CHAPTER 16

INDUSTRIAL POLICY AND GENDER INCLUSIVITY

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16.1 Introduction

The economics of development and structural change highlight the importance of industrialization as a means for countries to move from poverty to higher living standards and well-being. Industrial policy—that is, an articulated policy path to industrialization and the production of higher valued-added goods and services—is a means to achieve that goal. Markets on their own, however, do not ensure that the benefits of industrialization are equitably shared. With the scope of industrial policy becoming far broader than it had traditionally been conceived, integration of issues of equality and inclusion are both timely and needed.[1]

While greater equality that ensures the benefits of structural change and industrial upgrading are broadly shared is a goal in its own right, a large body of research on feedback loops from intergroup equality to the macroeconomy[2] suggests that the degree of equality itself impacts the effectiveness of industrial policy. For example, correctly implemented, industrial policies that promote greater equality generate the aggregate demand required to absorb increased output, putting the economy on a path to equity-led structural change and growth. And at the same time, greater equality has positive supply-side effects on the quality of the labour force and knowledge assets, key components of successful industrial policies.

Attention to the role of gender equality in the success of industrial policies is yet another, albeit relatively neglected, way in which the industrial policy frame can usefully be expanded. This chapter explores the two-way relationship between gender

[1] On the changing landscape and scope of industrial policy, see Oqubay (Chapter 2, this volume) and UNCTAD (2018).

[2] See, for example, UNDP (2013) and Ostry et al. (2014).

and industrialization and the consequent implications for industrial policy design. In terms of the effect of industrialization on gender, the employment, consumption, social reproduction, and knowledge production channels are the most salient. Regarding employment, in the early stages of industrialization of developing countries, women's share of manufacturing employment rose substantially, albeit under conditions of insecure employment and low wages, with little opportunity to move up the ladder to better paid jobs. That trend appears to reverse as countries industrially evolve, with evidence of women excluded from jobs in more knowledge- and capital-intensive industries. This has occurred despite the fact that gender educational disparities have narrowed and even closed in a number of countries.

Women are also underrepresented in high-tech firms, and more generally, in job categories associated with innovation and technological change. Apart from the loss of women's talent in such jobs, this limits the types of innovations generated, and omits the interests and needs of women as consumers in product design. It also leads to a lack of attention to technologies that could reduce unpaid care work, with which women are disproportionately burdened. As outlined in this chapter, substantial economic gains could be achieved by industrial policies that promote gender equality. This suggests that gender should figure prominently in industrial policy design from the start, expanding the scope of industrial policies related to sustainability and inclusion.

16.2 The Impact of Industrial Policy and Structural Change on Gender Equality

At the broadest level, the aim of industrial policy is to stimulate productivity growth in order to raise living standards. The way to do this is to generate the conditions for the production of high value-added goods, in particular manufactured products but also services and agricultural goods (Oqubay, Chapter 2, this volume; Cramer and Tregenna, 2020). To achieve this goal, industrial policies target activities that promote gains in productivity and employment, foreign exchange earnings via export competitiveness, production arrangements that support backward and forward linkages, and perhaps most importantly, knowledge production, including learning by doing, in order to support dynamic comparative advantage.

Governments face significant social, economic, and environmental challenges that, if left unaddressed, can undermine progress in achieving the objectives of industrial policy. For example, the negative environmental impacts of pursuing industrialization and development with current energy technologies are by now well understood. The 'greening' of industrial strategies has been advanced as a means to address environmental challenges while promoting growth of output and employment (Rodrik, 2014; Pollin,

Chapter 15, this volume). The Green New Deal is an example of an industrial policy that addresses environmental goals as well as equity issues (Ocasio-Cortez, 2019).

Gender inequality is also impacted by industrial policies, and thus requires targeted efforts to design gender-equalizing policies. There are several channels through which industrial policies affect the degree of gender inequality. Among them, the most important are the following: 1) structural change influences access to employment and wages, and may be gender equalizing or dis-equalizing due to the existence of gender job segregation, unrelated to human capital differences; 2) industrial policies influence innovation pathways that result in the diffusion of new varieties of industrial goods that may benefit some groups more than others; and 3) public investment in infrastructure may reduce or exacerbate gender inequalities, especially in the sphere of social reproduction.

16.2.1 Gender, Employment, and Industrialization

The impact of industrial policy, industrialization, and structural change on women's relative access to paid employment has long been a topic of feminist economics research. A gender division of labour continues to be pervasive globally and is one of the main sources of gender income inequality. Two salient aspects to this phenomenon are that: 1) women are socially assigned responsibility for unpaid labour that produces and reproduces the labour key to the industrialization process; and 2) even within the paid sector of the economy, jobs are 'gendered', with women slotted into lower-quality occupations and industrial sectors of the economy.

I begin with a discussion of the relationship between industrial policy, industrialization, and gender job segregation. Industrial policies, whether in the United States in the 1800s or in semi-industrialized countries since the 1980s, began with the development and expansion of labour-intensive manufacturing industries, most notably garments and textiles. Due to their lower wages than similarly qualified men, women have been the target labour force in these and other labour-intensive industries. The pursuit of cheap labour sources is intensified in economies that rely on exports to stimulate growth, with export competitiveness enhanced by low unit labour costs and thus low-wage labour. The recent period of globalization that began in the 1970s in response to the liberalization of trade and investment flows has exacerbated the pressure on early industrializers to rely on low-wage female labour as a means to attain competitiveness. Two descriptive terms have emerged to describe this trend—the 'global feminization of labour' (Standing, 1989) and the 'feminization of foreign exchange earnings' (Samarasinghe, 1998).[3]

[3] The feminization of foreign exchange earnings is particularly salient in developing countries. With few exceptions, countries cannot run persistent current account deficits. This implies that national income cannot grow faster than the rate at which export growth at least equals import growth (Thirlwall,

This is not to say that industrial policies have explicitly identified women as the preferred source of low-wage workers in labour-intensive jobs. Rather, export-led labour-intensive industrialization has been passively compatible with, and indeed, has relied on patriarchal norms. Those norms, which assign women the responsibility for unpaid labour, meant that women have often been barred from light manufacturing employment once married.[4] This proved essential to the success of industrial policies in so far as women provided the unpaid labour that produced and reproduced the labour force. That labour includes the care, socialization, and training of children and activities to ensure the productivity of adult workers (e.g. cooking and other tasks that maintain the household, as well as provision of emotional labour). Young unmarried women, as a result, have been the target factory workers in a number of industrializing countries in the last four decades.[5] This is due to their low wages, perceived docility,[6] ideologically constructed stereotypes about women (such as their supposedly 'nimble fingers'),[7] and the flexibility of hiring and firing women to reduce labour costs in response to fluctuations in product demand.

What are the channels through which gender wage inequality stimulates growth? Women's low wages are less a function of their skills than of overt gender wage discrimination as well as job segregation that reduces women's bargaining power, depressing their wages. There is evidence that women's low wages have been a causal factor in the success of the industrial policies that have stimulated the growth of export manufacturing in a number of newly industrializing economies (Seguino, 2000; Busse and Spielmann, 2006). Women's low wages have substituted for (or complemented) currency devaluation, making exports cheaper than they would otherwise be and thus stimulating demand as well as a country's share of global supply. This serves to relax the balance-of-payments constraint. Women's low wages in labour-intensive manufacturing therefore act as a subsidy that supports the acquisition of intermediate inputs and technology required in more capital- and skill-intensive manufacturing industries.

Neoclassical theory posits that women's subordinate position in the industrialization process will improve over time. This view is based on the assumption that the strong demand for female labour and increased educational opportunities for women would

1979). Developing countries, typically dependent on imported intermediate and capital goods (for which demand is price inelastic), therefore rely heavily on exports to relax the balance-of-payments constraint.

[4] The 'marriage bar', once widely practised in Europe and the United States in the 1900s, and more recently by some late industrializing economies such as South Korea and Taiwan, has resulted in employers terminating women workers upon marriage.

[5] The Industrial Revolution was also characterized by its heavy reliance on women's factory labour (Berg, 1992; Freeman, 2018).

[6] Perceptions of docility were, however, challenged by women factory workers' militancy, a notable case being that of South Korea in the 1970s and 1980s, to which the government retaliated with force (Nam, 1996).

[7] This refers to the assumption of greater manual dexterity making women more productive than men in some types of factory work, like assembly production, and less suitable for jobs requiring 'brawn' such as mining and heavy manufacturing. For a ground-breaking article on this topic, see Elson and Pearson (1991).

contribute to rising female wages and a narrowing of the gender wage gap over time. Scholarly work on trends in gender wage inequality indicates that such optimism is not warranted. There is evidence that the discriminatory portion of gender wage gaps has widened in a number of industrializing countries, such as China, India, Mexico, and Vietnam, despite a strong demand for women's labour (Braunstein, 2012).

Downward pressure on women's manufacturing wages is due to several factors. Women workers' concentration in labour-intensive export industries as compared to men's in non-tradables or capital-intensive export goods production results in women's weaker bargaining power. Labour-intensive firms that are more mobile than 'male' industries can more easily relocate to other countries, should wages rise, holding down women's wages (Seguino, 2007). Further, many firms in developing countries are subcontractors in global buyer- or producer-driven commodity chains. The outsized bargaining power of the dominant firms in the chain allows them to obtain low-cost components and assembled goods from subcontracting firms in developing countries, squeezing the wages of (women) workers. Again, the gendered effect is a function of the forms that gender job segregation takes in industrializing countries that have promoted export-led growth.

As semi-industrialized countries have moved up the industrial ladder, employing production technologies that are more capital and knowledge intensive, there is substantial evidence of de-feminization—that is, of women's declining share of manufacturing employment (Tejani and Milberg, 2016; Kucera and Tejani, 2014; Saracoglu et al., 2018). Kucera and Tejani (2014) conducted a decomposition analysis to more fully understand this trend, focusing on two causal mechanisms of de-feminization. The first is the *reallocation effect*—that is, the impact on women's share of employment due to the shift in production to more capital- and knowledge-intensive goods. The second is the *within-industry employment effect*, whereby industrial upgrading within an industry contributes to the decline in women's share of employment. While they find evidence of both effects, within-industry effects in the manufacturing sector dominate in explaining the declines in female shares of manufacturing employment. Kucera and Tejani (2014: 578) explain:

> Though structural change in the process of economic development is indeed characterized by shifts toward less labour-intensive, higher value-added manufacturing industries, it is developments within industries that generally matter more in accounting for patterns of feminization and de-feminization for the manufacturing sector as a whole.

In addition to women's declining share of manufacturing employment as capital intensity of production rises, there is evidence of increased gender job segregation, with a declining share of women employed in industry[8] (a broader measure than

[8] Industry comprises mining, manufacturing, construction, electricity, water, and gas.

manufacturing) relative to the share of men employed in industry.[9] This is indicative of increased exclusion of women (relative to men) from jobs in the industrial sector as a whole, where employment tends to be of higher quality than in the agricultural and services sectors.[10]

Data in Figure 16.1 demonstrate that gender job segregation is increasing in countries at varying stages of development over the period 1991 to 2017, reflecting women's declining access to industrial employment (and thus crowding into jobs in other sectors of the economy). Panel A shows these trends by region.[11] Gender job segregation is measured as the ratio of the share of women employed in industry relative to the share of men employed in industry—dubbed 'women's relative concentration in industrial-sector employment'. The largest decline in women's relative concentration (–23 per cent) occurred in the most industrially dynamic region, East Asia and the Pacific, closely followed by the Middle East and North Africa (MENA), and Central Europe and the Baltics. Sub-Saharan Africa has experienced increased relative exclusion of women from industrial-sector jobs as well, but to a lesser extent than more industrialized regions. South Asia has not experienced an increase in gender job segregation and this may be due to the fact that this region is still engaged primarily in labour-intensive export production.

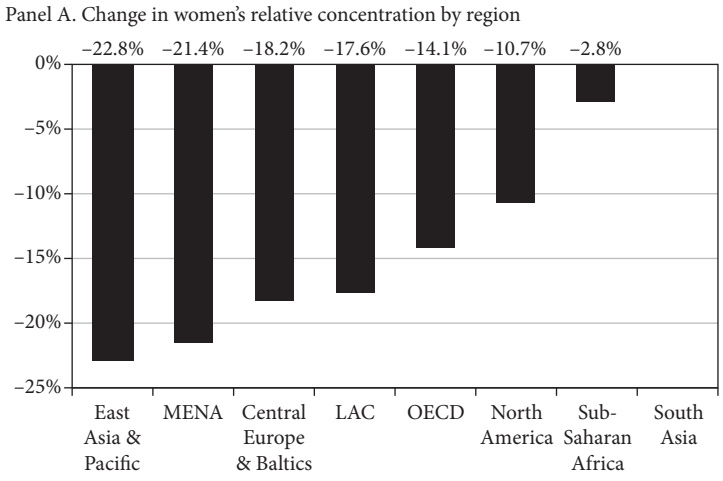
Panel B displays trends in gender job segregation by stage of development. As would be expected, in low-income countries, industrialization is less likely to be characterized by a decline in women's relative concentration in industrial-sector employment. The most substantial decline (−21 per cent), is in middle-income countries. The increase in job segregation in high-income countries is also strong. There, women's relative share of industrial jobs declined by 16 per cent over this period.

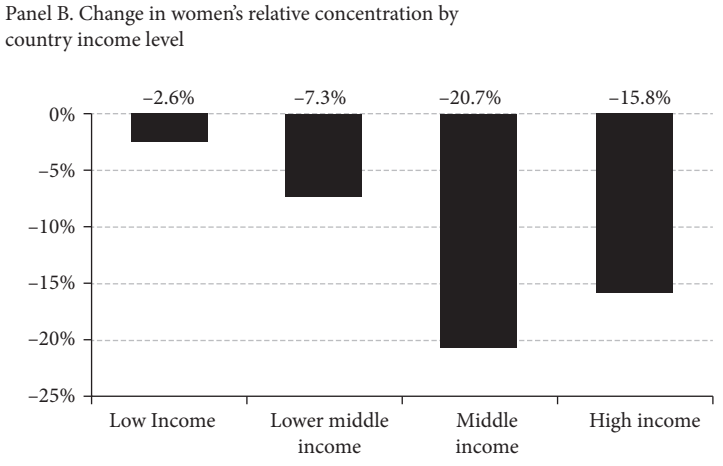
Finally, changes in women's relative concentration in industrial-sector jobs in selected noteworthy industrializing countries are shown in Panel C. The largest increase in job segregation among these countries has taken place in Ethiopia, with women's relative concentration falling 85 per cent (from 173 per cent to 88 per cent) over this time period. Note that this occurred in the context of expanding industrial output, such that the percentage of women employed in the industrial sector as well as the percentage of men so employed *rose* during the period, but men's rose more than women's (from 4.6 per cent to 12.1 per cent as compared to 7.9 per cent to 10.7 per cent

[9] Though a related concept, de-feminization is measured differently from gender job segregation. The former is the percentage of manufacturing employees that are women. The latter represents how women (relative to men) are distributed across sectors of the economy, and in particular, in industry as compared to other sectors.

[10] That agricultural employment tends to be of lower quality than industrial employment is not contested. It might be argued, however, that service-sector jobs can be of high quality. Although there is some validity to that argument, service-sector jobs are bifurcated in quality with low-wage service jobs typically held by women and racial/ethnic minorities and high-quality professional jobs in the financial sector, health services, and product design dominated by men.

[11] Regional categories are defined using World Bank categorizations in World Development Indicators.





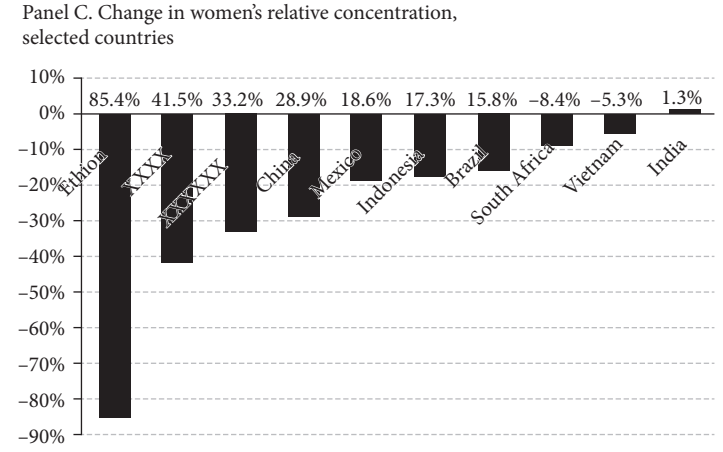


FIGURE 16.1 Change in women's relative concentration in industrial-sector employment, 1991–2017

Note: LAC is Latin America and the Caribbean. MENA is the Middle East and North Africa. OECD is the Organisation for Economic Cooperation and Development. Women's relative concentration in industrial-sector employment is defined as (share of employed women in industry)/(% of employed men in industry).

Source: Author's calculations from World Development Indicators (accessed November 2019).

for women).[12] Similarly, in China, Indonesia, Vietnam, and India, the decline in women's relative concentration in industrial employment is due to a more rapid increase in men's concentration in industrial employment than women's. In Malaysia, Republic of Korea, and South Africa, the share of women employed in industrial-sector jobs declined more than did the share of men so employed. And in Brazil and Malaysia, the share of women in industry fell while the share of men employed in industry rose.

These trends do not bode well for the ability of structural change and industrial upgrading to contribute to gender equality. Why is de-feminization and increased gender job segregation occurring? The mainstream explanation for women's exclusion (whether absolutely or relative to men) from high value-added jobs is that women's lack of education renders them less qualified for skill-intensive jobs. That, however, ignores the fact that for many workers, skills are acquired on the job through training and learning by doing—and that educational gaps have in any case narrowed substantially over time.[13]

A number of other factors, including restrictive gender norms and stereotypes,[14] contribute to women's exclusion from good jobs as the economy upgrades. Moreover, as industries become less labour intensive, labour costs are not as much of a constraint on product demand or firm profits—and therefore, employing men at higher wages (than women's) is not a significant hindrance to competitiveness or profits. In other words, gender discrimination in access to good jobs becomes less costly as economies evolve industrially.

Those explanations, however, cannot fully explain the process of de-feminization and job segregation observed in industrializing countries. To understand gender employment dynamics occurring with structural change requires an analytical framework able to explain the determinants of intergroup inequality—and in this particular case, gender inequality as evidenced by women's increased exclusion from higher-equality jobs in the industrial sector. Stratification theory argues that intergroup inequality is created and reproduced by dominant groups in order to maintain their privileged access to and control over resources. Two mechanisms are used to maintain dominance: exploitation (paying people less than the value of what they produce), and opportunity hoarding (or exclusion) of prized economic assets such as high-quality jobs (Blumer, 1958; Tilly, 1998).

[12] Data are author's calculations, based on modelled ILO employment data and reported in the World Development Indicators. A caveat in interpreting these results is that labour market statistics in a number of African countries have weaknesses so results should be interpreted with caution.

[13] Moreover, Borrowman and Klasen (2017), using data on sixty-nine developing countries, find that rising education levels, either overall or of females relative to males, tend to increase rather than decrease segregation.

[14] Norms are informal 'rules' about behaviour that solicit punishment if violated. Stereotypes are generalizations we make about groups of people that may or may not be accurate. More generally, they tend to reflect limiting and often negative assumptions about the characteristics of a particular group of people.

Gender inequality persists and indeed is increasing in terms of job segregation as a result of these dual processes. Gender norms and stereotypes saddle women with the responsibility for unpaid labour that others benefit from (exploitation), and justify men's right to the highest quality and status jobs, affirming a gender hierarchy. 'Gender police' are not required to enforce a system of stratification. Gender norms and stereotypes work to consolidate perceptions of group differences that justify exclusion. In the case of gender, for example, a widely held norm is that men are the primary breadwinners, and are thus most deserving of high-wage jobs. More recently, the stereotype has emerged that men are more suited to science and technology jobs than women. The gendering of newly created types of jobs in technologically upgrading industries demonstrates that even as old occupations associated with one gender or the other disappear in the process of structural change, gender stereotypes recreate gender inequality in new occupations and work environments (Ridgeway, 2011).

The processes of de-feminization and increased gender job segregation are exacerbated in the context of increasingly scarce industrial-sector employment. In recent years, patterns of stalled industrialization or premature de-industrialization have been observed in a number of developing countries, limiting the growth of industrial-sector jobs (UNCTAD, 2016). The result is a relative downsizing of the core industrial sector. A falling share of industrial jobs in total employment can intensify competition for the fewer jobs available, triggering the forces of stratification that influence job access. Seguino and Braunstein (2019) present empirical evidence that structural change, as evidenced by increases in capital/labour ratios, combined with declining industrial employment shares of total employment have contributed to a worsening of gender job segregation since 1991.

As a result of stratification dynamics, structural change induced by industrial policies can and has led to increased exclusion of women from employment in upgrading sectors in countries, resulting in women being crowded into other sectors of the economy, and putting downward pressure on their wages. This discussion underscores two key points. First, industrial policies that promote structural change and the shift to higher valued-added production using more sophisticated technologies can contribute to and exacerbate already existing gender inequality. Women as workers may be the losers, absent attention to the dynamics that lead to their exclusion from newly created jobs.

Second, macroeconomic conditions matter. Productivity growth is not sufficient for workers to obtain the benefits of industrial upgrading. An exclusive focus on a supply-side increase in output through industrial policy misses the fact that aggregate demand and other macro-level policies (such as exchange rate, trade, and investment policies) may not be sufficient to ratify the increases in potential output that comes with effective industrial policy. Without sufficient demand growth for industrial output, there will be negative effects on employment, that is, de-industrialization, and ultimately, more intense gender job competition that contributes to gender inequality.

These problems are not fatal to industrial policies that intend to be inclusive. Below I discuss approaches to industrial policies that can alleviate the potential for upgrading

to worsen gender inequality. Here, suffice it to say that just as industrial upgrading is unlikely to happen without government intervention in the form of industrial policy, so too industrial policy is unlikely to be gender equitable, absent specific policies to override gender dis-equalizing practices embedded in labour markets and other institutions.

16.3 Gender Equality Feedback Loops: Impact on Success of Industrial Policies

Just as industrial policies may affect women and men differently—and potentially unequally, via gendered employment effects—so too does gender (in)equality affect the potential success of industrial policies, and the desired structural change that accompanies those policies. The following discussion, while not exhaustive, highlights salient aspects of feedback loops with regard to labour productivity and knowledge production.

16.3.1 Gender and Labour Productivity Growth

A key question identified in section 16.2 is how to make industrial policy inclusive, given that gender job segregation is prevalent, with women slotted into lower-wage jobs and unpaid labour, and men dominating in higher-wage industrial jobs. This question is all the more pertinent due to the complementarities between production methods and a country's level of skills and capabilities. As a country moves up the industrial ladder to the production of more knowledge- and capital-intensive goods and services, governments must ensure that human capability improvements, the invisible foundation of a country's successful economic development, keep pace.

Conventional economics portrays labour productivity as merely a function of the level of formal education and on-the-job training of the individual. That narrow characterization misses the important fact that long before arriving at the factory or office door, people as a resource have been produced through significant amounts of material investment as well as time. Recognizing this, feminist economists have expanded the concept of human capital in a way that treats it as an asset that is co-produced by families and government, rather than simply a product of the formal education system (Folbre, 2012). To differentiate the use of this term from its traditional definition employed in economics, we use the term human capacities, which reflects the full breadth of learning and socialization that extends beyond formal education and is required for workers to be productive.

Investments in human capacities raise future productive capacity (i.e. generate economic growth) in ways similar to building more factories and equipment, though investing in the future labour force is almost never treated as investment in macroeconomic models (Braunstein, van Staveren, and Tavani, 2011; Heintz, 2019). Although governments and men also participate in human capacities development, it is primarily women who carry out the work of social reproduction by doing both paid and unpaid caring labour.[15]

Macroeconomic and economic development theory err by assuming women's unpaid care work is infinitely elastic. But women's participation in the paid economy necessarily affects the quantity of investment in human capacities—that is, the more time spent in paid work, the less time and energy is available for investments in human capacities. Failing to track and ensure sufficient human capacities investments can cause industrial and other macroeconomic policies to inadvertently undermine social reproduction with negative effects on the current and future labour supply's productivity and ability to provide the complementary skilled labour needed as countries industrially upgrade.

How can industrial policy take account of and address this problem? Through public policies and infrastructure investment, governments can redistribute and reduce[16] unpaid care work, creating the conditions for women to participate in the paid economy without sacrificing investments in the care labour required to ensure children become a productive future labour force. Public policy can influence the distribution of care work between women and men, and can also reduce the amount of necessary care work through public investment in physical infrastructure (roads, sanitation, and electricity that reduce the time necessary for care activities such as fetching water and fuel), as well as social infrastructure (spending on publicly funded care services). These expenditures, which can reduce women's unpaid care burden and redistribute social reproduction to the state and to men, also support the goals of industrial policy. Attention to issues of social reproduction, then, is another way in which the scope of industrial policies can be expanded beyond its traditional frame.

Braunstein, Bouhia, and Seguino (2019) present a model and empirical analysis that links structures of class-driven growth of output, employment, and productivity with those of social reproduction and gender inequality. How social reproduction is organized (Who does it? Does it take place in the household, or in public or market sectors?) influences long-run productivity. The analysis covers the period 2008–15. Principal components analysis (PCA) scores, based on indicators of social reproduction and

[15] Social reproduction is a concept with origins in Marx's concept of the development of productive forces (Cohen, 2001). It includes activities directly involved in the maintenance of life on a daily basis and intergenerationally, including the development of children and the regeneration of workers and is thus a far broader concept than human capital. The latter is defined as capacities developed through formal and informal education at school and at home, and through training and experience. For a critique of human capital theory from a social reproduction perspective, see Folbre (2012).

[16] Diane Elson (2017) describes the government's task with regard to are work as the 3 Rs—recognize, redistribute, and reduce.

equality-led vs. profit-led growth, are used to categorize national economies into one of four regime types: *mutual, time squeeze, wage squeeze*, and *exploitation*. Applying PCA to this typology, the authors identify the conditions under which systems of growth on the one hand and social reproduction on the other reinforce or contradict one another, with a focus on the role of gender (in)equality.

Mutual regimes are the ideal—production and social reproduction dynamics mutually reinforce each other. In this scenario, more gender equality (higher wages, more time spent in paid labour) raises growth of output, employment, and productivity because it raises aggregate demand[17] and promotes human capacities development more than it cuts into profits. Strong public support for care, the availability of care commodities, and men stepping up to provide care all add to the beneficial impact of gender equality on growth and social reproduction.

In *time squeeze* countries, more gender equality in the form of higher wages for women or for care workers supports investment and growth because it raises human capacities. However, as women's labour-force participation increases, the time devoted to care work decreases (because men do not contribute enough to care work, market care services and commodities are inadequate,[18] and/or due to infrastructure inadequacies). This inhibits structural change and the success of industrial policies more generally, owing to the negative effect on labour productivity growth.

In *wage squeeze* countries, higher wages for women raise human capacities but not by enough to outweigh the negative effect of those higher wages on profits, investment, and thus growth. The more profit-led (or inequality-led) the structure of the macroeconomy, the more likely wage squeeze is likely to be obtain. The more open to the global economy, the greater the probability an economy is profit-led, exacerbating the contradictions between gender equality, social reproduction, and growth (Blecker, 2016).

And finally, the *exploitation* regime is one in which higher wages for women reduce growth because they dampen profits and aggregate demand more than they raise human capacities investment. And women's higher wages and increased market participation squeeze time spent on social reproduction, a problem that is accentuated in the event of lack of public or male support, and absence of adequate care commodities and infrastructure to replace women's decreased care time. In this regime, growth is predicated on exploiting women's (unpaid) reproductive labour.

Gender/growth regimes vary widely among the countries that have adopted industrial policies in the last several decades (Table 16.1). This variation is demonstrated by the BRICS, among which Brazil's is the only regime to fall into the *mutual* category. The recent increases in social protection spending there are instructive, demonstrating the importance of public policy to promote gender equality. But Brazil's poor

[17] One channel through which this takes place is that improvements in women's labour-market outcomes (both wages and employment) allow them to replace some of their unpaid labour with paid care services, thus stimulating demand.

[18] This could be due to lack of quality market (paid) care services, as well as insufficient capital goods such as stoves or washing machines.

Table 16.1 Gender regimes in BRICS and selected developing and developed countries

	Regime type
BRICS	
Brazil	Mutual
Russia	Wage squeeze
India	Exploitative
China	Wage squeeze
South Africa	Wage squeeze
Developing Africa	
Ethiopia	Time squeeze
Nigeria	Time squeeze
Rwanda	Time squeeze
Developing Asia	
Bangladesh	Time squeeze
Hong Kong	Wage squeeze
Indonesia	Wage squeeze
Malaysia	Wage squeeze
Singapore	Wage squeeze
South Korea	Wage squeeze
Thailand	Wage squeeze
Developed economies	
Finland	Mutual
France	Mutual
Germany	Wage squeeze
Ireland	Wage squeeze
Norway	Mutual
Poland	Exploitation
Sweden	Mutual
United States	Time squeeze

Source: Braunstein, Bouhia, and Seguino (2019).

macroeconomic performance (relative to other successful industrializers) reminds us that a *mutual* regime does not automatically or inherently induce economic growth, absent supportive macroeconomic policies such as appropriate exchange-rate policy (Astorga, Cimoli, and Porcile, 2014).[19]

[19] Argentina, Colombia, and Ecuador also have mutual regimes. For a full list of regime types in countries by region and at varying levels of development, see Braunstein, Bouhia, and Seguino (2019).

In contrast, China, Russia, and South Africa are characterized as *wage squeeze* regimes. In those cases, higher wages for women show slow growth (these are profit-led economies, due to the structure of production and macro-level policies) because the benefits to human capacities production are outweighed by the negative effect of higher wages on profits, investment, and demand.[20]

India is a case of an *exploitative* gender/growth regime. Improvements in gender equality in the paid economy negatively impact growth, while movement of women into the paid economy reduces human capacities due to government's failure to take action to redistribute unpaid care work, lack of adequate infrastructure, and insufficient male participation in care work.

Among developing African economies that have adopted industrial policies, Ethiopia, Nigeria, and Rwanda have *time squeeze* regimes (as do many other African economies). As more women enter the labour market in these countries, the consequent strain on women's time limits human capacities development and the growth of labour productivity. The policy implication of this combination is clear: increasing women's paid employment must be accompanied by more support for care and social reproduction to sustainably deliver growth—and absent attention to this, industrial policies may very well not succeed in the longer run due to insufficiently productive workers, whose labour is complementary to industrial upgrading.[21]

In developing Asia, most regimes can be characterized as *wage squeeze*. Those that have adopted extensive industrial policies fall into this category—South Korea, Malaysia, Indonesia, and Thailand. Finally, developed economies have a higher number of *mutual* regimes (Finland and Norway, for example), but here too we find *wage squeeze* (Germany and Ireland), *time squeeze* (United States), and *exploitation* (Poland).

It is apparent from this analysis that industrial policies *can* succeed by exploiting women's time, and/or excluding them from participating in the development process—although those that structurally constrain investments in care and social reproduction are likely to pay a cost in the longer run due to lower labour productivity growth. Ensuring a win-win scenario—that is, structural change that induces an

[20] To be clear, this does not imply wages for women should be lowered in order to promote growth. Macro policies, such as exchange-rate policies to maintain export competitiveness, can attenuate negative demand-side effects of higher female wages. Moreover, managed trade policies and restrictions on financial and firm mobility can create conditions for equality-led growth (Seguino and Grown, 2006). And a shift in the structure of production to reduce reliance on labour-intensive homogenous export goods and a shift to skill- and capital-intensive goods production—with women integrated into new industries—can contribute to the creation of a *mutual* regime. That is because the latter types of goods and services tend to be price inelastic, such that higher wages have a much smaller negative effect on demand than on labour-intensive goods.

[21] Among economists noting the complementarity of labour's skills with industrial upgrading, Nelson and Phelps (1966) have argued that that the rate at which the gap between the technology frontier and the current level of productivity is closed depends on the level of human capital. In a more detailed analysis, Nübler (2014) offers a theory of knowledge-based capabilities (a broader concept than human capital) whereby capabilities and structural change co-evolve and are mutually causative, and applies this to an analysis of the divergent paths of South Korea and Costa Rica.

economy's movement to higher value-added production with women included in that process—requires attention to tendencies towards excluding women from higher-wage and more technically sophisticated jobs *and* necessitates appropriate public investment and policies that promote human capacities development by redistributing and reducing the care burden women differentially shoulder.

16.3.2 Gender and Knowledge Production

Knowledge production, situated in formal education and research, as well as workplace teams, is vital to the success of industrial policies. Gender inequality and in particular gender exclusion from these sites, however, can hinder innovation and the acquisition of knowledge. STEM education and research are essential to industrial policy, and here women are underrepresented, even though they are now the majority of university students in most countries (UNESCO, 2017).[22] The challenge is that exclusion of women results in a selection bias problem with significant costs in terms of knowledge production and economic growth (European Institute for Gender Equality, 2017). That is, gender-unequal participation in STEM programmes in universities and research institutes can result in overinvestment in less qualified males, and failure to capture the benefits of an excluded talented pool of women that has costs in terms of knowledge production.[23]

In part, the low representation of women in STEM fields and research entities is due to gender-unequal norms and stereotypes that shape attitudes of the gatekeepers—professors, and directors and managers of research institutes. STEM subjects are typically characterized as 'male' and that characterization is not too distant from the facts. The majority of professors of STEM are male, sending an often unconscious message about what scientists look like. This both discourages women from entering STEM, and also causes implicit biases that can lead to subtle and overt forms of discrimination on the part of male faculty and students that make STEM a hostile environment for women. To make clear the point advanced here, the loss of women's talent in STEM, a critical set of fields for industrial upgrading, may appear to be a labour-supply problem attributed simply to women's lack of interest in science and engineering. But a more accurate understanding is that while this is a labour-supply problem, it results from exclusionary practices in both universities and research institutes (and tech-related workplaces) that create a hostile environment for women.

[22] It is often argued by way of explanation that women simply choose to study topics other than science. That view, however, is inconsistent with the fact that women are the majority of students in the natural sciences and mathematics and statistics, even as they lag men in engineering, manufacturing, and construction (27 per cent of all students), and information and communication technologies (28 per cent of all students) (UNESCO, 2017: 20).

[23] Several studies also show that gender inequality in education in general has negative effects on growth (Bandara, 2015; Klasen and Lamanna, 2009). See also Izdes and Tregenna (2020).

Learning and upgrading for late industrializers is also predicated on the ability of organizations to incentivize and coordinate learning (Amsden, 1989). The composition of organizations impacts their effectiveness in the problem solving so central to industrial upgrading. A by now large body of research underscores that diverse organizations function more effectively than homogeneous ones. Economist and complex systems theorist Scott Page (2017) finds evidence, for example, that identity-diverse groups (e.g. based on gender, race/ethnicity) can outperform homogeneous groups due to their greater functional diversity—that is, differences in how people define problems and approach solving them.

With regard to the industries that are critical to industrial upgrading, Vasilescu et al. (2017) similarly find that team diversity in open software development projects correlates positively with team output. Male and female engineers who collaborate with both genders are roughly twice as productive—that is, they produce more citations in peer-reviewed articles—than those who only collaborate with one gender (Ghiasi et al., 2015). Group composition matters, in other words, and in particular, lack of gender diversity in STEM activities, industries, and organizations can limit knowledge generation.

Given that gender inclusion contributes to success in high-tech organizations, what factors explain women's low representation? Discrimination, due to implicit or explicit bias, is an important factor.[24] As an example, one study finds that women's open-source software coding has a higher acceptance rate than men's when a coder's gender is unknown. But when the gender of the coder is known, acceptance rates of women coders' proposed changes to a software project's code or documentation fall (Terrell et al., 2017). Tech workplaces more generally are widely reported to be hostile towards women scientists, with undermining by male managers a key reason given by women for leaving tech jobs (Mundy, 2017). This state of affairs, predicated on gender hierarchical practices embedded in organizations, is a market failure to be addressed by industrial policy.

16.3.3 Gender, Diversity, and Technical Design

Exclusion of groups of people (e.g. women) from technological domains and activities can lead to their absence as users or consumers of technology because products

[24] Explicit bias refers to conscious attitudes and beliefs we have about people or groups of people. In contrast, implicit bias is an unconscious association or belief toward a social group. Implicit bias is shaped by social conditioning in response to dominant norms and stereotypes, such as that women are less good at science, that men are more intelligent, and so on. Stratification theorists argue that hierarchical norms and stereotypes are intentionally cultivated as a means for dominant groups (men) to legitimize their privileged position in institutions and broader society (Darity et al., 2017).

developed do not reflect women's needs and preferences. According to Wajcman (2010: 149):

> Empirical research on everything from the microwave oven . . . the telephone . . . and the contraceptive pill . . . to robotics and software agents . . . has clearly demonstrated that the marginalisation of women from the technological community has a profound influence on the design, technical content, and use of artefacts.

In contrast, drawing on women for design can lead to benefits for women consumers of technology, whose needs are more likely to be taken into account—and could have the added benefit of addressing and reducing time required for social reproduction.[25]

Several examples of the failure of technological innovation to represent the needs of women are instructive. A wide variety of products marketed as gender neutral are in fact biased towards men's bodies: virtual reality headsets too big for women's heads, smart watches too big for women's wrists, and calorie counts on treadmills calibrated to men's bodies are just a few examples (Perez, 2019). The problem is particularly serious when it comes to testing and safety. Although women are more likely to contract HIV than their male counterparts, they represent just 19 per cent of antiretroviral drug subjects in clinical trials (Ovseiko et al., 2016). Crash-test dummies, used to test the safety of automobiles, are typically male, despite the fact that women are at higher risk of serious injury in automobile accidents (Holder, 2019).

This discussion underscores that inclusion of women in technical design can generate a more equitable distribution of the benefits of industrialization. Inclusion of women in the design of products could also contribute to a reduction of the grind of domestic housework that women disproportionately bear. Addressing the time squeeze of social reproduction, as noted in section 16.3, has a positive effect on the long-run success of industrial policies.

16.4 Conclusion

As a number of chapters in this volume indicate, the conceptualization of industrial policies has broadened, and is beginning to encompass sustainability and greening

[25] The introduction of labour-saving consumer durables (such as washing machines and vacuum cleaners) reduced the time required for household work, contributing to the rise of women's labour-force participation in the twentieth century (Greenwood et al., 2005). I do not know of any recent studies, however, that measure the pace of household labour-saving technological change that reduces the time needed for care work. Much of the current research on this topic focuses on estimating the gender-equalizing benefits of public infrastructure investment. See, for example, de Henau and Himmelweit (2016) and Fontana and Natali (2008). There is also some evidence that information and communication technologies (ICT) reduce women's time burden although, to be clear, ICT development was not originally targeted to reduce unpaid care burdens (Grassi, Landberg, and Huyer, 2015). A concern is that technological innovation emerges from the global North and is ill suited to the needs of women from the global South, who have a greater need for clean water and electricity than digital technologies (Mitter, 2004).

policies in addition to the themes of technology, innovation, and knowledge production. The relationship between gender and industrial policies, however, has not yet been comprehensively explored or integrated into the industrial policy literature. To address that gap, this chapter highlights several key channels through which gender and industrial policy interact: employment, consumption, social reproduction, and knowledge production and innovation.

Regarding the employment channel, research has identified women's instrumental role in providing the labour linked to the success of early-stage late industrialization efforts via women's segregation in labour-intensive export manufacturing industries. As countries move up the industrial ladder, however, women become increasingly excluded as workers in industry, and are crowded into low-wage employment. Gender exclusion from employment in the dynamic sector of the economy is an important challenge for industrial policy. With respect to social reproduction, industrializing countries have also relied on women's unpaid labour to nurture the development of the human capacities required of a skilled, productive labour force. This has unduly burdened women, and contributed to the gender wage and income gap. Further, by failing to recognize and redistribute the burden of unpaid caring labour—or social reproduction—productivity growth is hampered.

The research discussed in this chapter also identifies the economic costs of the absence of equitable gender inclusion in processes of innovation and technological upgrading. Exclusion of women from knowledge-intensive workplaces can negatively affect the efficiency of firms' learning and innovation efforts. Women's limited representation in high-tech firms and occupations is often attributed to their preference for fields of studies such as humanities and the arts, rather than sciences. But this ignores the exclusionary practices and distorted gender norms and stereotypes that contribute to women's exclusion from high-tech workplaces. Further, failure to include women in technology design undermines the ability of technological innovation to produce benefits for women as consumers.

A challenge, then, is for industrial policy advocates, whether academics or policymakers, to adopt a gender lens so as to improve the efficacy of industrial upgrading efforts and to make those efforts more inclusive (Fontana, 2018). The tools that governments use to nudge, cajole, and encourage the private sector and research institutions to cooperate with industrial upgrading plans can also be used to address gender disparities identified in employment. Reciprocal control mechanisms, such as making subsidies and other supports contingent on achieving performance targets, can be used to incentivize gender inclusion. For example, governments could require (and some already do) that research teams on government-funded grants be gender balanced as a means of promoting gender inclusion in research that influences product and technology design.

Governments could also use innovative monetary policy tools to achieve gender inclusion. Asset-based reserve requirements (ABRRs) are one such mechanism, whereby central banks use non-interest-bearing reserve requirements to guide the

allocation of credit towards areas deemed of strategic importance.[26] Women-owned tech firms, or firms with an equitable representation of women in high-level positions could be the targets. Of course, state-owned development banks could also target their lending to achieve strategic goals, including those that promote gender equality.

Social reproduction policies are also legitimately part of an industrial strategy. Publicly funded physical infrastructure, targeted at reducing women's care burden in developing countries, can reduce time poverty, enabling women to join the paid labour force. Moreover, other social policies such as publicly funded care of children, the sick, and elderly, as well as policies that promote male participation in care, are critical to redistributing and reducing care work, promoting gender inclusion in employment. It also reduces any potential negative trade-off between women's increased paid employment and investment in children's and workers' human capacities and, ultimately, long-run productivity growth. The message, then, for both scholars and policymakers is that the distributional effects of industrial policy should be understood and interventions designed to ensure that the benefits are broadly shared. Doing so also contributes to the effectiveness of industrial policy.

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[26] For more on ABRRs and other innovative tools central banks can utilize to promote development, see Epstein (2006).

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