that have been traditionally dominated by men, such as engineering and science. The percentage of men graduating in these fields was at least 5 times higher than that of women in one third of a regionally diverse group of countries with data for the period 2005–2012 (UNESCO, 2014). This contributes to the continued prevalence of male researchers and scientists. Promoting women’s greater participation and influence in science and technology is thus of particular relevance for

gender equality within the ISID agenda.

To conclude this brief general overview, **industrialization and structural transformation can affect both paid and unpaid aspects of the unequal gender division of labour, for example by creating more decent jobs (in the ILO meaning of the term) in sectors previously precluded to women workers and by contributing to infrastructural investment that reduces their unpaid work burden.** Gender inequalities in turn may shape the type of industrial growth model that prevails in a specific country. The design and implementation of gender-equitable industrial policies must therefore take into consideration the two-way interaction between industrial development and gender equality/inequality. The following sections examine each direction of this two-way causality in turn.

### 1.2.1. From industrialization to gender relations

Regarding the transmission channel from industrialization to gender relations, **gender-differentiated distributional effects are likely to result not just from possible job creation/destruction across manufacturing sub-sectors employing women and men with different intensities, but also because of new products and consumption opportunities made available by the development of the manufacturing sector.** A framework frequently used to analyse the distributional effects of trade expansion identifies three distinct channels through which changes in relative prices and production structures can variously affect different groups of women and men (Fontana, 2009): the employment channel (sectors that expand or contract may require different kinds of workers); the consumption channel (changes in relative prices and range of goods available affect socio-economic groups differently, due to differences in consumption needs and patterns), and the public provision channel (possible group-specific changes in the availability and quality of public services, and terms of access). A similar framework could be applied to examine the full range of gender distributional effects likely to result from the development of manufacturing, and technological change, in a country.



## Employment effects

Industrialization can reduce gender gaps in employment if it leads to the expansion of sectors that offer women more and better job opportunities than those previously available to them in other sectors, such as agriculture. There is evidence that this might be the case in countries at early stages of development but not in later stages (Tejani and Millberg, 2016). It is important to pay attention to the quality and not only to the quantity of newly created jobs for women. Even in manufacturing, there is often little diversification outside of typically ‘female’ jobs and occupations. As already noted, women workers are heavily concentrated in apparel, textiles and food processing, usually in low-skill positions and with limited opportunities for training and promotion. **Both sectoral and occupational segregation by gender has only marginally declined over the last three decades in most developing countries despite the increase in female labour force participation** (ILO, 2017a). Gender-based hierarchical segregation tends also to persist in services enabled by manufacturing and/or facilitated by the development of new technologies such as jobs in the information and communication sector (Mitter, 2004; Prasad and Sreedevi, 2007; Starritz and Reis, 2013).

As pointed out in earlier paragraphs, technical education is crucial for enabling women to diversify into industrial sectors and occupations previously precluded to them. Even to shift from agricultural jobs to low-tech manufacturing jobs, women would need to possess at least basic literacy skills, thus underscoring the significance of gender equitable skill development to promote inclusive industrialization. Importantly, many of the skills needed for industrial jobs are acquired on the job. **Thus, a factor undermining women’s participation on equal terms as men in industrial sectors (e.g. equal opportunities for promotion to high-tech jobs) may not be women’s lack of training prior to joining the labour market, but rather employers’ reluctance to offer them training once they are hired.**<sup>4</sup> This suggests that greater policy effort

<sup>4</sup> Special thanks to Stephanie Seguino for this point.

is needed towards not only making technical fields of education more welcoming for women but also encouraging employers to hire more women and offer them on-the-job training equivalent to what men receive. Other demand-side factors make it more difficult for women to access the productive resources and markets needed to participate in industrial sectors, (e.g. as entrepreneurs) and these deserve equal policy attention.

A related policy issue is whether it is easier for women to be included in the industrialization process as wage factory workers or as entrepreneurs, and the terms and conditions of such inclusion. This point is aptly made by Elson et al. (2007) with reference to international trade. The authors argue that **gender inequality positions women as sources of competitive advantage (as cheap wage labour) rather than achievers of competitive advantage (as small entrepreneurs)**. This argument makes the point that female business owners or own-account producers need more than just their own labour. To achieve competitive advantage they also need access to finance, technology, social networks, markets, and freedom from other demands on their time. Social and gender inequalities structure the access and use of these crucial resources, often to women’s disadvantage. It is useful to note that the trajectory of development and employment among today’s fully industrialized economies has involved a shift away from self-employment and towards wage employment.<sup>5</sup>

## Consumption and public infrastructure effects

Technological diffusion and new consumption opportunities can in principle reduce the time women must spend on household chores, thus contributing to the objective of reducing and redistributing the burden of unpaid domestic work and care. This includes the availability of manufactured goods such as affordable and healthy ready-made meals or appliances like washing machines and gas cookers. On the oth-

<sup>5</sup> However, as reported in ILO 2016, non-standard and contractually less-secure forms of employment are on the rise in all countries, regardless of the stage of development.

er hand, products such as processed ‘junk food’ may have negative impacts on people’s diets, with consequences for the health and well-being of both consumers and those responsible for their care, who tend to be female family members (e.g. mothers and children suffering from obesity particularly in the industrialized world). Regarding modern ‘labour-saving’ household appliances and related infrastructure, the evidence of their impact on the gender distribution of housework is ambiguous. Some researchers find, surprisingly, no reduction in women’s unpaid housework despite the greater availability of household appliances in some industrialized countries (for example, Bittman, Rice and Wajcman, 2004; Offer, 2006) and others point out that such devices are of no relevance to poor women from developing countries who live in areas lacking basic water and electricity infrastructure (Mitter, 2004).

The potential of newer information and communication technologies (ICTs) for empowering women is not unequivocal either. There has been optimism regarding the possibility that ICTs could enable women to achieve greater autonomy by giving them more control over their lives and by building their confidence through networking, knowledge gathering, and exercise of their voice. Examples include the use of mobile phones for money transactions and for running businesses, the digitalization of custom clearance or similar transactions (assumed to reduce the risk of dealing with corrupt officials), and the availability of distance learning, telemedicine, and even ‘remote mothering’ (Madianou and Miller, 2011). **A popular perspective highlights the potential for cyberspace and the Internet to facilitate more equitable gender relations by helping women overcome difficulties related to restricted physical mobility, and by redressing power imbalances likely to surface in their face-to-face interactions with men, especially in public spaces (Wajcman, 2009). Yet empirical research also illustrates challenges for women in using ICTs.** These challenges are primarily based on practical constraints such as literacy, education, financial resources and infrastructure (Buskens and Webb, 2009; Elnaggar, 2008) thus suggesting that ICTs ability to improve unequal gender relations will

be highly context-specific. Some of these issues will be revisited in Chapter III.

The gender-differentiated **employment effects** of industrialization are easier to document than **other effects**. As the role of manufacturing evolves along the lines highlighted in UNIDO’s latest Industrial Development Report (UNIDO, 2018) — with the consumption/demand channel acquiring greater significance for inclusiveness over the employment channel — fully understanding the gender distributional implications of changes in consumption and public infrastructure becomes paramount.

**Underpinning these issues and deserving of greater policy attention is the need to ensure that women from different socio-economic backgrounds and countries, especially the most disadvantaged ones, are more fully involved in the design of technologies aimed at reducing drudgery, improving standards of living, and overcoming existing gender inequalities** (Mitter, 2004; Wajcman, 2009). Empirical evidence suggests that increases in per capita income stem from advances in technology (UNIDO, 2014). Including women throughout technology design and development would increase the chances of creating and disseminating technologies that are more suited to the needs of women in their everyday lives, potentially increasing the rate of adoption of such technologies and promoting a more equal sharing of care responsibilities. As many feminist scholars have pointed out over the years, ‘there is interdependence between women being more equally treated within science and technology and the extent to which science and technology can be used for emancipatory ends’ (Mitter, 2004; Wajcman, 2009, p. 231).

### 1.2.2. From gender relations to industrialization

Regarding the transmission channel from gender inequalities to industrialization, there exists a substantial body of work on the relationship between gender equality and economic growth, which can be especially salient for understanding the interlinkages between gender and industrial development. Literature rooted in the neoclassical tradition argues that gender equality unambiguously raises economic

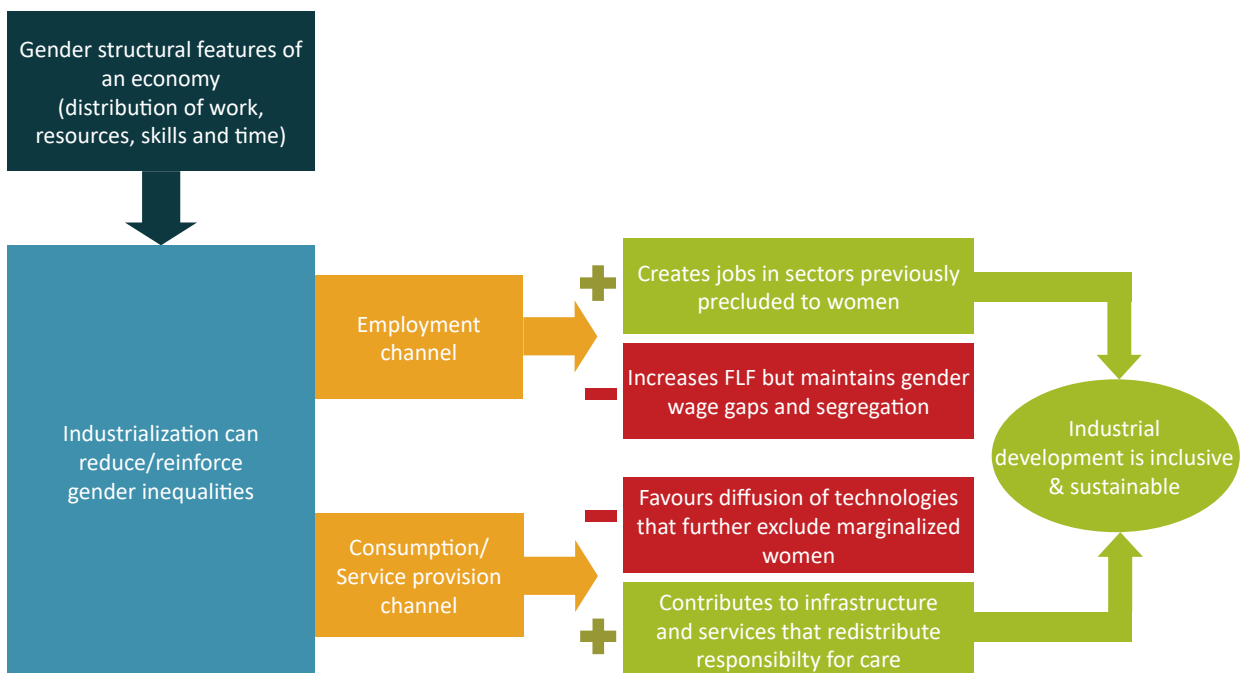
efficiency and growth (Dollar and Gatti, 1999; Klasen, 1999; Klasen and Lamanna, 2009). The reasoning is that market imperfections, combined with conventional gender norms, have distortionary effects in education and labour markets, and inhibit investments in human and physical capital. Greater gender equality is associated with declines in fertility, greater investment in children and often less corruption, with positive externalities for growth. Most models suggest that exogenous technological change will erode gender gaps in the long run, but also see a role for policy that could successfully promote gender equality and economic performance. A recent systematic review of cross-country empirical evidence (Kan and Klasen, 2018) robustly shows that lowering gender gaps in education leads to higher economic performance. The literature on the impact of other gaps, including employment gaps, is much more limited, but also points to higher growth as a result of lower gender gaps. On the other hand, heterodox economic approaches (Seguino and Braunstein, 2017, Braunstein, 2015) stress **that an important step in exploring the effect of gender relations on the macro economy and on growth is to first identify the domain in which gender (in) equalities are measured.** This is crucial, as some kinds of gender inequality may have a negative effect on macro-level outcomes, while other measures may have a positive effect. Moreover, some kinds of gender inequality affect macroeconomic variables in the short term, while others have an effect only in the long run. In a nutshell, measurements of gender (in)equality that emphasize women's productive activity or attributes—such as narrowing of gaps in labour force participation and educational attainment—are generally associated with faster growth (as corroborated by recent literature reviewed in Kan and Klasen, 2018). In contrast, when indicators are based on the returns to women's productive activity, such as wage rates, gender inequality can actually contribute to growth. Gender differences in education will lower growth because lower levels of female education also lower the average productivity of labour. When gender discrimination is manifested in ways that do not compromise the overall quality of the labour force, but simply lower the cost of labour for employers (e.g. through lower female wages),

discriminating against women can have positive effects on economic growth, at least in the short term. However, a strategy for economic growth that is centred on gender discrimination is short-sighted and disregards the negative long-term impacts on human development and a country's development trajectory. In other words, it would lead to economic growth that is neither inclusive nor sustainable.

*A strategy for economic growth that is centred on gender discrimination is short-sighted and disregards the negative long-term impacts on human development and a country's development trajectory. In other words, it would lead to economic growth that is neither inclusive nor sustainable.*

From a macro and structural change perspective, Braunstein (2015) provides a useful framework linking the type of growth model adopted by a country with its prevailing institutional arrangements for care provision (or social reproduction). She argues that these institutional arrangements are crucial for the sustainability of economic growth in that they determine the extent and distribution of resources (both time and money) available to produce, maintain, and invest in, human capacities and the productivity of the labour force. When gender inequalities prevail in both, the structure of production and the organization of care provision, the possibility of a type of economic growth that generates greater equality and shared prosperity over time is reduced. This can be the case, for example, if economic growth depends on low wages and large gender wage gaps while at the same time keeping taxes and public spending (particularly on education and health) low, and therefore, relying on women's unpaid work to care for the current and future labour force. In this type of growth, benefits go disproportionately to foreign investors and women's overall working time and stress increase, as paid work is added to unpaid work (Elson and Cagatay, 2007). This growth model undermines the investment in human capacities that is needed to move

**Figure 2: Mapping the gender effects of industrialization**



towards a higher level of productivity, higher wages and a more equal economy.

The special relevance of these considerations for the industrialization process comes from the fact that several semi-industrialized, export-oriented (SIEOs) countries in Asia seem to have followed similar paths, with ambiguous outcomes for gender equality objectives. The first generation of these economies including the Republic of Korea, Singapore and Republic of China (Taiwan) are now fully industrialized and high income. The second generation, located in Southeast Asia, includes Indonesia, Malaysia and Thailand. Both groups of countries have experienced a similar manufacturing-led path of development, although the levels of skill formation, social protection, and state capacity of the second generation of SIEOs are lower than those of the first generation, and foreign capital has played a more significant role in the industrial strategies of the first (UNRISD, 2010).

Research has suggested that the export strategy of these SIEOs has focused on labour intensive manufactured goods produced by comparatively cheap female labour resulting from occupational segregation and large gender wage gaps (most notably Seguino 1997 and Seguino, 2000).

This strategy has stimulated profits in the short run, resulting in industrialization being associated with higher levels of female labour force participation, but has arguably led to little improvement in the quality of jobs available to women. Gender wage gaps have widened in some countries and gender-based labour market segmentation persists (Berik et al., 2004; Busse and Spielmann, 2006). Public support for child care provision is often limited, making it problematic for women to combine market and nonmarket work as female labour force participation increases, hence offsetting the positive effects on human capacities development (Peng, 2010). Braunstein (2015) interprets the recent sharp decline in marriage rates across the East and Southeast Asian region as a clear manifestation of these tensions.

Previewing the discussion in Chapter II, recent research points to a defeminization of industrial employment in some countries, while others continue to feminize (Tejani and Millberg, 2016; Kucera and Tejani, 2014). **This poses the important policy question of how to prevent women from becoming the preferred labour force only in the early stages of industrialization, to be left behind when industries upgrade.**

To summarize, this section has shown that industrialization may either limit or broaden opportunities for redressing women's socio-economic disadvantage (through several channels and depending on a range of factors) and is in turn affected by gender (in)-equality. **It is therefore especially important to carefully investigate the terms under which women are included in the industrialization process and the public resources made available to support human development within this process, to establish whether or not their experience is truly empowering.**







## 2. Gender patterns in manufacturing employment

This chapter is about empirical evidence and data gaps. It looks backwards, over the last few decades, to examine the terms under which women have been included in the industrialization process across regions and countries with different production structures. The analysis largely focuses on gender-differentiated employment effects associated with manufacturing sector development. As noted in Chapter 1, this is the dimension (or channel) of the gender-industrialization nexus that has been more systematically documented. However, even regarding gender employment effects, there are data gaps, particularly regarding the quality of jobs available to women. The first part of the chapter offers a broad-brush picture of regional patterns. Issues of data gaps and suggestions for gender-industrialization-specific SDG indicators are discussed in the concluding section. The chapter attempts to draw lessons from current and past trends for policies needed to promote more inclusive and gender-equitable processes in countries that are currently industrializing.

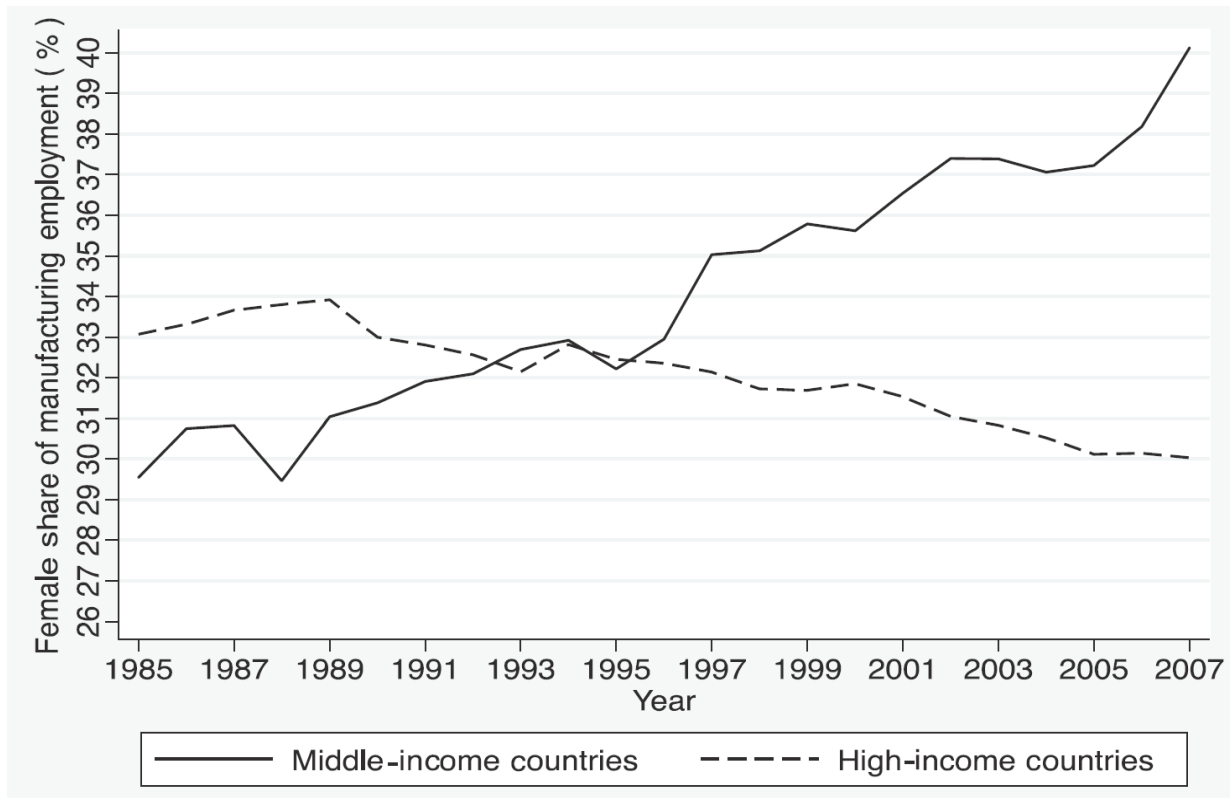
### 2.1. Regional patterns over the last few decades: feminization and defeminization

When looking at manufacturing employment data from the 1970s through to the 2000s, **the first identifiable pattern is feminization in the early stages of industrialization and defeminization in the more advanced stages.** Specific trajectories vary depending on the region concerned and various other factors. This observation therefore requires further qualification.

#### Export-led and female-led industrialization

A substantial body of literature documented the unparalleled mobilization of women workers in manufacturing production in developing countries during the 1970s and 1980s, particularly associated with export-oriented labour-intensive manufacturing (see Fontana, 2009 for a review). That literature also pointed out, however, that the increase in developing countries' manufacturing exports resulted in disproportionate job losses for women in high-income developed economies, who constituted the majority of workers in import-competing industries such as textiles, footwear and leather goods (most notably Kucera and Milberg, 2007). These job losses for women in the manufacturing sector in high-income countries have been compensated to some extent by job growth in services, but whether wage levels and working conditions in the growing sectors are better is the subject of ongoing debate. Diverging outcomes between women working in the manufacturing sectors of different countries have also been observed within the Global South itself. The intensified trade competition among developing countries following the end of the Agreement on Textiles and Clothing (ATC) in 2005, for instance, brought a shift in exports and employment from Central America and Africa towards China. Economies such as the Dominican Republic, El Salvador, South Africa and Mauritius in particular, have lately witnessed absolute declines in their textile and garment production with female jobs being especially affected (Berik, 2011, Otobe, 2008). Newly industrialized countries (NICs) such as South Korea and Republic of China (Taiwan), which have been considered archetypes of female-led and export-led industrialization in the 1970s, have experienced declining female shares of manufacturing employment since the early 1980s.

**Figure 3: Average female share of manufacturing employment for high- and middle-income countries, 1985–2007**



Source: Illustration based on ILO data, Tejani & Milberg (2016)

**One element that seems to emerge from this brief account is, thus, that women’s inclusion in the industrialization process in any country might be a transient phenomenon and is very closely associated with developments in a few specific low-tech sectors, most notably textiles and garments.** But it would be important to broaden the analysis beyond the export sector, carry out systematic data analysis and consider the complexity of factors influencing these processes in order to improve our understanding.

#### Insights from regional and cross-country studies

It may be useful to start, first, with a broad picture of trends in female shares of manufacturing employment as a whole, and later, disentangle what might be taking place at more disaggregated levels for both countries and sectors. A systematic aggregate picture can be gained from two comprehensive studies, by Tejani and Millberg (TM) (2016)

and Kucera and Tejani (KT) (2014), examining patterns across various countries and regions over three decades (approximately between 1980 and 2008). TM use ILO data and focus on a comparison between two specific regions: Southeast Asia (represented by Indonesia, Malaysia, Philippines and Thailand and excluding the first group of NICs<sup>6</sup>) on one side, and Latin America (represented by Argentina, Brazil, Chile, Colombia, Mexico, Peru, Venezuela, Costa Rica, Dominican Republic, Ecuador, El Salvador and Panama) on the other. KT use UNIDO data and include in their sample 36 countries at different stages of development, ranging

<sup>6</sup> Indonesia, Malaysia and the Philippines are in the early stages of defeminization. South Korea, Hong Kong SAR, Republic of China (Taiwan) and Singapore, which by now have transitioned to fully ‘developed’ status, started to defeminize earlier. They experienced dramatic defeminization over the 1985-2005 period, falling approximately 10 percentage points. For this reason, these countries are excluded from their analysis of South East Asia.



**Table 1: Female share of manufacturing employment by region, 1985–2007**

| Region                         | 1985–95 |                     | 1996–2007 |                     | 1985–2007 |                     |
|--------------------------------|---------|---------------------|-----------|---------------------|-----------|---------------------|
|                                | Average | Growth <sup>a</sup> | Average   | Growth <sup>a</sup> | Average   | Growth <sup>a</sup> |
| East Asia and Pacific          | 43.17   | 0.32                | 39.52     | – 0.79              | 41.84     | – 0.12              |
| Latin America and Caribbean    | 29.54   | 0.88                | 37.93     | 1.79                | 32.08     | 1.65                |
| Other industrialized countries | 31.76   | – 0.2               | 29.73     | – 0.52              | 31.21     | – 0.31              |
| Europe and Central Asia        |         |                     | 37.54     | 1.24                | 37.54     | 1.24                |
| Western Europe                 | 28.54   | 0.12                | 27.78     | – 0.24              | 28.45     | – 0.09              |
| Middle East and North Africa   | 21.03   | 4.46                | 16.74     | – 2.04              | 19.76     | 0.28                |
| South Asia                     | 10.65   | 2.6                 | 17.43     | 3.74                | 13.06     | 3.04                |

Source: Based on ILO data, Tejani and Milberg (2016)

from industrialized high-income countries such as New Zealand, the UK and South Korea; industrializing upper middle-income countries such as Azerbaijan, Turkey and Malaysia; industrializing lower middle-income countries such as Morocco, India and the Philippines; and low-income countries such as Ethiopia.<sup>7</sup>

Both analyses make evident opposite trends in middle-income and high-income countries, confirming insights from other literature: while the female share of manufacturing employment rose steadily over the period 1985–2007 in middle-income countries, it experienced a decline in high-income countries, as shown in Figure 1 (reproduced from TM 2016 below). These opposing trends have continued well into the 2010s (Seguino and Braunstein, 2017).<sup>8</sup>

Table 1 in TM (this too reproduced below) also shows the trajectory of the female share of manufacturing employment by regions. Starting

from a relatively low base, Latin American and South Asian countries have experienced a rising female share of manufacturing employment, especially since the mid-1990s. This is particularly true in South Asia where the average female share was only about 10 percent in 1985–95. East Asian middle-income countries as well as Western European and other industrialized countries, on the contrary, have defeminized, from a relatively high base, particularly in East Asia and the Pacific (the average female share was 43 percent in this region in 1985–95). The trajectory for the Middle East and North Africa appears to be somewhat more mixed: starting with an episode of feminization from a relatively low share of female employment in the 1980s, but experiencing defeminization in the period from 1996 to 2007 (Table 1).<sup>9</sup> The case of Sub-Saharan Africa is less documented since sex-disaggregated industrial employment data is even more sparse for this region than elsewhere. A study by Seguino and Were (2014) estimates the growth elasticity of female and male employment for 38 Sub-Saharan African countries differentiated by industrial and trade structure for the 1991–2010 period. It finds that the largest employment effects are in non-oil, non-mineral producing economies, with

<sup>7</sup> The full list of 36 countries is: Austria, Azerbaijan, Bangladesh, Bulgaria, Canada, Chile, Croatia, Cyprus, Egypt, Eritrea, Ethiopia, Germany, India, Indonesia, Iran, Ireland, Japan, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Lithuania, Macao SAR, Malaysia, Malta, Morocco, New Zealand, Panama, Philippines, Portugal, Puerto Rico, Republic of China (Taiwan), South Korea, Sri Lanka, Turkey, United Kingdom.

<sup>8</sup> As verified by the authors through examining ILO LaborStat statistics up to 2016. The corresponding updated Figure 1 (extended to the 2008–2015 period) is available on request.

<sup>9</sup> Given that only two countries are included in the MENA region (Morocco and Egypt) in the TM sample, one should probably use caution in drawing generalizations from these results.

elasticities close to 0.8 for women and 0.6 for men, producing therefore a gender equalising effect (Seguino and Were, 2014, Table 3). In non-oil, mineral exporting countries, employment elasticities of growth are smaller and differential benefits in favour of women are very modest.<sup>10</sup>

These are all useful insights, but regional averages mask a diverse range of experiences between countries with different histories, policy orientations, and production structures, hence the value of carrying out in-depth single country studies alongside cross-country analyses.

Both TM and KT do not stop at descriptive statistics, but rather seek further explanations for these aggregated patterns, with each of the two studies focusing on different sorts of issues (and groups of countries).

### Comparing South East Asia and Latin America

TM's study begins by questioning whether manufacturing export growth is the main explanation for changes in female employment shares as suggested by the literature reviewed earlier in this section. They choose to focus on Latin American and Southeast Asian countries because these two groups exhibit contrasting trends in feminization over the 1985-2007 period, thus making the comparison interesting. Manufacturing exports grew rapidly in most countries in the two regions, but South East Asia experienced a slight defeminization (which is even greater when Thailand is excluded), while the female share of employment increased in Latin America. TM use a robust econometric model controlling for a variety of possible biases in the data and find **neither the manufacturing export shares nor the gender education gap to be significant factors in explaining changes in female manufacturing employment. Changes in the technological conditions of production, as evidenced by growth of labour productivity in manufacturing<sup>11</sup>, were shown to have the strongest impact.** The coefficient for this

variable is negative and highly significant. More specifically, their estimates show that, on average, a 10 percent rise in productivity leads to more than a 2 percent decline in the female share of employment, all other things being equal (TM, 2016, p. 37). **This relationship holds across the sample and in effect demonstrates that almost invariably, when production becomes more capital intensive, defeminization indeed sets in.**

Of special relevance for the topic of this paper, TM provide further details on the different gendered industrialization trajectories observed in Latin America relative to the second-tier industrialising countries of South East Asia. They note that **while the wave of feminization experienced in South East Asia in the 1970s and 1980s took place in the context of an expanding industrial sector, rising productivity, and rapid overall employment growth, the more recent wave of feminization in Latin America is occurring in the context of slow productivity growth, generalized distress in the labour market and growing informalization.**

TM point to differences as well as similarities between countries within the Latin American region. For instance, Mexico expanded its manufacturing sector through exports, especially in apparel, motor vehicles, and electronics during the 1990s, but its link to the rest of the economy and contribution to value added remained low (Kuwayama, 2009). Chile has had a very successful industrialization experience, but never went through a feminization of its manufacturing and its female share of employment has been fairly constant over the years. Both Costa Rica and the Dominican Republic undertook export-oriented industrialization in the early 1980s, rapidly increasing their share of apparel exports, largely to the US until the mid-1990s, after which they suffered from severe competition from China (Sanchez-Ancochea, 2006). As this brief overview demonstrates, a careful understanding of the main constraints and forces at play at the country level is necessary to inform relevant gender-equitable industrial policies in each case.

<sup>10</sup> Unfortunately, the study does not look specifically into the manufacturing sector.

<sup>11</sup> TM measure labour productivity in manufacturing as manufacturing value added per manufacturing worker.

### Decomposing within-industry and sectoral reallocation effects

TM are mostly concerned with broad macroeconomic trends and do not conduct a detailed sectoral analysis of manufacturing, an aspect which is taken up by KT (2014). KT's main aim is to examine changes within manufacturing, differentiating between labour-intensive, intermediate, and capital-intensive sectors.<sup>12</sup> They use accounting decomposition methods to assess the relative importance of within-industry versus sectoral reallocation effects on the feminization and defeminization of manufacturing employment. They also want to identify which specific industries are driving these changes. TM find that **labour-intensive industries, and especially wearing apparel and textiles, have indeed been the largest driver of female employment changes** in their sample of 36 countries. This applies to both defeminizing countries such as Malaysia and South Korea and feminizing ones such as Turkey and Morocco. They also find that, for most of countries, within-industry effects dominated over employment reallocation effects. **In defeminizing countries, technological upgrading of previously labour intensive (and female intensive) sectors is a more important explanatory factor than compositional shifts towards more capital-intensive sectors.** In South Korea, Republic of China (Taiwan) and Malaysia, in particular, the declining female share has been associated with substantial technological upgrading in both apparel and textiles.

<sup>12</sup> The way Kucera and Tejani categorise labour-intensive, intermediate, and capital-intensive manufacturing does not perfectly match UNIDO categorises of low-tech, medium-tech, and high-tech manufacturing. More specifically 'food products and beverages' is categorised as capital-intensive by KT, but classified as low-tech by UNIDO, 'electronics and computers' is categorised as intermediate manufacturing by KT, but high-tech by UNIDO. For the same 2-digit ISIC industry, the capital/labour ratio can vary depending on the stage of a country's development. For instance, electronics could be relatively labour-intensive in countries in early stages of development where assembly work is still prevalent, but become more high-tech in later stages. This might explain the association of electronics with relatively high shares of female employment in electronics, but only in early stages e.g. Vietnam or the Philippines. None of these differences in categorizations undermine the general message from KT's findings.

Among feminizing countries, different trajectories can be observed. In Morocco for instance, changes in female manufacturing employment have been driven by strong positive increases in the apparel sector due to both within-industry and employment reallocation effects—these patterns mostly reflecting employment of women workers as part of a cost-cutting, flexible employment strategy combined with total employment growth. In Turkey, on the other hand, the increase in female share of manufacturing employment has been dominated by strong, positive reallocation effects, consistent with a rapid growth of total employment in the apparel sector relative to textiles, that has more than offset negative within-industry effects in textiles (the latter largely resulting from a preference for men workers in the context of technological upgrading).

*In defeminizing countries, technological upgrading of previously labour intensive (and female intensive) sectors is a more important explanatory factor than compositional shifts towards more capital-intensive sectors.*

In sum, one of the main findings of Kucera and Tejani (2014) is that **women's participation in manufacturing employment is closely associated with the expansion of a few specific, generally low-tech, sectors.** Women are over-represented especially in apparel and textiles, but also in footwear, food processing, and electronics and these patterns of women's representation across manufacturing are similar across countries in any region. Not all the so-called 'female sectors' are labour-intensive (e.g. electronics), and not all labour-intensive sectors are female intensive (e.g. wood and paper). Further, in all of these female sectors, women seem to be preferred as semi-skilled assembly operators, but not in any other role. **This 'gender-typing' is very persistent and likely to result from various factors.**

Both TM's and KT's analyses offer revealing insights on aggregate patterns and key interactions for

which there are several possible explanations. As they eloquently explain ‘[...] **defeminization may take place for reasons related to the causes that led to preference for women’s labor in the first place...**’ (TM, 2016, p. 33). One factor thus refers to the specific way in which gender seems to interact with structural change within the industrial sector: as labour costs come to constitute a smaller proportion of total cost in higher value-added production, the incentive to employ cheap female labour as a cost-cutting strategy may cease to exist (Seguino, 2005). Related to this, as women begin to organize for better working conditions, they may become a less attractive workforce for employers (Ghosh, 2002). Another explanation is offered by stratification and dual labour markets theory, which posits that the dominant group (men) uses both exploitation (underpaying women) and hoarding (giving men preferred access to good jobs) to maintain gender hierarchy (Seguino and Braunstein, 2017). According to this interpretation, therefore, maintaining and encouraging gender norms and stereotypes designating technologically sophisticated work as ‘masculine’ is a means to preclude hiring women for such work and/or providing them with on the job training, which would help them in building new skills.

As can be seen, therefore, several factors interact to generate positive or negative outcomes in any given economy, underscoring the value of detailed micro-studies at the country level, to which the next section now turns.

## 2.2. Selected country cases

At the country level, planning for inclusive and sustainable industrial development (ISID) with an emphasis on gender equality requires an understanding of both, **the macro gender structure** of the economy concerned and of the **specific gender dynamics that relate to its manufacturing sector**. Industrialization can be a vehicle for promoting women’s economic empowerment but, equally, it might exacerbate gender inequalities if industrial strategies ignore the structural barriers denying many women the opportunities to realize their full potential (as illustrated in Figure 2, Chapter I). As discussed in previous sections, and emphasized by many recent UN reports (UN Women, 2015; ILO, 2017a, UNCTAD, 2017, Chapter IV), **the**

**key policy challenge is therefore, to ensure that women’s economic opportunities are expanded and that the quality of employment improve as part of the industrialization process.**

This section briefly presents some country level statistics and information on Vietnam, Jordan and Ethiopia, which have been chosen as they represent different geo-economic regions, production structures, and industrialization trajectories. It must be stressed, however, that the information provided is not aimed to be comprehensive which would be beyond the scope of this working paper. This section is merely intended as an illustration of the sort of analytical approaches and empirical data required to diagnose a country’s barriers to gender-equitable industrialization.

As shown in Table 2, Ethiopia is a low-income country (with a GDP per capita of about 490 US \$ in 2015) while Vietnam is a lower middle-income country (with a GDP per capita of about 1685 US \$ in 2015). Jordan’s economy is richer than either Ethiopia or Vietnam (with a GDP per capita of about 3300 US \$ in 2015) and is classified as an upper-middle income country. Both Ethiopia and Vietnam are dynamic economies that have experienced a sustained pace of growth in the last decade while Jordan’s economic growth has been more uneven. Ethiopia and Vietnam are characterized by high levels of female labour force participation (above 70 percent, UN Women POWW 2015, Annex 4) while Jordan’s female labour force participation rate continues to be unusually low, despite close-to-zero gender gaps in literacy and women’s relatively high education levels (ibid.).

### The macro gender structure

Regarding **the macro gender structure** of these three economies, Ethiopia’s economy is still agriculture-based, with recent expansion in construction and services but limited developments in the manufacturing sector. In other words, Ethiopia is still at an early stage of industrialization, while Vietnam shows signs of progress from an early stage towards the middle stage. The Jordanian economy is heavily dominated by services. As can be seen in Table 2, in Ethiopia, agriculture constitutes about 39 percent of GDP and employs more than 60 percent of the female labour force. In Vietnam, agriculture is about 19 percent of GDP and



**Table 2: Output and gendered employment structure of Ethiopia, Vietnam and Jordan (2015)**

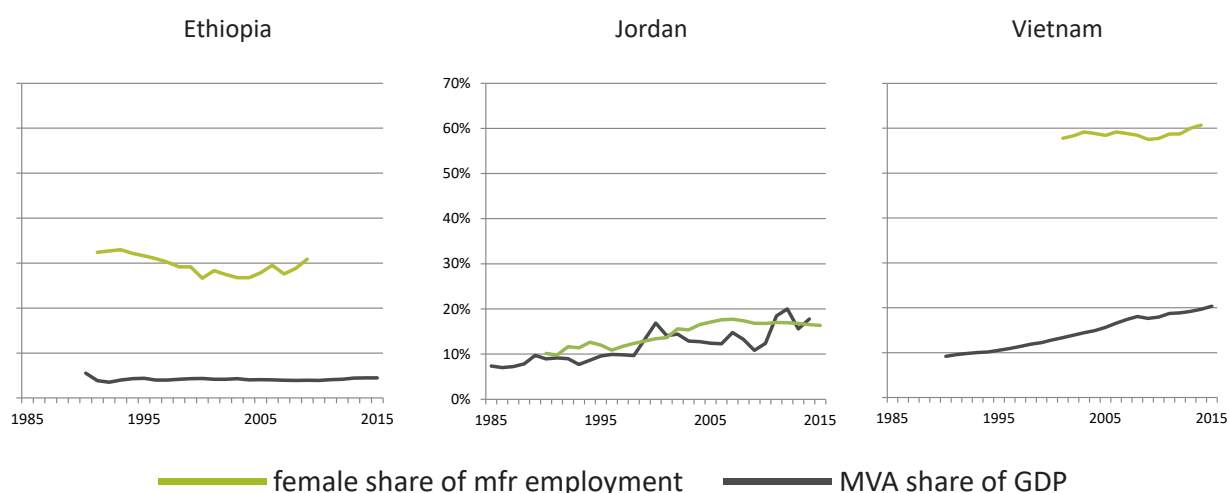
|             | Indicator (2015)   | Ethiopia | Jordan | Vietnam |
|-------------|--|----------|--------|---------|
|             | GDP per capita (constant 2010 US\$)                        | 487.3    | 3297.9 | 1684.7  |
| AGRICULTURE | Agriculture, value added (% of GDP)                        | 39.2     | 4.2    | 18.9    |
|             | Employment in agriculture (% of total employment)          | 71.4     | 2.0    | 44.0    |
|             | Employment in agriculture, male (% of male employment)     | 78.5     | 2.2    | 43.1    |
|             | Employment in agriculture, female (% of female employment) | 63.0     | 0.9    | 45.0    |
| INDUSTRY    | Industry, value added (% of GDP)                           | 17.7     | 29.6   | 37.0    |
|             | Employment in industry (% of total employment)             | 8.0      | 17.7   | 22.3    |
|             | Employment in industry, male (% of male employment)        | 7.7      | 19.4   | 26.1    |
|             | Employment in industry, female (% of female employment)    | 8.4      | 8.4    | 18.3    |
| SERVICES    | Services, etc., value added (% of GDP)                     | 43.0     | 66.2   | 44.1    |
|             | Employment in services (% of total employment)             | 20.6     | 80.3   | 33.7    |
|             | Employment in services, male (% of male employment)        | 13.8     | 78.5   | 30.8    |
|             | Employment in services, female (% of female employment)    | 28.6     | 90.7   | 36.7    |

Source: World Bank World Development Indicators for GDP per capita and sectoral value added; ILO KILM for sectoral employment estimate.

employs 45 percent of the female labour force. In Jordan, agriculture is a tiny share of GDP (only 4 percent) and employs less than 1 percent of the female labour force. The overwhelming majority of the (small) Jordanian female labour force is employed in services, which constitute about 66 percent of the country's GDP. The corresponding shares of female employment in services in Ethiopia and Vietnam are 29 percent and 37 percent respectively.

As for industry (to include mining and construction as well as manufacturing), the share of the female labour force working in this sector is about 8 percent both in Ethiopia and Jordan. By contrast, the share of the male labour force working in this sector in Jordan is 19 percent. In Ethiopia, the share of male employment in industry is similar to the female share, at about

8 percent. Industry as percentage of GDP is significantly greater in Jordan (30 percent) than in Ethiopia (18 percent). In Vietnam, industry constitutes about 37 percent of GDP and employs about 18 percent of the female labour force. In sum, in Jordan women workers appear to be heavily concentrated in services and make up a rather small fraction of the total workforce. Women work in higher numbers and are more evenly distributed across the three broad economic sectors in Vietnam and Ethiopia. This indicates a higher level of gender-based segregation in the Jordanian labour market than in the labour markets of Ethiopia or Vietnam. **These illustrative examples clearly show that the evolution of manufacturing development needs to be situated in the specific gendered context of each country.**

**Figure 4: Trends in manufacturing female employment and value added: Ethiopia, Jordan, Vietnam**

Source: UNIDO Statistics (2018)

As can be seen from Figure 4,<sup>13</sup> concomitant patterns in the manufacturing share of GDP and the female share of manufacturing employment over time suggest feminization in both Vietnam and Jordan, although in Jordan female shares start from very low values and the pattern is uneven. In Vietnam, female shares start from high values and continue on a steady, if slow, upward trend. These patterns suggest a story of female-led as well as export-led industrialization in Vietnam, and to a lesser extent in Jordan. In Jordan, the driving sector behind feminization is exclusively garments, while in Vietnam the situation is more diversified. The trajectory of female employment as related to patterns in manufacturing seems to display no clear trend over time in Ethiopia, at least over the 1990-2010 period. Once more up-to-date employment data become available for this country, it would be interesting to observe whether a distinct pattern of feminization is starting to emerge.

### Gender dynamics and manufacturing development in Vietnam

In 2010, Vietnam became recognized as a lower-middle income country. It is a country still in the early stages of industrialization,

<sup>13</sup> Data on both value added and employment in 'Industry' in Table 2 include mining and constructions as well as manufacturing and were taken from the World Bank WDI. There may be possible discrepancies therefore with the figures reported from UNIDO that have been used to build Figure 2.

but is very energetically pursuing market-oriented reforms and trade liberalization. The overall development goal of the Government of Vietnam, as stated in its 2011-2020 Socio-Economic Development Strategy, is to become a 'modern industrialized country by 2020' and to continue shifting from agriculture to industry and services. The growth of garments, motor vehicles, and particularly electronics, has been impressive in recent years. However, production in all these sectors still largely involves simple assembly processes with relatively low value-added for the producer, and heavy reliance on imported materials (Tran and Nørlund, 2014). Most export-oriented enterprises have been hiring more female workers than male workers (while the trend is reversed in non-FDI enterprises (UN Women Viet Nam, 2016), thus in some ways suggesting a strategy for competitiveness close to what Tejani and Kucera (2014) defined as 'a cost-cutting flexible employment strategy'.

The structure of Vietnam's GDP seems to have altered only slightly in the last decade (with more substantial shifts from agriculture to industry having occurred in the previous decade) while a more significant structural shift has been observed in employment (UN Women Vietnam, 2016). Within manufacturing, women are heavily concentrated in the textiles and apparel sectors (where about 80 percent of labour is female), while sectors such as metals

and furniture are male-intensive, reproducing patterns found in most other countries. As data analysis in UN Women Vietnam (2016, p. 42-47) highlights, in the last ten years, employment growth has been faster in sectors where export production has increased. These were either female-intensive sectors right from the beginning of the period such as wearing apparel, or have become so in the process. It is especially notable that the female intensity of employment in electronics has increased from 58 percent in 2005 to 79 percent in 2013. Even the motor vehicles sector seems to have shifted from being a relatively male-intensive sector in 2005 to having a female share of 58 percent in 2013 (UN Women Vietnam, 2016).<sup>14</sup>

Through the lense of Tejani's and Kucera's decomposition approach (see section II.1), the feminization of manufacturing employment in Vietnam is thus taking place because of both growth of traditionally female-intensive sectors (wearing apparel) and sector reallocation effects (electronics and vehicles parts becoming more female-intensive). These developments could be a promising pattern for women in new dynamic sectors, offering expanded professional opportunities and better quality jobs. However, various evidence (Tran and Nørlund, 2014) suggests the employment opportunities for women so far have been largely concentrated in unskilled jobs and opportunities for training, skills development, and promotion in these sectors have been limited.

Moreover, the concentration of manufacturing production and employment around Vietnam's two main cities, Ho Chi Minh City and Hanoi, has been a source of regional imbalance and domestic migration (Cling et al., 2011). Many of the women working in export-oriented apparel or electronics factories are migrants to the cities and face additional challenges due to their limited entitlement to social services (childcare, health, housing) because of their lack of residency status). Some pilot projects providing childcare for working mothers in industrial zones have recently been launched

by the government, but so far, such initiatives remain limited in scope (UN Women Vietnam, 2016).

Vietnamese women are being incorporated into industrialization more as wage workers than as entrepreneurs. Women entering export-oriented manufacturing sectors are largely wage workers and tend to be younger and better educated than the women working in agriculture. Similar shares of Vietnamese women and men are classified as own-account workers (42 percent and 40 percent, respectively, according to the 2015 LFS) but more women are likely to be found in the informal low-end of the spectrum in this category. Most self-employed women work at the subsistence level as 'micro-entrepreneurs' either in agriculture or in typically 'female' services such as preparing and selling food on the street side, or providing beauty services. Self-employed women in agriculture earn the least - about 65 percent of what self-employed men in agriculture earn and only 22 percent of what male wage workers in urban areas earn (UN Women Vietnam, 2016, Table 12 and Table 13). Recent reports point to promising new developments in the production of high value products such as pork, cut flowers, and litchis for export markets as well as increasingly important domestic supermarket networks (UNDP, 2016) and it would be important to better understand the terms upon which rural women are involved in these initiatives.

Outside of agriculture, small and medium enterprises owned by women tend to grow more slowly and generate lower profits than men's. According to a Vietnamese Institute of Social Development Studies (ISDS) survey (2015, Figure 4.7), for example, 42 percent of self-employed women belong to the poorest bottom quintile compared with 23 percent of self-employed men. Explanations for these patterns include greater difficulties and restrictions on their time that women entrepreneurs face in balancing work and family responsibilities. Women entrepreneurs also report various forms of discrimination in accessing productive resources and networks, and lack of education, which may translate into limited knowledge of legal provisions, or simply less self-confidence

<sup>14</sup> It should be noted, however, that employment growth in these sectors is from a tiny base.

(VWEC/ILO, 2007). According to Waibel and Gluck (2013), the training available to women entrepreneurs is largely provided by business clubs affiliated with the Vietnam Women's Union (VWU), which tend to focus on forms of training and income-generation activities considered stereotypically female such as hair dressing and sewing. Training services for men tend to be organised by either the government or private business development providers. The more professional and specialized sector-based business associations, however, remain male-dominated and have not adapted their operations and service delivery to the needs of women entrepreneurs (VWCE/ILO, 2007). An alternative explanation might be that poor women may be better off in wage work. Cling et al. (2011), for instance, suggest that many of the informal female enterprises that closed over the period of Vietnam's recent financial crisis did not close for reasons of business failure, but because of better opportunities in waged jobs.

Gender gaps in economy-wide earnings in Vietnam have remained significant despite promising new developments in export-oriented manufacturing. Overall, female earnings have declined from 87 percent of male earnings in 2004 to 80 percent in 2012. This is largely a consequence of women being clustered in both lower-paying sectors and lower-paying occupations within a given sector, while men more easily reach higher paying positions. Women's share of the working population participating in technical and vocational education (TVET) has also fallen while that of men has risen since 2004 (UN Women Vietnam, 2016). Moreover, even though good progress has been made in closing gender gaps at all educational levels, fields of study remain highly gender stratified. Among students enrolled in tertiary education, men are considerably more likely to specialize in engineering, manufacturing, construction and services, while women tend to specialize in education, humanities and the arts, with no significant change over the last years (UNESCO, 2014). This is one of the principal factors contributing to the reproduction of gender segregation within the occupational structure.

As is the case globally, stereotypes about what jobs are suitable for women are widespread, both among employers and the wider public. A survey by the Vietnamese Institute of Social Development Studies (ISDS, 2015) shows that the belief that men are better than women at jobs requiring technical skills and management jobs is widely held. For example, nearly two thirds of respondents believe that men are better at learning than women, particularly in the natural sciences and technical subjects. About 64 percent of female respondents and 58 percent of male respondents also believe that men have stronger leadership abilities, and that organizations would work more effectively if headed by male leaders (ISDS, 2015, Table 8.13).

In sum, Vietnam has one of the highest female labour force participation rates and is also one of the most open economies in the South-East Asia region (trade in goods constituted about 180 percent of GDP in 2015, World Bank WDI). This high trade openness constitutes both an opportunity and vulnerability. From a gender and social policies perspective, women have many new opportunities for work in export factories and industrial parks but Vietnam appears to be characterized by limited public support for care services and gender norms that still assign primary responsibility for care provision to women within the private sphere of the household (UN Women Vietnam, 2016). From the perspective of Braunstein's framework outlined in Chapter I, there is thus a risk that women might find themselves increasingly squeezed between paid work in the manufacturing sector and care responsibilities at home, with negative consequences for both their well-being and the overall quality of human capacities development.

### **Gender dynamics and manufacturing development in Jordan**

Jordan is a small country with a population of almost 10 million in 2018 (World Bank Open Data, 2018). It has smaller reserves of water and natural gas compared to other countries in the Arab region, but is a relatively open economy with active trade flows. The main exports based on shares in total value of exports



are garments, minerals and fertilizers, and pharmaceutical products (World Bank, 2018). The share of manufacturing in Jordan's GDP has been growing moderately over the last two decades but its structure has not significantly changed, except for the expansion of chemicals, pharmaceuticals and, above all, export-oriented garment production (Abugattas-Majluf, 2012). The Government of Jordan is currently investing resources into expanding the chemicals and pharmaceuticals sector, which is a higher value-added sector than garments (ILO, 2017a). Women employed in this sector, however, are fewer in number than in other manufacturing sectors, and gender-based occupational segregation is very strong. For instance, women constitute over 96 percent of workers in the packaging department, but hold less than 8 percent of the technical jobs (Peebles et al., 2005). Most women working in the manufacturing sector, however, are employed by the garment industry.

The garment industry has not historically been an important industry in Jordan, but has enjoyed substantial growth since the mid-1990s after the signing of various trade agreements between Jordan and the United States and, later with the EU and other countries. The Free Trade Agreement (FTA) with the United States grants products manufactured in Jordan duty free and quota free status. As noted by the ILO (ILO Better Work Jordan, 2018), the garment industry currently accounts for about 25 percent of Jordan's total export value (a 9.6-percentage point increase was reported in 2017), with the United States as the main market of destination. There are 89 garment factories employing about 70,000 workers, a small fraction of the total labour force. Most garment factories are located in three large qualifying industrial zones (QIZs) in Dulyal, Irbid and Sahab and operate as enclaves, with little backward or forward linkages with the rest of the economy.

Although the garment industry is one of the few female-intensive sectors in Jordan, only about a quarter of workers are Jordanian. The low number of local Jordanian women employed in this sector is unsurprising in context of the fact that, although highly educated, the female labour force participation rate was estimated to be around 19% in 2017 (UN Women, 2017b).

This indicates that although Jordan has achieved a reversal of the gender gap in education at the secondary and tertiary levels, there are still difficulties for women in transitioning from completion of education into employment in the labour market. A recent UN Women survey found that a majority of women who are not currently employed (57%) in Jordan would like to work if they had the opportunity (ibid.). Further examination of the female intensity of sectors also shows that local women are primarily educated and employed in low-growth/low-productivity sectors such as health, education and public administration, rather than the garment industry.

Reasons for this include social stigma associated with a negative perception of the working conditions in the QIZ zones. Further compounding issues include the need for transportation to the QIZ zones and competing care responsibilities. Hence, the few women of Jordanian origin in QIZs are usually from rural areas and are likely to have joined factory work out of necessity to supplement their household incomes. The garment industry, as one of the few female-intensive sectors, therefore heavily relies on international female migrant workers primarily from the Asian subcontinent (about 75 percent on average during 2000-2015) and more recently, an influx of refugees from Syria, the population of which in Jordan now reaches 1.4 million, as estimated by UN Women.

**The above suggests an industrialization process that risks reinforcing workers' vulnerabilities based on both their gender and migration status, which undermines the principle of inclusiveness and necessitates important policy challenges.** Feminization that is largely driven by the expansion of one sector can be viewed as an example of what Tejani and Kucera term 'a cost-cutting flexible employment strategy.' The added complications of significant migrant and refugee populations increases the need for more data to ensure their particular vulnerabilities are taken into account when developing policies. Potential conflicts may arise in cases where policies developed to increase the employment of local women result in negative impacts on the migrant and refugee workers who may also depend on these jobs. In an effort to increase the local employment

rate, including for Jordanian women with few income opportunities, the minimum wage was increased, which led to a two-tier wage system in which Jordanians are paid more than foreign workers; the work permit fee for employers recruiting foreign workers was also raised, and a 30% local workforce rate (to reach 50% by 2021) was put in place (Better Work Jordan, 2018). These policies can result in negative impacts on the chances of migrant and refugee workers getting decent jobs and refers back to the need to collect more information and data on the particular situation of foreign workers in this sector. This is especially needed to track and monitor indicators related to SDG target 8.8: ‘Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants and those in precarious employment.’

Policies developed would also need to address the constraints local Jordanian women face in gaining employment, which include limited access to productive resources and to the labour market, and sole responsibility for housework and unpaid care. Unemployment rates are significantly higher for women than for men (particularly so for graduate females). This, too, reflects gender-based prejudices and stereotypes, not only within households but also among employers and in the world of work (ILO, 2017a). Women who seek to start and develop their own business may find it particularly hard because of generalized de facto discrimination, even when formal laws do not treat women and men differently. Difficulties are reported in accessing finance, but also in reconciling work and family life, given childcare and housework responsibilities (UNIDO, 2017; UN Women, 2015). They may also face negative perceptions about their abilities. Most women-owned businesses tend to be in services (44 percent), trade (23 percent), handicrafts (19 percent), and only a small proportion in manufacturing (11 percent) (UNIDO, 2017).

These conditions propel the vast majority of Jordanian women who are in paid employment into jobs in the public sector. Reasons include better wages and working conditions, as well as a higher likelihood that labour standards relevant to women workers (such as equal remuneration or maternity protection) are

respected, as compared to the private sector. These constraints are often compounded for migrants and refugees due to a more restrictive legislative environment (UN Women, 2017b). Reports from Better Work (2018) have also brought to light the potential for violations of labour standards in QIZs, including forced overtime; non-compliance with health and safety regulations; bullying and sexual harassment; and obstruction of workers’ access to their personal passports and work permits.

The Government of Jordan has taken steps to redress the above challenges and reduce labour market discrimination with attention to the garment sector. Of note is the decision of the Ministry of Labour in 2011 to make Better Work Jordan a mandatory programme for all garment factories and their subcontractors exporting to the United States and Israel (Better Work Jordan, 2017). Since its inception, the Better Work Programme has contributed to some important changes in Jordan. Examples include the establishment of satellite production units in rural areas with few income opportunities outside of the QIZ areas functions as a means to overcome transportation issues and increase female participation in the labour market. The promotion of a campaign jointly with local NGOs for the creation of workplace nurseries to help mothers continue working after having children could also lead to increasing numbers of employers offering concrete support for the needs of working mothers with young children. **A strong policy emphasis on public provision of childcare for working mothers should not, however, remain confined to garment workers; it is equally relevant for women working in other sectors and for the promotion of women’s entrepreneurship.**

Small-scale interventions in cooperation with the government aimed at supporting women’s integration in the world of work include recent initiatives by the World Bank and UNIDO, among others. The World Bank, for instance, is supporting a pilot programme to increase the employability of young female graduates through a two-pronged approach: (a) training them in skills prioritized by employers as needed by their firms, but perceived to be lacking in young women, and (b) providing short-term financial incentives to firms for hiring female

graduates who still lack work experience. The rationale is that this type of approach might help in challenging employers' stereotypes by creating opportunities for them to observe first-hand female graduates at work (Gatti et al., 2013). As part of the project 'Promoting women's empowerment for Inclusive and Sustainable Industrial Development in the MENA region (2014-2017),' UNIDO supports Jordanian women entrepreneurs in the textiles, food, and jewellery sectors by simultaneously: facilitating policy dialogue at the macro level; strengthening the capacities of the National Women's Business Association at the meso level; and counselling female entrepreneurs on business plans at the micro level (UNIDO, 2017). An interesting example of how new technologies can be creatively used to facilitate women's inclusion in fields otherwise precluded to them is the creation of an online platform for engineering contractors by the Jordanian Handasiyat.net, which has attracted female engineers seeking to work from home (ILO, 2016).

In sum, from the perspective of Braunstein's framework (see Chapter I), Jordan appears to have the characteristics of a dualistic economy with highly segmented labour markets, low female labour force participation rates, a strong reliance on women's unpaid care work, and limited public investment in social infrastructure. Under these circumstances, a vigorous policy for the public provision of education, health and care services is recommended to avoid unsustainable growth scenarios. Such a policy should give special attention to the needs of all categories of working women, facilitate their inclusion in a diverse range of occupations and sectors, and challenge gender stereotypes in the workplace.

### Gender dynamics and manufacturing development in Ethiopia

Ethiopia is considered by many as one of the more successful development stories of the last decade, having experienced continuous and robust growth at an average annual rate of about 10 percent since 2004. In addition to favourable weather conditions for agriculture, factors contributing to this success include large market reforms in the 1990s, improvements in access to

basic services, such as health and education, and heavy investment in infrastructure, especially roads and telecommunications (UNECA, 2016; Seid et al., 2016). These changes are galvanized by recent developments related to increased women's representation and gender mainstreaming in decision-making: Ethiopia has appointed its first female head of state, reached 50% representation in the Cabinet; and has started to employ an accountability tool to assess the performance of all sectors and regional bureaus on gender equality and the empowerment of women. An increasingly gender-responsive legislative and regulatory environment can support development efforts by more effectively institutionalizing and increasing women's labour force participation (UNDP, 2018).<sup>15</sup>

In terms of the structure of the Ethiopian economy, focus has moved from agriculture to services and construction while changes in the share of manufacturing in GDP have so far been negligible. More specifically, in the period from 2004 to 2014, about 70 percent of the decline in the GDP share of agriculture was accounted for by the service sector, with the remaining 30 percent going to the construction sector. In contrast, the share of the manufacturing sector in GDP remained around 4.4 percent in 2014, only 0.2 percentage points higher than its share in 2005. This is a rather low value compared to the Sub-Saharan Africa (SSA) average of 10 percent. Between 2004 and 2013, manufacturing exports grew more than 11-fold, largely thanks to increasing export earnings of the leather, textile and apparel sectors. Nevertheless, the contribution of manufactured products to total

<sup>15</sup> The Ethiopian Constitution (1995), the Revised Family Code (2000), regional and international instruments including ILO conventions, Ethiopian Labor Proclamation No.377/2003 guarantee women's equal rights to employment, promotion, pension, transfer entitlements, as well as the right to form associations. The Ministry of Women and Children Affairs (MoWCA) has developed gender-specific policies and strategies aligned with national strategies in order to increase women's participation within the labour force. These include the National Action Plan for Gender Equality (NAP-GE) and the National Women's Development and Change Package (UNDP, 2018).

Ethiopian exports and employment remains modest (UNECA, 2016).

Analysts are optimistic about the role of industry to catch up in the future, particularly the light manufacturing industries. One of the main arguments supporting this optimism is that these are industries for which labour costs are very important, and Ethiopia 'has a labour cost advantage over both China and Vietnam' (ibid.). The UNECA assessment (2016) also praised the quality of Ethiopia's industrial policy-making as embodied in its Growth and Transformation Plan covering 2015-2020 (GTP II). The GTP II identifies rapid industrialization and structural transformation as its core objectives, setting the goal of achieving lower-middle-income country status for Ethiopia by 2025. It aims to do this by targeting and developing priority sectors through selective industrial policies, supported by continued improvements in physical infrastructure and skills development through public investment.

Recognizing the need to ensure women's inclusion within this process, **the GTP II also aims to promote the empowerment of women and youth through their effective participation in the development process as well as equitable benefit from the outcomes of development.** It sets targets for: increasing women-owned SMEs; improving women's access to both credit and land use rights; doubling women's participation in agricultural activities; achieving gender parity at all levels of education; and improving training access for 'vulnerable' women (Government of Ethiopia, 2015). Implementation of the GTP II's gender goals will take place within a legislative framework that, as noted above, is geared towards enabling women's equitable participation in the labour force. However, there is limited evidence to assess whether these provisions have resulted in concrete actions as yet. **Translating the GTP II's commitments on gender into effective implementation requires a high level of coordination between all relevant ministries to overcome any sectoral silos in gender expertise.** Building up the capacity of national gender machineries and increasing gender expertise and gender balance within all sectoral ministries involved

in implementing the GTP II will enhance actions towards achieving its gender goals.

This gender-responsive approach should extend beyond achievement of the GTP II's gender goals, to underpin implementation of all goals and aims of the GTP II. This is particularly necessary in light of the fact that designated priority manufacturing industries include heavily female-intensive sectors such as garments and textiles, agro-processing, meat processing, and leather and leather products. Priority industries were designated based on considerations of resource availability, labour intensity, linkages to agriculture, export potential, and low technological entry barriers. For each of these industries, the government has set up supporting institutes to coordinate the value chains effectively and assist firms with technological upgrading (UNECA, 2016, Section IV.3.3.). As mentioned, some priority sectors are female-intensive (most notably textiles, leather and apparel) whereas others are male-intensive (most notably construction).

The leather products and textile and garments sectors have been designated as top priority manufacturing sectors not only because they have strong linkages with the agricultural sector, but also as they are both labour-intensive (thus absorbing labour from the agricultural sector) and have good export potential. Although export figures from the last few years indicate positive trends for both industries, according to UNECA (2016) the results are not yet sufficient to make a significant contribution to structural change. For an accurate assessment, it is essential to understand not only whether industrial development will generate, on average, more jobs for women, but also the terms under which women will be incorporated in the various targeted sectors and initiatives. Policy formulation would therefore significantly benefit from **conducting gender-focused value chain studies of particular products in these sectors, to examine with accuracy where women and men are located in the various segments of the chain, both their paid and unpaid contributions, and the main bottlenecks and power imbalances they face.** It would be important to collect sex-disaggregated statistics



at a highly disaggregated level and at frequent and regular intervals.

One such example of a gender-responsive examination of manufacturing sectors and sub-sectors in Ethiopia has been carried out in 2018 by the Ministry of Trade and Industry and UNDP Ethiopia. The resulting study entitled “Women in Manufacturing” indicates visible gender segregations among the different sub-sectors and value chains. It finds that although the manufacturing sector provides formal employment for women, they are disproportionately represented in informal sectors, lower-skilled intensive levels of value chains and in lower-skilled intensive sectors and jobs. Various factors are found to contribute to this, starting with a lack of access to the market, capital and other productive assets. Women are also found to be under-represented in higher education, especially at the university level and in engineering and technology fields. Possible reasons cited include norms, cultural perceptions and discrimination that discourage women from taking up leadership positions, curbing their earning potential and prevent them from studying for or taking up jobs within technical areas. When employed, a lack of support services that accommodate mothers’ needs for work-life balance, such as limited time for breastfeeding and a lack of quality childcare facilities, negatively impacts their working environment. These factors, among others, work together to funnel women into labour-intensive, semi- and low-skilled sub-sectors within garments, textiles, leather, agro-processing, pharmaceuticals and electronics. Sub-sectors that involve higher-skilled or technical skilled labour force, such as chemicals and metal engineering have negligible rates of women’s participation (UNDP, 2018).

The rapidly growing leather export industry in Ethiopia is a good example of how the GTP II has the potential to positively impact women. Leather exports currently stand at \$132 million, and is predicted to grow to \$800 million by the end of 2020 (National Bank of Ethiopia, 2017-2018). The leather and leather products sub-sector by itself is expected to generate 35 percent of the employment created by the GTP

II. Being a female-intensive sector, the leather industry’s rapid growth will make a significant contribution to women’s employment in the manufacturing sector, both in terms of increasing productivity and international competitiveness among enterprises. Some changes are already being made within this sector to accommodate more women and their needs. These include efforts to increase women’s participation within sectoral associations, which are the main sources of information, skill building, market linkages and advocating common agendas, including by decreasing membership fees; as well as facilitating access to capital for SMEs, benefitting small business-owning women entrepreneurs, etc. (UNDP, 2018).

*It is essential to understand not only whether industrial development will generate, on average, more jobs for women than for men, but also the terms under which women will be incorporated in the various targeted sectors and initiatives.*

The leather sector is also one of three sectors targeted by the UNIDO Programme for Country Partnership (PCP) in Ethiopia (UNIDO, 2018a), and has generated examples of good practices that could be applied on a wider basis. In addition to helping the country’s government progress their national development strategy (GTP II) and reach its industrial development goals of achieving middle-income status by 2025, the PCP component targeting the leather sector aims to improve the quality of leather products manufactured by micro and small enterprises (MSEs) in accordance with domestic and international standards, therefore increasing the competitiveness and turnover of the Ethiopian leather products industry. A gender distribution analysis of the sector as part of the PCP led to the establishment of a cluster (i.e. registered network of producers) consisting exclusively of women’s enterprises. The PCP component also developed linkages with international and

national organizations providing training on design and export opportunities to enterprises run by women. Their products were promoted at an exhibition of leather products manufactured by MSEs owned by women, after which the women's network applied for legal registration as a business association under the name of LOMI. The World Bank, in implementing its Women Entrepreneurship Development Project for Ethiopia, has also established a partnership with the UNIDO leather project to carry out joint initiatives and facilitate the acquisition of loans for women. Data collected indicate an increase in average employment per enterprise in the various networks of the leather clusters after one year of project implementation. (UNIDO, 2016b)

Initiatives like these that aim to unlock women's potential through manufacturing development in Ethiopia benefit from an enabling legislative environment and good practices and lessons learned from which to draw on. Their sustained success requires ensuring good coordination between various ministries and agencies responsible for the implementation of GTP II, and, above all, that the gender equality policy agenda is not dealt with in a silo, but fully integrated within Ethiopia's broader structural transformation and industrialization plans. Policy formulation, in turn, would be significantly strengthened by sex-disaggregated data generated from gender-focused value chain studies that reveal where women and men work and the constraints they face in moving to higher skilled and higher value-added sub-sectors. It will be essential to monitor further developments regarding compliance with labour standards, as well as other possible gender-based constraints, not only in the leather sector but also in the other emerging sectors of textiles, agro-processing, and footwear.

### Policy implications

In the early stages of industrialization, growing demand for female 'cheap labour' due to the expansion of labour-intensive manufacturing might, under certain circumstances, have some positive empowering effects for some groups of women. **It is crucial, however, that in the long**

**term countries focus on an industrial strategy where women's economic opportunities are expanded and that the quality (including wages) of employment improve as part of the industrialization process.** This would need to be aimed at enabling women, especially the most vulnerable ones, to participate in industrial and technological development on decent terms. For this to happen, skill development policies, infrastructural investment, policies to promote access to credit and technology, and any other component of a comprehensive industrial strategy must be operationalised in a gender-responsive manner.

The statistics and information on the three cases of Vietnam, Jordan and Ethiopia illustrate different circumstances and policy environments surrounding the incorporation of women workers into the industrialization process. Looking at the specific in-depth example of Vietnam, the representation of women is increasing not only in traditional female sectors such as garments, but also in electronics and even vehicle parts. Therefore, the current challenge is not that women are unable to diversify into new sectors e.g. electronics, but that many continue to be employed largely in low/semi-skilled occupations in any sector, with limited opportunities for promotion and career advancement. For those women who remain in self-employment, integration into new expanding sectors (such as agribusiness for instance) is more difficult, because prevailing gender biases in the economy mean that they are often channelled into stereotypically female income-generating activities instead, and face restricted access to credit and networks.

**Policies to promote skills and training** would be essential to address gender differences in technical skills, which in Vietnam are one of the main causes of persistent gender occupational segregation and gender wage gaps. This is a core issue in Jordan too, where women tend to outnumber their male peers at most educational levels but study different subjects, largely in the field of humanities and arts, hence developing skills which do not match labour market needs (World Bank, 2014).



General educational policies need to be accompanied by **targeted interventions aimed at removing the underlying causes of women's low participation in technical subjects and/or TVET** and could include: programmes aimed at **challenging gender-stereotypical attitudes in the wider public and building girls' confidence in STEM fields; trainings designed in more gender-sensitive ways** (e.g. through better curricula as well as by ensuring that training modalities are compatible with women's caring responsibilities); and **initiatives to challenge employers' prejudices and incentives for them to provide on-the-job training to their female workforce**. Investment in this area of human capacities development would have the important added benefit of contributing to higher overall labour productivity and therefore enhancing firms' capacity to upgrade. At the same time, it would prevent women from being left behind in the upgrading process, a pattern which unfortunately has already been observed in other middle-income countries as noted earlier in this chapter.

*The likelihood of inclusion in the industrialization process can be different for different groups of women, and the terms of such inclusion may be especially disadvantageous for some*

In Jordan, the expansion of export-oriented garment production of the last twenty years does not appear to have been a strong catalyst for broad-based inclusive growth and women's economic empowerment. The garment sector has mostly remained an enclave with limited linkages with the rest of the economy and society, risking the reinforcement of workers' vulnerabilities because of their gender and migration status. In countries with high levels of migrant workers, there is a **need for greater data collection to ensure their particular vulnerabilities are taken into account when developing policies**, through the collection and analysis of sex-disaggregated statistics at a highly disaggregated level and at frequent

and regular intervals. The situation of female international migrant workers in Jordan is being addressed through some promising steps taken by the Ministry of Labour and other ministries as well as dedicated committees, but it is too soon to assess the long-term impact of these initiatives.

Importantly, effective measures to strengthen women workers' rights and access to productive resources must not be confined to export industries, but rather extend to all sectors in the economy. The Vietnam and Jordan case studies highlight global trends in **that the likelihood of inclusion in the industrialization process can be different for different groups of women, and the terms of such inclusion may be especially disadvantageous for some**. Migrant women, women from minority ethnic groups, female own-account workers in rural areas, and refugees emerge as the most vulnerable groups and would hence deserve special policy attention through a range of integrated measures.

**The lack of affordable and quality child care emerges as an important constraint not only for workers in factories but, just as crucially, for women owning small enterprises**. This latter group of women often cite childcare and family responsibilities as a main reason for not running more profitable (and demanding) businesses or for not joining training and networks. Governments in all parts of the world are starting to recognise the issue of childcare provision and many are trying to encourage the establishment of on-site childcare in factories. Policy-makers need to fully acknowledge that public support for gender-aware care policies is critical for the twin objective of gender equality and sustainable industrialization at large, and plan and design interventions accordingly.

Ethiopia recently moved from an initial phase largely focused on infrastructural investment to begin rapid industrialization and structural transformation as embodied in its GTP II. Although gender equality objectives have been accorded consideration in the formulation of its industrialization plans, it is not yet clear to which extent gender will be considered in

their implementation. An important lesson for Ethiopia from the experiences of both Vietnam and Jordan is that, to promote gender equality within an ISID agenda, **efforts should be directed not only towards strengthening the potential and competitiveness of economic sectors where women already work in significant numbers, but also towards enabling them to participate in new sectors and roles.** As noted, this requires a high level of coordination between all relevant ministries to overcome any sectoral silos in gender expertise, and a focus on increasing gender expertise and gender balance within all sectoral ministries to enhance actions towards achieving inclusive and sustainable industrial development.

*The inclusion of women in new sectors previously precluded to them will in turn allow new emerging sectors to thrive by making full use of richer and more diverse skill sets.*

Governments need to provide relevant departments and institutions with the adequate resources and skills needed to carry out detailed gender-aware baselines, evaluation studies and monitoring. **Gender-focused sectoral value chain studies** would generate the sex-disaggregated statistics needed to determine where women and men are located, paid and unpaid contributions, and the main bottlenecks and power imbalances they face. **The inclusion of women in new sectors previously precluded to them will in turn allow new emerging sectors to thrive by making full use of richer and more diverse skill sets.**

The next section gives an initial flavour of the sort of statistics that might be useful for this purpose.

### 2.3. Gender and ISID-related indicators, data and gaps

Good data are the foundation for good planning. Efforts to strengthen the use of gender statistics in industrial development planning must involve two main tasks: (a) making better and more creative use of data and surveys that already exist (but are seldom used to generate gender-aware economic analysis) and (b) collecting new sex-disaggregated data and ensuring that such collection is undertaken on a frequent basis to enable regular monitoring. Both tasks are rendered particularly relevant by the new 2030 Agenda for Sustainable Development and its indicators.

#### Using available data for gender monitoring

Table 3 describes a country profile with key manufacturing statistics which mimics what UNIDO provides on its statistics data portal front page, but is adjusted to include several gender indicators.<sup>16</sup> More specifically, our 'gender-extended' country statistical profile includes the following indicators: female share in manufacturing employment (also called female intensity of a sector) as well as female manufacturing employment as share of total female employment.

The first indicator is relevant to the lively debate about feminization and defeminization of industrial employment summarized in section II.1, particularly so if recorded over time. Observing trends for this indicator, the economic analyst could not only monitor whether the manufacturing sector of a country is becoming more female-intensive or not over the years, but also correlate these trends to a range of other variables. One could for example attempt to correlate changes in female shares of manufacturing to changes in export orientation, GDP structure, sectoral composition of manufacturing, or changes in any relevant gender characteristics of the economy, thus helping to identify possible underlying causes and interactions.

<sup>16</sup> In building such a profile we relied on UNIDO data whenever possible, but we also had to use other surveys from the ILO and World Bank. For further details, please see annex 1.

**Table 3: Gender extended industrial statistical profile for Jordan (Year 2014)**

| Upper Middle Income, Asia & Pacific, Other Developing Economies |           |  |      |
|---|-----------|--|------|
| Population  | 8,809,306 | <b>Female Manufacturing Employment Composition</b>   |      |
| GDP per capita (constant 2010 US\$)                             | \$3,348.8 |  |      |
| Trade (% of GDP)  | 113.1     | <b>Top 5 industries ranked by their share in total female manufacturing employment (%)</b> |      |
| Employment to population ratio (%)                              | 32.1      | Wearing apparel, fur   | 55.7 |
| Male employment to population ratio (%)                         | 53.7      | Chemicals and chemical products  | 14.7 |
| Female employment to population ratio (%)                       | 10.0      | Food and beverages   | 14.2 |
| Share of women in STEM graduates (%)                            | 40.3*     | Printing and publishing  | 2.6  |
| MVA share in GDP (%)  | 16.7      | Rubber and plastics products   | 2.3  |
| Medium and high tech MVA share in total manufacturing (%)       | 27.5      | <b>Manufacturing Composition</b>   |      |
| Manufactured exports share in total exports (%)                 | 78.0      | <b>(Top 5 industries ranked by their share in total MVA (%))</b>                           |      |
| Manufacturing employment share (%)                              | 16.8      | Chemicals and chemical products  | 21.5 |
| Share of total male employment (%)                              | 18.0      | Food and beverages   | 20.3 |
| Share of total female employment (%)                            | 12.5      | Non-metallic mineral products  | 10.6 |
| Female share in total manufacturing employment (%)              | 17.8      | Tobacco products   | 10.0 |
| Gender dissimilarity index in Manufacturing                     | 0.54      | Coke, refined petroleum products, nuclear fuel   | 7.9  |

\*For year 2007

Sources: ILO KILM (2018), UIS Statistics (2018), UNIDO Statistics (2018), World Bank Open Data (2018)

The second indicator, measuring manufacturing employment as share of total employment, separately for men and women, is simply a variant of SDG indicator 9.2.2 and responds to the UN SDGs Agenda's recommendation that as many SDG indicators as possible be disaggregated by sex. This indicator could be helpful to gauge the overall role of manufacturing in generating employment opportunities for women. It might well be the case that a country has a highly female intensive manufacturing sub-sector, but this does not necessarily mean that its manufacturing sector overall has the capacity to absorb a significant share of the female labour force. In Vietnam, for instance, manufacturing as a whole is female intensive (54 percent of its labour force is female), a result largely driven by wearing and apparel (80 percent of its labour

force is female). But manufacturing as a whole provides employment for less than 16 percent of the total labour force in the country while about half of the female labour force still works in agriculture. In sum, for monitoring progress on ISID, these two indicators complement each other and make it possible to monitor whether the manufacturing sector is creating employment opportunities equally for both women and men, and the overall extent of it.

As discussed in earlier sections, women's gains from manufacturing expansion may however be limited to specific sub-sectors, usually low-tech ones. Women may struggle to access industrial jobs other than jobs in textiles and

other similar ‘nimble fingers’ jobs<sup>17</sup> even in the face of narrowing gender educational gaps or other improvements in their skill set and productivity. For this reason, it is important to go beyond data on manufacturing employment as a whole and monitor the gender composition of manufacturing employment across sub-sectors. A first step could involve measuring and tracking the level of gender-based sectoral segregation within manufacturing over time. We therefore calculated the gender dissimilarity index using UNIDO industrial employment data at the 2-digit ISIC code. The index is a commonly used measure of segregation and can be interpreted as the percentage of one of the two groups of workers included in the calculation that would have to change jobs to obtain equal distribution of employment. It varies from 0 (no segregation) to 1 (maximum segregation). Our calculations show, for example, that the manufacturing sector is more gender segregated in Jordan (0.54) than in Ethiopia (0.26). A decline in the gender sectoral segregation index could be interpreted as more opportunities being created for women to enter manufacturing sectors previously precluded to them, and hence progress towards an aspect of ISID. To offer an indication of where women specifically work within the manufacturing sector of a particular country, we also report the top five industries ranked not only by shares in MVA (the format currently used for the country profile on the UNIDO portal) but also by shares in female employment. This initial ranking could help in prioritizing more in-depth sectoral studies (to focus for instance on the challenges faced by women in upgrading their enterprises and/or obtaining decent jobs).

It would be desirable if reporting gender and manufacturing data in the way illustrated in Figure 4 could become standard practice. One needs to be aware, however, that the indicators, even if offering a quick useful snapshot, have many limitations. More could be done to improve sex-disaggregated data collection and analysis in relation to industrialization.

<sup>17</sup> The term ‘nimble fingers’ was first used by Diane Elson and Ruth Pearson in a seminal article from the 1980s on women used as cheap labour in Third World manufacturing (Elson and Pearson, 1981).

### Filling gaps in current manufacturing data

Most manufacturing data are compiled for formal firms with at least 10 employees. Some countries conduct separate SMEs (Small and Medium Enterprises) surveys but these too fail to capture significant segments of informal manufacturing, particularly the more survival-oriented forms at the low-end of the spectrum. **This is a significant data gap which is important to address particularly from a gender equality perspective, since in many countries women are more likely than men to be found in the informal sector, either as micro-entrepreneurs or precarious wage workers** (ILO, 2017b).

Most data referred to in this chapter with regard to women’s participation in industrial development tell us about quantity of jobs but say little about the quality of women’s participation in manufacturing. Understanding better the terms under which women are included would be essential to assess whether industrial development is truly inclusive and sustainable. Regarding women-owned enterprises, it would be useful, for example, to gather systematic evidence on whether their survival rates, labour productivity, and capacity to diversify production are different from those of men-owned enterprises, and whether they face different barriers over time in access to credit and markets. A few country-level surveys collect this kind of information (e.g. see Rand et al., 2014 for Vietnam) but they rarely disaggregate data by sex in their reporting. Most of the information available on these dimensions usually draws on limited, small-scale, non-representative studies which are therefore not generalizable.

Similarly, with regard to wage workers in manufacturing, it would be important to more regularly collect and analyse data on possible gender differences in earnings and skills, promotion prospects, working conditions, and other aspects of workers’ well-being. Once again, some such surveys exist (e.g. ILO Better Work, 2018) but these are usually small in scale and not annually collected. It would also be useful to ensure greater comparability between types of datasets across countries.



Finally, systematic collection of data on expenditure patterns and use of health and other social services, not by household, but by gender of individual household members, could be particularly helpful in capturing the gender differentiated consumption effects likely to result from the diffusion of new and more affordable varieties of industrial goods.

### Monitoring SDG 9 indicators alongside other SDG indicators

The data suggestions above are mostly aimed at strengthening the monitoring of gender aspects of SDG9. There are obviously other indicators associated with other SDGs and targets that are equally important to capture whether progress is being made on gender-equitable ISID. The UNIDO report titled 'The 2030 Agenda for Sustainable Development: Achieving the Industrial-related Goals and Targets' (UNIDO, 2015) provides an effective discussion of the interrelated nature of all goals and targets and offers examples of industrial-related indicators under each SDG. Targets and indicators which might be particularly important for capturing progress on the twin objective of gender equality and ISID include:

- In relation to Goal 2 'Zero Hunger', it would be useful to disaggregate indicators on small industrial firms processing food by sex and include an indicator of the extent of technology adoption by sex as well as regularly monitor number of women and men participating in rural extension services;
- In relation to Goal 3 'Healthy lives and well-being for all at all ages', the emphasis could be on monitoring production of drugs and provision of appliances to the health industry that improve access to essential health services as well reproductive health for disadvantaged women. This could also have an indirect positive impact on indicator 5.4. 'Recognize and value unpaid care and domestic work through the provision of public services, infrastructure ...' (by reducing morbidity and hence the time women must spend caring for sick family members);

- In relation to Goal 4 'Quality education', it would be essential to record TVET by sex and subject of specialization, with particular attention to STEM fields;
- In relation to Goal 8 'Decent work and economic growth', it would be useful to regularly report data for indicator 8.3.1 'Proportion of informal employment' not only by sex, but also by type of production activity (e.g. sewing clothes vs. construction). Moreover, producing sex-disaggregated indicators related to target 8.8 'Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants and those in precarious employment' is especially important for monitoring to ensure that working conditions of women in Special Industrial Zones are just and equitable.
- In relation to Goal 9 'Resilient infrastructure, inclusive and sustainable industrialization, innovation', several examples and suggestions on sex-disaggregated data and indicators have been provided throughout this paper. Indicator 9.2.2 was covered extensively in the first paragraphs of this section. It would also be relevant to report 9.3.1 'Proportion of small-scale industries in total industry value added' and 9.3.2 'Proportion of small-scale industries with a loan or line of credit', by sex of the ownership (drawing on well-designed nationally representative SME surveys).

The examples above are just illustrations. There might be other additional sex-disaggregated indicators that planners may wish to focus on, depending on country context.







## 3. Looking ahead: the new industrial revolution and gender equality

### 3.1. Emerging trends in industry

The current wave of technological advances and radical innovations that goes under the name of the Fourth Industrial Revolution -or Industry 4.0- (Schwab, 2016; WEF, 2017) is already bringing about substantial changes in production processes, ways of communicating and living standards. It is often noted that the speed and depth of this technological revolution are unprecedented and all-encompassing. The Fourth Industrial Revolution builds on the Third Industrial Revolution (or digital revolution), the distinctive feature of which was the use of electronics and information technology to automate production, but goes well beyond it. In the words of Schwab, founder of the World Economic Forum, the Fourth Industrial Revolution is characterized by a 'fusion of technologies that is blurring the lines between the physical, digital, and biological spheres' (Schwab, 2016). Examples of technological innovations that are increasingly being promoted under Industry 4.0 include: mobile internet; the internet of things (i.e. the use of sensors, actuators, and data communication technology built into physical objects thus enabling those objects to be tracked and coordinated across a data network); new approaches to data storage such as the cloud; new approaches to both energy generation (e.g. renewable energy) and storage; knowledge-work automation and advanced robotics in production processes; additive manufacturing such as 3D printing; and autonomous vehicles. (UNIDO, 2016a, Box 2.1).

There is excitement about the gains and unique opportunities predicted to arise from these radical technologies for producers and consumers alike, women and men, in both high and low income economies, but there needs to be awareness that not all countries and segments of society will be able to benefit in the same way. As in any of the previous Industrial Revolutions, there will be significant disruption,

and the costs and negative implications will be borne by specific economic sectors and groups of people more than others. There is no guarantee that the gains from these new processes will fully compensate for the losses, as the long term distributional consequences of technological change will depend on the nature and speed at which new jobs and opportunities may materialize. Current debates on these issues are very lively in both policy and academic circles, but there is no clear-cut evidence, given that the effects are context-specific and depend on a range of factors. **Nor is it possible at this stage to assess conclusively whether gains or losses will be greater among women than among men.**

*The issue of gender norms and stereotypes deserves special policy attention, given the persistence of gender-typing in both early and mature stages of industrialization.*

The most important point to stress is that the forms that new technologies will take, and any resulting distributional effect through various channels, are not pre-determined or ineluctable. The outcomes for inclusiveness will ultimately reflect political decisions and possible reconfigurations of social norms, including gender norms. In other words, they can be shaped by policy. **The issue of gender norms and stereotypes deserves special policy attention, given the persistence of gender-typing in both early and mature stages of industrialization** documented in Chapter I and II.

Evaluating the potential gender implications of each of these radical technical innovations is well beyond the scope of this paper. The more modest aim of the next pages is to identify a



few selected emerging issues and challenges of relevance for the promotion of gender equality in the context of the Fourth Industrial Revolution, informed by the conceptual arguments and empirical evidence reviewed in early parts of the paper.

### 3.2. Gender implications: new challenges and opportunities

The conceptual framework laid out in Chapter I can be a useful guiding tool for thinking about the multiple mechanisms through which the technological changes spreading under the Fourth Industrial Revolution are likely to interact with gender relations. This framework identified three main channels through which technological and industrial development can generate gender-differentiated distributional effects: the employment channel, the consumption channel, and the public provision channel. Regarding the employment channel, one of the most controversial issues related to the Fourth Industrial Revolution is indeed whether the rapid spread of robotics technology will cause large-scale job displacement and wage erosion. This is a recurring source of policy debate in both advanced and emerging economies, with often contrasting views on the sectors and categories of workers (both by skill and gender) that are expected to be mostly affected.

The adoption and diffusion of the new technologies will have distributional effects via consumption and public provision channels as well. This is because new consumption opportunities will likely benefit some groups more than others: e.g. not everyone has the same level of accessibility to smart gadgets for monitoring home electronic devices remotely. Their use will be highly contingent on the financial resources and digital skills of individuals, as well as the socio-economic characteristics of the households concerned (including their gender composition), and the general level of infrastructural development in the particular area. Technology can also change both the costs and nature of public services provision, for example through innovations

in transport infrastructure or new monitoring systems for out-patient care by public health care providers. These changes, too, will have group and gender-specific effects, depending on modes of delivery and users' backgrounds and circumstances (e.g. women in different stages of the life cycle).

*A key first step for policymakers must be to ensure that a greater number of women, from a more diverse set of socio-economic backgrounds and countries, are able to fully participate in, and influence the course of, technological innovation.*

In sum, all these processes carry with them both promises and risks for the promotion of gender equality. These changes are taking place within institutional structures that are gendered and, in turn, are going to affect women and men in different ways. In some instances, a specific technological innovation may reduce some aspects and at the same time reinforce other aspects of gender inequality, resulting in uneven and contradictory processes. As stressed throughout this paper, policies to reduce the gender bias in these processes need to be informed by an understanding of the close interdependence between the equal treatment of women within the science and technological fields and the extent to which technological change can be used to promote gender equality and inclusiveness (Wajcman, 2009). **Therefore, a key first step for policymakers must be to ensure that a greater number of women, from a more diverse set of socio-economic backgrounds and countries, are able to fully participate in, and influence the course of, technological innovation.**

To add some concreteness to this discussion, the next paragraphs conclude by offering a few selected examples regarding specific technological developments under the Fourth Industrial Revolution and explore their possible gender implications.

### Industrial robots: gender bias in job destruction/creation?

Are women workers more likely to lose jobs than male workers due to the increased reliance on robot-based automation in manufacturing production processes? And will the effects be different between developed and developing countries? The answer to these questions will vary greatly, depending on the stage of development of the country concerned, the overall structure of its economy, and the specific economic sub-sectors likely to be most affected. **Gendered effects will result from differences in the set of skills that female and male workers possess and the degree of rigidity in the norms that define which occupations are suitable for either women or men - all of which may be country and context specific.** There will be immediate impacts, but also longer term impacts, and the latter will largely depend on governments, firms, and people's responses to the initial 'disruptions'. In the longer term, gender norms may decompose, for instance with men taking on jobs normally associated with women and/or vice versa, or they may recompose (Elson, 2010).

Many occupations in both manufacturing and services involve a combination of manual, routine, and abstract tasks, and different manual and routine tasks have been mechanized for centuries. The present wave of automation however, carries higher displacement risks because it is characterized by machines capable of performing an increasingly wider range of tasks. Still, even advanced robots have difficulty in substituting for more abstract tasks, such as those involving creativity, problem-solving, and complex coordination, as well as other non-routine tasks, such as those requiring artistic dexterity or flexible interpersonal communication. This means that, from a technical point of view, workers doing routine tasks, particularly in the manufacturing sector, are most at risk of robot-based automation. Estimates from UNCTAD (2017) show that the technical feasibility of automating workers' routine tasks is greatest in food, beverages and tobacco; textiles, apparel and leather; and transport equipment. But there is also an economic feasibility of routine-task automation, which takes into account savings

on labour costs against the cost of investment in new capital equipment. This is estimated to be greatest in transport equipment; machinery; rubber, plastic and chemical products; and the electrical and electronics sector; and lowest in the textiles, apparel and leather sectors.

Considering these findings, UNCTAD (2017) argues that many existing studies overestimate the potential adverse employment and income effects of robots in manufacturing, because they neglect to note that what is technically feasible is not always also economically profitable. It concludes therefore that the countries currently most exposed to automation through industrial robots are those with a large manufacturing sector dominated by industries offering relatively well-paying jobs, such as the automotive sector and electronics. By contrast, robot deployment is likely to remain limited in those manufacturing sectors where labour compensation is low, such as textile and apparel, even if these sectors rank high in terms of the technical feasibility of automating workers' routine tasks. These considerations are corroborated by evidence, which shows that the automotive industry accounted for about 45 per cent of annual industrial robots deployment between 2010 and 2015, followed by computers and electronic equipment (about 15 per cent), and electrical equipment, appliances and components (5 per cent to 10 per cent). The number of industrial robots per employee is the highest in developed countries and former developing countries that are now at mature stages of industrialization, such as the Republic of Korea, whereas there are still hardly any robots in Africa (ibid.).

In sum, robotization has had a relatively small direct effect in most low-income developing countries so far, and, according to UNCTAD, this is unlikely to change soon given the limited diversification and technological upgrading characterizing this category of countries at present. UNCTAD (2017) also warns against the risk that, given current patterns, industrial robots may increasingly lead to a high concentration of manufacturing activities in a small group of countries. This concentration would harm inclusiveness at the international level and could make it more difficult for low-income developing countries to pursue

economic development based on traditional industrialization strategies. Evidently, this may have important implications for the capacity of these economies to generate ‘good jobs’ for women.

In general, all these findings and observations have an impact on the gender effects of workplace automation from advanced robotics. Studies only looking at technical feasibility (e.g. World Economic Forum, 2016; World Bank, 2016) find that the absolute number of job losses is largely the same for women and men. Yet, women are comparatively more affected because their participation in the labour force is usually lower, and because they are more likely to be excluded from emerging manufacturing jobs in areas that are complementary to robot use (Braunstein and Seguino, 2017; Tejani and Millberg, 2016). Taking account of economic feasibility and low robot deployment in labour-intensive and low-paying manufacturing, such as textiles and garments where female employment tends to be concentrated, in some cases job displacement effects may turn out to be larger for men than for women. Whatever the eventual outcomes of these specific changes, the emphasis in policy recommendations remains the same as in Chapter II: **the promotion of women’s inclusion in industry cannot be premised on the basis that they constitute a good source of cost-advantage in the initial stage of industrialization. Governments and business communities alike need to be committed to continuous efforts to promote the full realization of women’s talent at every stage of industrial upgrading.** If women continue to be used as a source of cheap labour for short-run competitive advantage, while required to carry out most of the unpaid domestic work and care, there will not be the investment in human capacities development (in families and by businesses and governments) required to take advantage of the new technologies and sustain growth in the long run.

Outside of the manufacturing sector, a growing body of literature points to the fact that, in high-income countries, current technological and organizational changes are increasing the demand for jobs where ‘people tasks’, which are difficult to computerize, are important. These jobs involve interpersonal skills and the ability to

effectively communicate, care for, and motivate others, and in many societies tend to be held by women. For instance, research from the United States shows that the three occupations expected to grow the most between 2014 and 2024 are personal care aides, registered nurses and home health aides (reported in Institute of Development Studies, 2017). The shift towards social skill-intensive occupations may mean that some groups of women could perhaps indirectly benefit from the current wave of automation. However, for this shift to genuinely translate into better work opportunities and economic empowerment for women, policies would need to ensure that the new jobs created in social services offer decent working conditions and are well-paid. In the longer term, initiatives to encourage more men to train and work in occupations requiring high interpersonal skills may be another way to promote gender equality, by challenging prevailing assumptions about gender responsibilities in society, both in the world of work and at home.

### The internet of things and gender roles

“The internet of things” includes smart plugs, thermostats, and all sorts of other devices that enable turning on and off or programming a range of household appliances remotely, thus making homes more energy efficient and at the same time improving people’s capacity to manage their own time. The internet of things also includes various kinds of health monitors, which for example, can track heart rates, skin temperature, or even detect falls, and are therefore of valuable help to people who live on their own and may be elderly or have disabilities (Islam et al., 2015). **The adoption of these smart gadgets within the home environment may offer benefits to working-age women, by facilitating their tasks and responsibilities as primary carers for their family members. They can also be of valuable support in old age.** This is particularly relevant for women because of their tendency to live longer than men, to continue to carry out a significant share of unpaid care work even after retirement, and because of their likelihood to live alone in the last years of their life (especially in high income countries).



To maximise the potential of these technological innovations for the promotion of gender equality policy-makers need to pay greater attention and allocate more resources to two areas: (a) **reducing gender gaps in digital literacy** overall and, importantly, **addressing problems of access and affordability** for women who are disadvantaged by their status, age, or place of residence, in particular; and (b) **improving the design of the new gadgets** to facilitate use by a wider range of body shapes and physical abilities (evidence from a number of both developed and developing countries suggests a certain degree of inbuilt gender bias in technologies as varied as transport vehicles (Schiebinger 2010; Duma et al., 2016) and agricultural tools (Carr and Hartl, 2010).

*The spread of new smart gadgets and robots can pose challenges for the promotion of gender equality.*

It must be also kept in mind that a significant proportion of women in low-income developing countries still live in areas lacking basic water and electricity infrastructure, where “the internet of things” would be of very limited relevance. **In these contexts, widespread and robust investment in basic technologies is of the utmost importance and needs to be prioritized** (Klugman and Tyson, 2016; Mitter and Ng, 2005).

**The spread of new smart gadgets and robots can pose challenges for the promotion of gender equality.** Many computer programs and websites we use every day have built-in gender stereotypes, for example, in associating certain professions with a particular gender through the choice of gendered images or voices: receptionists and nannies are often female, while architects and philosophers are usually male (Institute of Development Studies, 2017). Moreover, current humanoid robots are frequently designed with either ‘feminine’ or ‘masculine’ characteristics, depending on the functions they are built to perform, thus reinforcing rather than challenging ideas and expectations about women’s and men’s roles.

The continued marginalisation of women from the scientific community is probably one of the main reasons for the persistence of gender biases in design, technical content and usage of technological and digital products (Wajcman, 2009; Wajcman et al., 2004). Recent recommendations made by the Web Foundation (quoted in Institute of Development Studies, 2017) could be especially effective in this regard. **These include that policy interventions prioritize: (a) investment in digitising services that low-income women find most valuable and (b) creation of a public fund for technology development** (e.g. incentives for technological entrepreneurs) that is specifically set aside for projects led by women.







## 4. Policy lessons for gender-equitable ISID

As background for this paper evidence from a range of countries on the terms of women's inclusion in manufacturing, and industrial development more broadly has been reviewed. The paper has focused mostly on the gendered employment effects of industrial sector expansion or contraction and asked whether, and under which circumstances, manufacturing jobs can be a source of economic empowerment for women. It has also pointed out that industrialization and technological development can affect, and are affected by, gender relations not only through the employment channel, but also through other channels. One example is the way in which new technologies could in principle contribute to a more equal sharing of caring responsibilities, by reducing the drudgery of domestic housework women disproportionately bear in most countries. The design and diffusion of goods (and technology-supported services) that meet women's daily needs is, in turn, more likely to be promoted when women's representation in STEM fields and relevant decision-making institutions is significant. The gender differentiated employment effects associated with industrialization are better understood and documented than other effects, but those related to private consumption and infrastructural development are likely to become more prominent as the role of the manufacturing sector in advancing inclusiveness and improving living standards evolves. This points to the need to fill existing data and research gaps by promoting more gender-aware analysis of new phenomena such as the diffusion of affordable varieties of goods, hi-tech infrastructural investment, and premature de-industrialization, among others.

A clear pattern emerging in relation to the gendered employment effects of industrialization is that women tend to be the preferred labour force only in early stages. Higher demand for female labour is usually driven by the expansion of a few sectors. Women are over-represented especially in garments and textiles, but also in footwear, food processing,

and assembly-type operations in electronics. Robust cross-country evidence across different regions shows that when production becomes higher value-added and more capital-intensive, defeminization almost invariably sets in (most notably Tejani and Millberg, 2016). A growing concern is that premature de-industrialization among late industrializers may amplify this male bias (Greenstein and Anderson, 2017; Rodrik, 2016), but there is the possibility of avoiding this trajectory through careful gender-responsive policy planning.

Many scholars note that the rigid association of women workers with low-skilled manufacturing occupations cannot be explained only by a lack of relevant skills, particularly considering women's educational achievements in recent decades. An important policy objective, therefore, must be about ensuring that women's inclusion in the industrialization process of any country does not remain a transient phenomenon or build on women's vulnerabilities. Policy-makers need therefore to carefully examine which measures and strategies can be most effective in breaking persistent gender barriers and fostering more gender-equitable and sustainable industrial development in specific contexts. This requires a holistic approach to industrial policy.

As noted in the industrial development literature (Weiss, 2015; Ha-Joon Chang for UNECA, 2016), the main role of industrial policy is to promote higher economic productivity and improve living standards through the creation and/or expansion of activities within the manufacturing sector. The ISID agenda also demands that the promotion of high productivity through manufacturing pays special attention to both environmental and social sustainability. Many of the priorities set out in the ISID agenda require concerted action to address gender-based and other inequalities. On the other hand, attention must be paid to the fact that some aspects of industrial development may exacerbate existing gender inequalities unless measures are taken to prevent this from happening.



Industrial planning involves both broad (or horizontal) measures and sector specific (or vertical) measures (Weiss, 2015). Horizontal measures include skill development and infrastructural investment, which are bound to have overall positive impacts on the economy and spill-over effects beyond the manufacturing sector. Vertical measures are applied selectively to priority targets, such as sub-sectors (e.g. agribusiness) or specific firms (e.g. microenterprises), or both. Both horizontal and vertical measures need to be designed and implemented in a gender-aware or 'gender-mainstreamed' manner. The adequate mix of policy interventions in each country is likely to involve a range of areas such as labour markets, technology, infrastructure, capital and product markets, and varies depending on an economy's stage of development (i.e. early, middle, and late stage). For instance, as noted by Weiss (2015), it is usually recommended that economies in early stages of development opt for trade specialization and diversification of exports into simple resource-based manufacturing, closely related to their existing set of resources. As economies become more sophisticated, strategies focusing on mastery of technology, innovation, and discovery of new products are to be encouraged. Early stage industrialization requires the government to play an important role in nurturing and supporting large numbers of micro-enterprises. In more mature stages, public-private dialogue tends to assume a different configuration given the emergence of a stronger private manufacturing sector and a broader range of activities in the economy (Weiss, 2015). In all cases, a careful assessment of country-specific, binding constraints, including gender-based constraints, is essential to avoid 'one size fits all' approaches. To be effective, an industrial policy requires a 'vision' and adequate resources on the part of the government as well as a great deal of coordination between different actors, both within the government (e.g. Ministry of Industry, but also Ministry of Labour, Ministry of Planning, Ministry of Education, and so on) and the private sector.

This paper highlights several themes that are of relevance to current debates about the policies required for a more inclusive and gender-equitable industrial strategy and offers

illustrations of what 'gender mainstreaming' in the industrial sector may involve in practice. An overarching recommendation, which cuts across all countries and sectors, is the need for improved gender and industry statistics and for comprehensive analytical frameworks spelling out the interconnections between different dimensions of gender inequality and aspects of industrial development. This will help to ground policy efforts in rigorous analysis and monitoring. The following paragraphs summarise policy lessons organized along similar lines as Weiss' taxonomy: they describe broad measures as well as group-specific measures, and point out possible differences in policy emphasis between early stages and more mature stages of development when possible and if relevant.

## Horizontal measures

### Skills and training

Country-wide policies to promote skills and training are crucial to address gender differences in technical skills, a main cause of persistent gender occupational segregation and wage gaps in both developing and developed countries. Many developing countries have made remarkable progress in narrowing educational gender gaps at most educational levels in recent years, but women continue to be clustered in specific subjects, largely in the field of humanities and arts, and often acquire skills that do not match labour market requirements. It is essential that women workers are offered specialized training, both prior to entering the labour market and while employed, that contributes to widening their choices for paid employment in a broader range of industrial sectors and occupations. A more technical and diverse skill set would also enable women to have a more substantial role and a greater say in innovation processes and new technological developments.

The continued issue of low productivity, even in countries that are successful in terms of economic growth, further strengthens the case for greater public investment in education and training to address skill shortages in STEM subjects, especially for women. This paper finds that even in high-income industrialized countries, women continue to face bias in

STEM fields, often due to low perception of their abilities, employer prejudice, and limited access to professional networks. Ideally, action is needed at every stage – from schools, to higher education, entry into the labour market and labour market retention – through measures offering women opportunities to upgrade existing skills or retrain on a regular basis. If organisations promoting women in STEM exist in a country, they should be consulted as part of the development of the government’s skills strategy. If they do not exist, governments should nurture them, including through financial support. The modalities for providing the optimal education and training infrastructure to foster gender-equitable ISID will vary depending on a country’s resources and stage of development, and could involve a combination of public sector education together with support to businesses that offer on-the-job training.

Targeted interventions aimed at removing the underlying causes of women’s low participation in technical subjects and facilitating access to skill development in a gender-aware manner could include, among others: programmes to challenge gender-stereotypical attitudes in the wider public and build girls’ confidence to participate in STEM fields; efforts to revise the content of textbooks and learning practices in schools to break down persistent prejudices about boys’ and girls’ abilities; programmes for employers to help them overcome their own gender prejudices and incentives for them to provide on-the-job training for their female workforce; childcare services for mothers who attend trainings; and strategies to address the specific training needs of self-employed women.

### **Upgrading physical and social infrastructure**

Quality and widely accessible physical infrastructure such as roads, electricity, transport and ICTs is amply recognized as a key ingredient for boosting the kind of industrial activity that promotes employment generation and enhanced living standards (and is therefore set as one of the targets of SDG 9). Further synergies can be generated by ensuring that physical infrastructural projects are designed and implemented to address women’s needs. This is especially salient in the context of low-income countries in the early stage of

industrialization, where irregular electricity provision and limited transport networks are still identified by many as important constraints to firm competitiveness. These constraints are gender intensified. For example, women in low-income countries tend to predominate among producers and traders who use public transport and hence feel the implications of weak infrastructure more acutely. In addition to the competitiveness dimension, a well-functioning road system has other positive impacts likely to be amplified for women: it can help young girls get to school safely and ease access to obstetrical and other health care services. Improved water and electricity infrastructure can reduce both the time and hardship of women’s and girls’ housework. In industrialized middle and high income countries, public investment would be on advanced technological infrastructure, with priority preferably given to devices and tools facilitating the provision of care to the elderly, the disabled, and the sick.

The gender-aware economic literature uses the notion of infrastructure with a broader meaning and includes social infrastructure (e.g. health and care systems) alongside physical infrastructure. Investment in social infrastructure builds social and human capacities that are just as important to future productivity as investment in physical infrastructure, as noted in Braunstein’s discussion of gender-equitable growth models. Basic social services and infrastructure are also important for the goal of equalizing responsibility for unpaid domestic work and promoting women’s ability to participate in paid work, community decision-making, and training activities.

Childcare, in particular, should be considered as much a part of industrial strategy as building roads or investing in skills. Accessible, quality childcare makes it easier, especially for mothers, to go to work and is likely to enable them to take jobs where they can be more productive. A system of early education and childcare for all pre-school children provided by well-qualified staff would also improve children’s educational outcomes and therefore have the added benefit of improving the productivity of the future labour force. Many studies and surveys point to the lack of affordable child care of good quality as an important constraint for both

female workers in factories and women owning small enterprises, particularly in industrializing countries. Women micro-entrepreneurs often cite childcare and family responsibilities as one of the main reasons for not running more profitable businesses or not participating in trainings. Both public support, especially for the women working in the informal sector, and private sector support for provision of good quality child care at the premises where women work is therefore critical to the twin objective of gender equality and sustainable industrialization at large, and policy makers need to engage both the public and private sector to plan and design interventions accordingly.

### Vertical measures

#### **Promoting gender-aware sectoral studies and regular use of gender statistics to inform targeting**

It is important that policy decisions on targeting in the context of the industrial strategy of a country be informed by gender equality considerations. When designating priority industries, gender equality objectives should be given the same weight as factors like resource endowments, potential for backward/ forward linkages, and technology. These gender-aware evaluations need to become an integral part of any assessment that a government undertakes when deciding which sectors or groups to target in its industrial plans. Such studies would involve gaining a more in-depth understanding of the key constraints facing a specific sector and different economic actors within it which prevent resources from being allocated between women and men in ways that enhance overall productivity and well-being.

Systematic gender assessments require first that adequate resources be allocated to both producing relevant gender statistics and developing analytical skills in gender-aware economics among government planners and the research community. It is essential that both collection and analysis of statistics as well as in depth gender value chain studies of specific sectors are undertaken regularly and in a timely manner. Efforts of various government institutions would need to be organically coordinated under a well-defined 'gender mainstreaming' agenda that especially involves

ministries and departments responsible for economic decisions.

A few suggestions on the sort of basic, gender-aware data that could usefully inform ISID planning have been provided throughout this paper and include among others: indicators of the gender composition of the labour force and its evolution over time at the detailed sectoral level; information on working conditions as well as gender-intensified constraints faced by female micro-entrepreneurs; statistics on men's and women's differential access to technical training and various other services. Smaller surveys and/or more in-depth studies to complement nationally-representative statistics may be needed to gain better insights into the situations of neglected groups such as migrant workers and home-based workers in the informal economy. These same data and indicators used for planning could be used at later stages for monitoring progress on gender equality goals once programmes are implemented.

Evidence from both low and high-income countries suggests that data collection and analysis of this kind may be available as a one-off contribution to policy planning, but is seldom undertaken systematically.

#### **Supporting women migrant workers**

Female migrant workers, either internal migrants (leaving rural areas to seek work in factories located in urban areas), or international migrants (hired by foreign companies to work in special industrial zones of host countries), emerge as an especially vulnerable segment of the industrial work force. The industrial sector can offer important job opportunities for female migrants who are struggling to provide for their families but they often have difficulties in gaining access to basic social services such as health, childcare and housing because of their lack of residency status, and are frequently subject to violations of labour rights in the form of forced overtime and bullying (ILO Better work, 2017, 2018).

These are serious issues that strongly undermine the principle of inclusiveness in industrialization. Attention from governments, international organizations and civil society organizations alike is therefore required. Unskilled female



migrants would be best protected from exploitation if they were covered on an equal footing with local workers, in law and in practice, by labour legislation on minimum wages, collective bargaining, and social protection. This principle has guided international conventions to protect migrant workers as well as the policy work done by organizations such as the ILO. In practice, however, there is still a long way to go, particularly in countries where enforcement of labour rights and women's rights is generally weak.

### **Supporting women micro-entrepreneurs**

Self-employed women and small business owners face gender-intensified barriers to start and grow their businesses in both high and low-income countries (OECD, 2017, Chap 24). For many women, self-employment is a positive option, allowing them to pursue fulfilling and flexible work. However, for many others, self-employment is a necessity rather than a choice, driven by factors such as job loss in the formal sector or a need to accommodate care responsibilities.

Although women-owned businesses have survival rates comparable to men's, they generally make less profit and their labour productivity is lower (and are also less likely than self-employed men to have employees) (OECD, 2012). Such differences can be partly explained by the different sectors in which female entrepreneurs work. As noted in the case studies, women-run businesses are often concentrated in services sectors with low profitability. By contrast, they are not well-represented in sectors with high value-added potential such as those related to STEM fields. Furthermore, many women entrepreneurs appear reluctant to increase the scale of their business operations, offer new products or services, or sell in new markets (OECD, 2017).

Policy measures to support women micro-entrepreneurs should focus on the main challenges that women identify in running their business, which in most countries include limited entrepreneurship skills, and difficulties in accessing financing and professional networks. Business development services, such as counselling, coaching, and mentoring can be effective, but only if they are specifically and

carefully tailored to women's needs. Policies to improve access to finance for women entrepreneurs usually include provision of grants, loans, and microcredits. Loan guarantee schemes tend to be prevalent in developing economies, where banks can still be hesitant to lend to microenterprises and are often characterized by gender bias. Another measure to facilitate finance for women entrepreneurs is to improve their access to public procurement markets with special provisions for contracting with women-led businesses. This is a very promising new approach but implemented only in a few high income countries (OECD, 2017).

An effective measure to address the lack of opportunities for women to network and share knowledge would be to strengthen the ability of organizations such as women's business associations to both provide financial services to women entrepreneurs and to help women entrepreneurs connect with one another. As observed in the UNIDO project on 'Promoting Women's Economic Empowerment in the MENA Region,' this then enables the associations to engage with policy makers and address barriers and constraints to women's entrepreneurship on a substantive level. Policies supporting female entrepreneurs should be part of comprehensive public policies and social protection systems that provide basic social and care services to all workers, of the kind already discussed under horizontal measures (UNIDO, 2017).







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# Annex 1: Country Profile Statistics Notes

The Country Profiles provide a snapshot for each country given the most recent year of available gender disaggregated data for manufacturing employment.

Population, GDP per capita (constant 2010 US\$), Trade (% of GDP) are from the World Bank World Development Indicators. GDP per capita is the measurement of the total output of a country divided by the population. Adjusting GDP to a constant 2010 US\$ adjusts for the effects of price inflation. Trade (% of GDP) indicates the relative importance of international trade in the economy of a country by dividing the aggregate value of imports and exports over a period by the GDP for the same period.

The Employment to Population Ratios are modelled ILO data from the Key Indicators of the Labour Market (KILM). The employment-to-population ratio is defined as the proportion of a country's working-age population that is employed. Employment comprises all persons of working age who, during a specified period, were in the following categories: a) paid employment (whether at work or with a job but not at work); or b) self-employment (whether at work or with an enterprise but not at work). The working-age population is often, but not always, defined as all persons aged 15 or older.

The Share of women in STEM graduates is from the UNESCO Institute for Statistics.

Manufacturing Value Added (MVA) share in GDP, Medium and high tech MVA share in total manufacturing, and Manufactured exports share in total exports are from the UNIDO MVA Database. MVA can be used as a proxy for industrialization.

The MVA of an economy is the total estimate of net-output of all resident manufacturing activity units obtained by adding up outputs and subtracting intermediate inputs. The value added of a manufacturing industry is the sector's net output, calculated as gross output

minus intermediate consumption. Value added is calculated without deducing consumption of fixed assets represented by depreciation in economic accounting concepts. The social cost of producing value added is higher than that considered in the existing statistical practice, as it takes the depletion and degradation of natural resources into account. Depending on the survey method selected, industry value added may often refer to census value added which disregards the margin between the receipt from and payment for non-industrial services. Survey data on industry value added may also disregard the contribution of small and household-based manufacturing units which are often excluded from the regular industrial survey programme. Estimates for such units are made separately for the compilation of national accounts. For these reasons, industry value added is used to measure the growth and structure, but not the level.

The value added of the entire manufacturing sector is, theoretically, the sum of the value added of all manufacturing activities. However, in practice, MVA cannot simply be derived by adding up all industry value added figures because of the complexity associated with survey methods. Industry value added may not cover all activity units engaged in manufacturing due to the incomplete frame used in the survey. On the other hand, activity units are often classified as manufacturing based on their primary activity. This implies that secondary activity can often be of a non-manufacturing nature. Such discrepancies are resolved in the process of compiling national accounts using supply use or input-output tables. Thus, MVA measures an exclusive and exhaustive contribution of manufacturing to GDP.

The Manufacturing Composition of an economy indicates the top 5 industries ranked by their share in total MVA.

Manufacturing Employment Share, Share of total male employment, and Share of total female employment are derived from gender disaggregated manufacturing employment data from UNIDO Indstat 2 (ISIC Revision 3) and total employment data from the ILO KILM.

Female Share in Total Manufacturing Employment is the number of women working in manufacturing divided by the total number of manufacturing employees in the country according to UNIDO Indstat 2 data.

The Gender Dissimilarity Index in Manufacturing is calculated with UNIDO Indstat 2 data. The following formula is used to calculate the index of dissimilarity within a country's manufacturing sector:

$$\frac{1}{2} \sum_i \left| \frac{M_i}{M} - \frac{F_i}{F} \right|$$

Where M is the total number of male manufacturing workers and F is the total number of female manufacturing workers. For each sector, i, we divide the number of men who work in that sector ( $M_i$ ) by the total number of men (M) and the number of women who work in that sector ( $F_i$ ) by the total number of women (F). The absolute value of the difference between these two numbers—the proportion of all men who work in this particular sector i minus the proportion of all women who work in this sector i—is then divided by 2. The closer the DI is to 0, the closer a country's manufacturing workforce is to 0 segregation. For example, if the DI is calculated to be .60, this means that 60% of either men or women must move to a different occupation in order to establish the same distribution of sexes across sectors. Under 0 segregation, each sector will have the same proportion of female workers relative to all women as male workers relative to all men. This does not necessarily mean a 50/50 split between men and women—as there might be more men than women in total. Rather, the gender composition of each sector (the % of workers in that sector who are women/men) will equal the gender composition of the workforce (the % of total workers who are women/men).

The Female Manufacturing Employment Composition indicates the top 5 industries ranked by their share in total female manufacturing employment. The share in total female manufacturing employment is calculated with data from UNIDO Indstat 2. For each sector, the number of female employees is divided by the total number of women working in manufacturing.

GDP per capita = GDP / population

Trade (% of GDP) = (imports + exports) / GDP

Employment to population ratio = total employed people / working age population

Male employment to population ratio = total male employed people / total male working age population

Female employment to population ratio = total female employed people / total female working age population

Share of women in STEM graduates = number of female STEM graduates / total STEM graduates

MVA share in GDP = MVA / GDP

Medium and high tech MVA share in total manufacturing = medium and high tech MVA / total MVA

Manufactured exports share in total exports = value of manufactured exports / value of total exports

Manufacturing employment share = manufacturing employees / total employed people

Manufacturing share of total male employment = male manufacturing employees / total male employed people

Manufacturing share of total female employment = female manufacturing employees / total female employed people

Female share in total manufacturing employment = female manufacturing employees / total manufacturing employees



$$\text{Gender dissimilarity index} = \frac{1}{2} \sum_i \left| \frac{M_i}{M} - \frac{F_i}{F} \right|$$

where M is the total number of male manufacturing workers and F is the total number of female manufacturing workers and  $M_i$  is the number of male manufacturing workers for sector i and  $F_i$  is the number of female manufacturing workers for sector i.

Industry or sector share in total MVA = sector MVA / total MVA

Share in total female manufacturing employment = female employment in sector / total female manufacturing employees.





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