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Resumen

La automatización industrial posa desafíos de gobernanza por su capacidad de producir desempleo y desigualdad a largo plazo. La segregación ocupacional por género sitúa a las mujeres en los sectores productivos con mayor riesgo de ser robotizados. Instituciones internacionales como la Organización Internacional del Trabajo, la Comisión de las Naciones Unidas por el Estatus de las Mujeres, y el Foro Económico Mundial han formulado propuestas de política pública para mitigar las adversidades que la automatización podría producir para las mujeres. La información por presentarse indica que las mujeres de color y las mujeres del sur global se encuentran en un mayor riesgo, y que la automatización refuerza las desigualdades económicas entre el norte y el sur global. En base a esta información, argumento que las propuestas diseñadas por los organismos internacionales mencionados son inadecuadas y requieren un enfoque interseccional y de tercer mundo para poder ser implementadas alrededor del sur global.

Palabras clave: automatización, tecnofeminismo, feminism tercermundista, segregación ocupacional, interseccionalidad, re-entrenamiento.

Abstract

Industrial automation poses challenges to policymakers as it could lead to long-term unemployment and rising inequality. Due to occupational segregation, mainly women work in the productive sectors most at risk of becoming robotized. International institutions, including the United Nations' International Labor Organization, the Commission on the Status of Women, and the World Economic Forum have outlined policy proposals to curtail the adversities that automation poses for women. Data presented throughout the paper shows that women of color and women from the global south are particularly at risk, and that automation reinforces inequalities between the global north and the global south. In light of this data, I contend that the proposals of international fora are inadequate and require both an intersectional approach and a third-world perspective in order to be implemented throughout the global south.

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Introduction

The automation of labor innate to the fourth industrial revolution is expected to be calamitous for the attainment of gender equity. Past industrial revolutions have been beneficial for the integration of women into the global workforce. If governments fail to maintain a steady and equitable supply of employment, the fourth industrial revolution will mark the first instance where the achievements made in gender parity may come undone. Productive automation, the process in which workplace technologies become upgraded to such an extent that human intervention is no longer needed to produce goods and services, is a critical feature of the next industrial revolution. The unemployment resulting from this process is a primordial concern for policymakers and civil society. Waves of automation have ensued along history, reducing the availability of jobs in the short term but amplifying net employment in the long term. Contemporary market dynamics and technological innovations are indicative that the forthcoming episodes of automation will not only be different from this beneficial pattern, but they will additionally be particularly disadvantageous for women.

The analyses developed throughout this paper determine how the economic disparities between regions and between ethnicities make the women-machine conundrum more complex. Data reviewed in the following pages argues that (i) the global south will suffer from the downturns of automation to a much larger extent than the global north and that (ii) prevalent racial discrimination and the racialization of productive sectors make it more likely for people of certain ethnicities to be substituted by automation than others. These trends evoke inquiries on how both privileged and disadvantaged women from the global south are expected to experience, withstand and counteract technological shifts in their workplaces.

These inquiries have led me to concern the following research with the role of international agencies in the formulation of proposals intended to moderate the adverse results of automation on women. From a third-world feminist and technofeminist theoretical stand point, this research answers the specific question of whether the proposals reviewed further along this article are responsive to the needs of women from non-developed geographies and whether they are feasible for implementation in developing countries.

The methodology implemented is a document review of the following official publishings issued by intergovernmental fora and international non-governmental organizations:

- United Nation's Commission on the Status of Women: Secretary General's report for the commission's 55th and 61st sessions.

- World Economic Forum: "*The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution*"; "*The Industry Gender Gap: Women and Work in the Fourth Industrial Revolution*"; "*Global Gender Gap Report: Gender Parity and Human Capital*". All of these World Economic Forum reports were published in 2016.

- International Labour Organization: "*World Employment and Social Outlook: Trends 2017.*"

This paper evaluates the empirical evidence accumulated by these organisms regarding the hazards of automation for women from a macroeconomic outlook. The content of these documents is then read from an intersectional and postcolonial/third-world feminist stance, questioning the assumptions these organizations subscribe to and formulating a prospective debate and research agenda.

This paper is composed as follows: Section 1 provides an overview on the causal mechanisms of automation that result in unemployment and inequality, regardless of gender.

Section 2 describes my theoretical inclinations and accentuate the necessity for a feminist approach to automation. Section 3 presents empirical findings on the effects of automation on women, regardless of class, ethnic, and geographical considerations. Section 4 delineates the proposals drafted by international organizations along specific taxonomical considerations. Section 5 builds on the specificities of women's resiliency towards technological change, providing evidence as to why a feminist approach is not sufficient, it ought to be additionally intersectional and third-world. Section 6 examines the biases of the proposals explored in section 4. Section 7 develops a research agenda for automation grounded in third-world feminism and Section 8 is a conclusion of my findings.

(1)

The Scope of Automation

Workers endure their progressive expendability as productive systems become ever more self-sufficient. In an automated economy where capital reproduces itself and human labor is continuously marginalized from the productive cycle, economic doctrines that have long stood unchallenged require intensive reevaluation. As a preface to these reevaluations, I ought to overview the consequences of industrial automation, elaborating on how it interacts with unemployment and inequality.

Automated technologies have penetrated a vast share of global markets, producing items and performing services with more efficiency than humans at a fraction of the cost. High productivity results in unprecedented economic growth, yet other indicators of development, such as employment and reduced inequality, have deteriorated. The World Economic Forum's "The Future of Jobs" report estimates that 15 developed nations may face an

aggregate loss of more than 5 million jobs by 2020 (2016, 1). The International Labor Organization expects a 3.4 million increase in global unemployment in 2017 alone, capping at 201 million (2017, 1).

Technological unemployment, as the trend has been labelled, specially afflicts middle-skill workers[1]. Middle-skill workers perform routine tasks and represent the largest share of workers in significant industries. Unlike low-skill and high-skill labor[2], these routine tasks are procedural and rule-based, making them intelligible for digital codification and therefore feasible by machines (Autor, Levy, and Murnane 2003). The middle-skilled, middle class workforce in the developed world[3], accordingly, is being hollowed out, with workers being redistributed to low-income and high-income positions (Goos, Manning, and Salomons 2009). This phenomenon is known as job polarization or wage polarization.

There exists, however, substantial literature contesting such effects of automation on unemployment. While this paper is not concerned with presenting the debate between technopositivist and technopessimist[4] scholars, I do recognize that several trends may alter the perceived magnitude of the impact of technological unemployment[5]. However, even if future technological unemployment is not as acute as scholars and international institutions perceive it to be, what remains unequivocal is that it will regardlessly widen class and gender

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[1] When in relation to labor, skill levels refer to the amount of education, experience, and specialization workers may or may not possess. Middle-skill jobs require education and training beyond a high-school diploma but less than a four-year college degree.

[2] For high-skilled professionals, state-of-the-art technologies are complementary rather than substitutive). These specialists use automated tools to enhance their performance, diminishing the need for assistants or otherwise redundant staff. Low-skill occupations, on the other hand, are not patterned and are abstract rather than routine, decreasing their automatability.

[3] Particularly the USA and Europe (and soon the developing world).

[4] Meaning in favor of automation and against it, respectively.

[5] For an in-depth analysis of this debate, see Autor, Levy and Murnane (2003), Brynjolfsson & McAfee (2014), and Frey & Osborne (2013).

gaps (World Economic Forum, 2016).

Automation and job polarization have a colossal potential to exacerbate domestic and international economic disparities. The World Economic Forum stated that individuals with high shares of wealth, income, and skills will most likely see their living standards increase and "will benefit from holding more of the assets whose value will be boosted by the Fourth Industrial Revolution." (Baweja et al. 2016, 15). As for middle-skilled workers affected by automation, remaining unemployed or transferring to low-skill positions will certainly magnify their wage asymmetry vis-a-vis high-skill workers. Internationally, inequality is expected to rise between developed and developing nations to the extent that new technologies may invert the competitive advantage that emerging markets have had in the form of low-cost labor (Baweja et al. 2016, 7).

(2)

Third-World Technofeminism

Contemporary labor and productivity structures are gendered, with women working in sectors with higher risks of automation and working against systematic discriminations that make the relationship between women and the fourth industrial revolution a troublesome one. This section will review different schools of feminist literature and present a detailed analysis on how automation is not only gendered, but also counterproductive for female empowerment.

Material feminism is concerned with how capitalism has shaped gender asymmetries. It emphasizes the innate problems of the sexual division of labor between private and public spaces, advocating for a transformative movement that deconstructs traditional gender roles.

Material feminism largely situated female resistance in the rejection of unpaid domestic labor. Modern feminist movements have inherited this perspective, partially neglecting the discussion of the remaining challenges women face in the economic structures they're embedded in. Unpaid domestic labor, for example, remains a key issue, yet feminist theory ought to quickly adapt to the ensuing vectors of gendered oppression, namely 21st century industrial automation. Female emancipation through the compensation of domestic labor will not be complete without the reduction of the heightened risk women face of becoming expelled from the productive economy due to automation. Material feminism, accordingly, is likely to converge with technofeminist theory[6], considering how current technological innovation is not only at the forefront of female emancipation, but most poignantly of female disempowerment. The following literature review explores two premises: (i) that the development of technology has historically been androcentric[7], with men producing a discourse of science that marginalizes the voices of women; (ii) and that modern productive technologies could worsen the inequalities under capitalism. This review accordingly links technofeminism, socialist feminism, and third-world feminism.

Women's relation to technology has been problematic for most of history. Critical perspectives have questioned the biases in knowledge-making processes, deeming western science to be permeated by archetypal masculinity and inherent androcentricity (Hartsock 1983; Keller 1985; Merchant 1980). Androcratic discourses have constructed technology as an exclusively male project by disassociating feminine practices from the notion of scientific knowledge. Knowledge equates to expertise, intelligence and professionalism. Female

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[6] Technofeminist theory succinctly posits that technology is gendered and interacts with gender relations.
[7] Androcentricity refers to the practice of masculinizing the world view of individuals and societies, implying a marginalization of feminine points of view.

intelligence and knowledge is still disregarded in numerous nations, ultimately leading to the forging of glass ceilings and a sexual division of work. These asymmetries in knowledge are key to understanding how technology reinforces male power and how automation poses a particular threat for women.

Male predominance in the consumption and the development of technologies raises concerns regarding technology's role as a medium to alter power relations between genders. Cockburn (1985), McNeil (1987), Webster (1989), among others constitute a robust body of work supporting the thesis that the notions of femininity and technical expertise are weighed as incompatible by hegemonic sexist discourses. Thus, gender and technology partake in dialogues of mutual configuration, leading technofeminist theory to invite us to understand technology as both a source and a consequence of gender relations, and thereby of gender inequality (Wajcman 2006, 15).

Einsenstein uses the term "capitalist patriarchy" to illustrate an integrated system of domination where capital (technology) is dominated by men, emphasizing "the existing mutual dependence of the capitalist class structure and male supremacy" (1977, 3). A feature of such globalized, androcentric and capitalist economy is the predominance of masculinity as a determinant factor of the direction that technological innovations will take. Such predominance is a consequence of having few women studying and working in industries of technological innovation. If men either consciously or unconsciously reproduce sexism while defining the purposes of technology and setting the accessibility of technology, capitalist development will continue to serve male interests at the expense of female empowerment. Feminist movements have occasionally regarded technology as a source of emancipation (see Firestone, 1970). However, without a dismantling of structural sexism, modern innovations

may further obstruct women's opportunities, as is the case with automation the prospective feminization of the world's unemployed.

A final addition to this theoretical discussion is the role of third-world feminism. Third-world feminism (also referred to as postcolonial feminism) links sexism with international relations theory such as Dependency Theory and World Systems Theory, arguing that efforts of female empowerment can be aided with efforts against neocolonialism and neoimperialism. Globalization lies at the very essence of international political economy. It is unquestionable that most nations are interlinked, for better or for worse, in a set of asymmetrical relations (see for example Galeano, 1997). The analyses of automation, female precariousness and empowerment are inextricable from this reality. Third-world feminism emerges as a response to current interregional relations. The approach developed here shares third-world feminism's interest in unraveling the power dynamics of western hegemony, multinational capital, dependency models, and the positionality of unprivileged women residing within the ever-changing contours of what constitutes the "third world" (Mohanty, Russo, and Torres 1991).

Standpoint feminist theory posits that the fabrication of knowledge is indivisible from each theorists' ideological propensities and identities[8] . This research project is formulated from a socialist feminist standpoint, in the sense that the problem of automation and the industrial exclusion of women is framed under the larger problems of wealth disparity and uneven ownership of the means of production. This theoretical stance is compounded by an intersectional and third-world feminist approach, exploring the complexities of class, race,

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[8] See, for example, the work of Patricia Hill Collins (2002) on black feminism or Sonya Andermahr, Terry Lovell, and Carol Wolkowitz 's review of feminist theories (1997).

and geographical distinctions among women and their relation to automation under neoliberalism.

<center>

(3)

Mainstreaming Gender into the Robot Discussion

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Feminist movements in developed and emerging economies have made remarkable advances regarding the inclusion of women into high-skill occupations, yet glass ceilings worldwide remain unshattered and women account for a disproportionate share of middle-skill workers, particularly in the economic sectors set to be profoundly changed by automation. The processes that keep most women in middle-to-low-skill professions are both overtly and covertly sexist in nature. To the extent that these workplace disadvantages may snowball in the fourth industrial revolution, it is evident that policymaking concerned with future workforce planning, social security warranties, education and parity must situate gender mainstreaming at its core. This section outlines the varied ways in which automation is increasingly harmful for women, showing that the largest international organisms have included gender mainstreaming in their agendas.

The relation between enterprise leadership and womanhood must be factored in to unravel the asymmetrical effects of automation. Glass ceilings have undermined women's abilities to access high-skill positions at the executive level. Additionally, motherhood concessions (if they exist at all) account for shorter work hours that unjustifiably tax a high mobility penalty on women. These elements produce a lack of diversity in women's management opportunities, which becomes a self-reinforcing vicious cycle to the extent that women are incapacitated to develop their own management experience. Women thus remain relegated

in middle-to-low-skill jobs with higher chances of being relinquished to automation.

Occupational segregation by gender is another significant problem. Manufacturing-production and office-administration are two female-predominant industries that will be certainly reconfigured by the fourth industrial revolution (World Economic Forum 2016b, 5). Mainly women may be disenfranchised by automation in these sectors, as two thirds of the expected 7.1 million job losses over the next five years will occur in office and administration areas (World Economic Forum 2016, 1). In a striking finding, the World Economic Forum reported that four million men are expected to face job losses in the next ten years compared to 1.4 million gains; one job gained for every three lost. Women, on the other hand, will lose only 3 million jobs but will gain just 0.55 million, amounting to five jobs lost for every job gained (World Economic Forum 2016b, 6).

Labor trends, however, do not all point to the same bleak direction for women. In fact, the contemporary shifting dynamics of some markets are set to open vast amounts of job positions that have been traditionally female. One example is the expected growth of healthcare jobs and healthcare practitioners in the United States of America, with 2.3 million workers of both sectors combined needed throughout the coming decade, representing 1 out of 4 new jobs (United States Department of Labor, 2017). In fact, the healthcare and social assistance sector is expected to become the largest employing major sector during the decade (United States Department of Labor, 2017). As the most populous generations worldwide will come into retirement age, these trends will replicate in most developed and developing nations with similar demographic compositions.

Automation, moreover, is projected to de-structure gender roles in the care industry. As men become partially phased out of other sectors and substituted by machines, care work appears as a promising alternative to avoid unemployment. Care jobs have remained

chronically underpaid, particularly due to the gender unbalance in this industry. A stream of male labor into care services could defeminize the industry and push forward a movement for higher and more equitable wages within the sector.

Automation has the potential to acutely alter the relation between capital owners and the working class. In its core, the process of automation entails a replacement of human labor for capital (in the form of machine labor), meaning that revenues are no longer distributed among workers, but funneled directly towards capital owners. The benefits of automation are expected to be distributed unevenly among genders given that a significant amount of capital owners are men rather than women. This is due to the fact that 35% of countries have "somewhat restrictive legislation in place to regulate women's access to financial services… (and) the number of countries with highly restricted rights of inheritance (for women) is much higher, (standing) at 18%." (World Economic Forum, 2016c). Additionally, due to the gender wage gap that favors men, they have more saving capacity than women[9], allowing them to undertake significantly more investments and thus earn higher superannuation returns or establish their own businesses. Automation could further polarize the economic gender gap to the extent that it could allow men to own more capital through the use of robots than women are able to.

Gendered job segregation is expected to trigger further inequalities as age of automation will prompt unprecedented growth in the areas of science, technology, engineering, and mathematics (abbreviated as STEM), which has been overwhelmingly saturated by men. In fact, "one area in which women continue to remain under-represented is among STEM graduates, for which the global gender gap stands at 47%, with 30% of all male students

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[9] It takes women more effort to achieve the same savings level as men in a similar occupation since men are paid higher wages than women who do the same type and amount of work.

graduating from STEM subjects, in contrast to 16% of all female students." (World Economic Forum, 2016c). Thus, not only are women circumscribed within jobs with high automatable risks, but they are also underrepresented in the few economic sectors prone to prosper the most with the advent of new technologies.

Another instance of this phenomenon is ICT. Information and Communications Technology (ICT) will develop at outstanding rates considering the prominence of big data and the internet of things[10]. Participation in the industries associated with ICT and digital work are demographically skewed in terms of gender. In developing countries, men are 2.7 times more likely than women to work in the sector and 7.6 times more likely to be in ICT occupations (World Bank 2016, 106). It would be expected that developed countries had a narrower gender gap in terms of ICT representation and internet accessibility, yet this does not hold true. In Europe, there are 3 times more men than women holding a degree in ICT, and 5 times more men than women work in this sector (Directorate General for the Information Society and Media, 2013).

The prevalent exclusion of women in ICT and STEM fields entails much more stark problems than them being unable to earn large amounts of income in these blooming industries. Virtual reality, artificial intelligence, the internet of things, big data, and cyborgization technologies[11] will profoundly restructure the way human societies develop. As did the revolutions before, the fourth industrial revolution will alter the most infinitesimal detail of our future. It is in STEM and ICT fields where the decisions regarding what form

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[10] The Internet of Things refers to the ability of "smart objects" to establish a network between each other and transfer data through the internet. A "smart home" is an example of an Internet of Things network.
Big data, on the other hand, is a voluminous amount of data that requires specialized software and hardware to be processed and understood. Consumption analysis is a field where big data is used and helps companies determine the purchasing trends of consumers.
[11] Cyborgization technologies are understood as devices that can be integrated with the human body to improve its functions.

these details may take are made. If women remain cast out of these fields, societies face the threat of having technologies become increasingly androcentric.

These issues are not future-specific, as some problems are already present in technological developments. The predominance of men in boardrooms and in the interface development positions of leading technology markets have already been questioned due to their engendering of commonplace technologies. Apple's Siri, Amazon's Alexa, Microsoft's Cortana, and Google's Home Assistant, for example, are all virtual helpers that have been programmed as feminine in spite of their disembodied technologies. To program these assistants with female voices is to reinforce female stereotypes and to portray even "virtual women" in secondary assisting roles rather than in more empowering representations. Even more severely, a lack of female participation in programming software algorithms may stagnate the feminist quest of ensuring gender parity. According to a study designed by Carnegie Mellon University, employment pages operating through Google ads showed high-paying job ads to a male group of users much more frequently than to females (Datta, Tschantz, and Datta 2015).

These processes of female disempowerment are intricate and require integral solutions executed by a wide array of stakeholders. This research streamlines the following section among one of the specific type of stakeholder: international organizations. I seek to outline an overview of the policy measures drafted by a selection of prominent international agencies such as the International Labour Organization, UN Women, and the World Economic Forum.

(4)

The State of Affairs of Automation Prescriptions

Feminist movements undergo a continuous yet unceasing process of renewal. From the suffragists and "liberal feminists" to the third-wave intersectional feminists, the movements have demanded their requests to be included in international agendas so that woman are not left behind. Current feminist concerns on the fourth industrial revolution have already been discussed in international fora. Several policy plans have been designed to aid nations in discerning what paths to tread in order to mitigate the effects of automation on women. Notice, however, that the premise of female inclusion is problematized since the forthcoming solutions lack a truly intersectional[12] and critical foundation. This chapter explores some of the proposed alternatives, especially those framed under female education, corporate leadership, and entrepreneurship.

4.1) Education

Reforming educational systems is the most feasible alternative for public governments to close gender gaps. In developing nations where automation is especially detrimental and where gender discrimination stands unchallenged, governments are pressured to guarantee proper and leveled education for all social groups. The global south is partially composed of nations with low enrollment rates in school. Girls are particularly of deprived of education as the males are disproportionately selected to attend school[13]. Governments ought to

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[12] By intersectionality I mean the analytical method of understanding how class, race, gender, religion, sexuality, among other categories may interact with each other to produce specific social problems.

[13] This phenomenon is not exclusive to developing nations. Developed countries where some forms of sexism are still prevalent, like China and Japan, also observe educational gender disparities.

improve their efforts to provide public universal education, focusing on creating incentives for young girls who quit school due to pregnancy.

To the extent that tertiary education reproduces gender stereotypes, thereby affecting the gender proportion of certain job groups, governments are required to establish strategic alliances with academia and companies to achieve two goals: (i) elaborate communicational campaigns to counter the underrepresentation of women in male-dominated industries and (ii) design internship programmes that favor female graduates' opportunity to work in areas with low female representation. These measures are a priority considering that such occupational segregation threatens to exclude women from participating in some of the most promising economic sectors of the future, which is currently male-dominated.

The G20 countries have taken a right step in this direction. Among the agreed strategies for implementation between these countries exist fostering women's interest in STEM careers and facilitating female STEM graduates access to training networks, bolstered by incentives for the private sector to hire female STEM graduates, trainees, and apprentices. The United Nation's Commission on the Status of Women (UNCSW) additionally proposes that states should "Develop or strengthen policies and programmes to support the multiple roles of women in society, including in the fields of science and technology, in order to increase women's and girls' access to education, training, science and technology" (United Nations Commission on the Status of Women 2011, 10).

4.2) Access to Leadership

Efforts must be sustained to attain gender parity in leadership positions in the global private sector. As the fourth industrial revolution unravels, companies will start a process of crucial decisionmaking regarding the adoption of automated technologies and labor market

policies. In order to guarantee that these decisions do not particularly harm women, it is critical for boardrooms to include of empowered women in decisionmaking departments. Previous attempts to enhance female leadership have been effective, yet leadership gender gaps remain sizable (World Economic Forum 2016c).

The World Economic Forum has elaborated the blueprint for a six-point plan to guide the private sector into including and empowering women (2016b, 7-8). Among the six strategies, two of them are targeted to break the glass ceiling in leadership spaces.

Notable areas for improvement are accountability and transparency. Recruitment processes among companies are rarely held into scrutiny, allowing gender selection biases. Additionally, career paths require more transparency so that workers may clearly see promotion possibilities. Women are often stuck in career that do not lead to management positions, a situation that could be reduced if companies had a transparent recruitment process. The second keystone for managerial parity identified by the World Economic Forum is direct leadership intervention within companies, consisting of supporting women already in managerial positions, establishing diversity departments, and constantly communicating in favor of gender through equality workshops or campaigns focused on gender parity (2016b, 8).

Two of the other paths of action singled out by the World Economic Forum are not straightforwardly related to leadership, yet they are promising alternatives for helping women overcome labor obstacles and improve career advancement. One of them is achieving work-life balance as an imperative measure to be achieved on a global level. Women's performance is often interrupted due to caregiving responsibilities, making it essential for legislators to implement policies that mitigate the penalties that women face due to motherhood. Secondly, prioritizing gender parity as a component of corporative social responsibility plans may yield

valuable results. Enterprises have imparted gender diversity trainings and support for their partner companies which are led by women. Exercising influence to push for gender-neutral or gender-positive career advertisement is also a promising social responsibility endeavor that companies should undertake.

4.3) Entrepreneurship

If large and medium-sized firms automate their human capital, women may thrive in small-sized entrepreneurial settings[14]. The internet and online selling platforms, for example, could allow women to establish their own businesses. Prior to the internet boom of merchandising, the high capital costs for setting up businesses discouraged women from becoming entrepreneurs. However, female entrepreneurship still remains unattainable in impoverished areas where there is no internet connectivity. Additionally, a lack of access to capital is a poignant issue in these demographics. Sexist work structures place women mainly in part-time jobs and informal jobs, greatly hampering their credit prospects. Women in full-time formal jobs are also less likely to access the same amount of credit loans than men due to the fact that pregnancies and childcare reduce job stability, which is a key criterion for loaning in banks and other agencies. For female entrepreneurs, earning the capital needed to launch their businesses is burdensome, as loaning agencies tend not to invest in companies that are not owned by men or that do not have male partners in their boardrooms.

Online tools are indispensable to overcome sexist patterns in entrepreneurship. An estimated 13 to 18 billion dollars could be added to annual GDP across 144 developing countries if twice as many women were online and had access to internet (Watson et al. 2012,

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[14] Small-sized firms are also capable of engaging in automation processes, but the capital costs of doing so are too high to manage in most cases.

12). Additionally, 140 million jobs could be created in emerging markets by aiding people's access to ICT, especially in the most underserved geographies (Deloitte 2014, 3). Therefore, states should revise their development budget to make funds available for digital development projects. Local governments should additionally approach banks and loaning institutions to provide gender sensibility trainings. Finally, governments could issue incentives for the loaning institutions that prioritize female entrepreneurs.

4.4) Others

There is a variety of other decisive measures capable of balancing gender disparities during the fourth industrial revolution that may not be grouped within the clear-cut categories detailed above. The United Nations Commission on the Status of Women has developed recommendations along the lines of international aid. Developing nations ought to employ foreign assistance funds in an effective and gender-responsive fashion to promote women's empowerment in unstable labor structures. Among the initiatives where such funds ought to be invested, the commission highlights expanding the scope of education and training opportunities in science, technology, engineering and mathematics, in information and communications technology and digital fluency, and enhance women's participation as users, content creators, employees, entrepreneurs, innovators and leaders (United Nations Commission on the Status of Women 2017, 15).

The recommendations selected here for discussion are not representative of the entire body of strategies being designed to counter the potential risks of automation, but they are appropriate proxies for analysis. The following sections lay out important data that leads to the argument that these recommendations lack important additions such as an intersectional and third-world approach.

(5)

An Intersectional and Third-World Feminist Approach to Automation

Mainstreaming gender is a key analytical vector to determine how present and future technologies will either shift or reinforce oppression. However, it is only a component of the vast number of tasks at hand. Striding towards female emancipation requires intersecting womanhood in the fourth industrial revolution with the neighboring compasses of race, ethnicity, class, and geography. This section explores the mutually-reinforcing racial and class vulnerabilities of women in three aspects: national and transnational domestic work, education access to quality employment, and labor relations between the global north and south.

Mainstream feminist discourses[15] emphasize the positive aspects of automation for female emancipation while they overlook how it may unevenly disempower low-paid female domestic workers. Household automation holds the positive potential to diminish the share of unpaid housework women do[16], yet only women with a higher economic status may be able to afford these technologies. Class differences among women could be exacerbated in the fourth industrial revolution. Household automation affects paid domestic workers negatively. There are 53 million domestic workers worldwide, out of which 83% are women (United Nations Commission on the Status of Women 2017, 11). Increasing technological progress in the household would render domestic workers nonessential to the extent that automatic ironing devices, automatic kitchens, drone floor cleaners, drone grass mowers

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[15] Such as the optimistic line of thinking developed by Shulamith Firestone in "The Dialetic of Sex" (1970)

[16] Dishwashers, slow cookers, washing and drying machines are examples of how automated devices have already reduced the unpaid domestic labor women perform.

among other devices may displace domestic workers. Domestic work is one of the biggest job markets for low-skilled women (Tayah, 2016). When displaced, low-paid female workers may endure unemployment since there are comparatively no other female-specific low-skill markets as large as domestic work.

Domestic work has helped shape the relation between the global north and south and between urban and rural demographics. The demand for domestic work in the global north is primarily fulfilled by migrant women from developing nations (Chaney, 1991; Nisha, 2007)[17]. These women are motivated to migrate to wealthier nations due to severe economic constraints in their home countries. Domestic work does not lead to career advancement and large proportions of what these women earn are remitted to these women's families in their home countries[18] (Pettman 2010, 257). Similar patterns are observed in domestic work within each nation, as the demand for domestic work in wealthy cities throughout Africa, Asia and Latin America is fulfilled by women in rural areas who wish to improve their living standards but who do not earn enough to achieve social mobility (International Labour Office 2013, 1-2). Transnational and internal migrant domestic workers thus remain in a precarious low-income status. Domestic work is thus gendered, racialized, and is markedly an issue of class to the extent that both rural areas and the global south are related to non-whiteness and "underdevelopment". This racialized and gendered configuration of domestic work ultimately situates poor women of color in risk of technological unemployment and could thus severely alter the current trends in migration and in care work.

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[17] These authors respectively explicit how domestic workers in the United States are mostly Latina women, and how most domestic workers across the middle east are African or South Asian.
[18] The automation of domestic labor as such may not only lower the living standards of migrant women, but also of their families in their origin countries should remittances plummet.

These scenarios are not irreparable. Household chores are not the only fuel for the demand of domestic work. Caretaking accounts for a large proportion of domestic work. The continuous growth of the care economy is capable of outbalancing technological unemployment. Automatable chores may make domestic work less necessary, but looking after children and the elderly is not an automatable task in the present.

Although the effects of automation on the demand of domestic work is contestable, it poses dissimilar unemployment threats for different ethnicities and races in non-care industries. In the United States, for example, the American Institute for Spatial Economic Analysis illustrates how 61.4 percent of Hispanics in the US workforce could be replaced by advanced machinery, yet they only represent 16.7 percent of the total working population (Chen, 2017). African American populations represent 11.9 percent of the workforce, yet 55.2 percent of them risk technological unemployment. Educational attainment is a significant in understanding how ethnicity intersects with technological unemployment. Workers with a PhD are six times less likely to risk automation unemployment than workers without a high school degree (ibid). The risk of unemployment decreases as educational attainment progresses. A high school degree "reduces automation risk by roughly 6 percent, some college by 10 percent relative to a high school degree, an associate's degree by 13 percent relative to some college, a bachelor's by 23 percent, a master's by 40 percent and a doctorate by almost 50 percent relative to a master's degree." (ibid). Considering that Hispanics and blacks enroll in college at lower rates than whites (U.S Department of Education, 2011), they are at a higher risk of working in automatable positions.

The deficient American educational system has been unable to surmount the structural inequalities embedded in its society, with automation now threatening to further cripple the economic prospects of those already marginalized from the privileges of education. The

youth, Hispanics, blacks and women will all concomitantly endure heightened technological unemployment due to their restricted access to education. Women in particular are "more than twice as likely as men to lose a job that is highly automatable" (ibid)[19]. Interpreted as a group, the statistics reviewed above single out lower-middle-class to poor women from non-white ethnicities as the most vulnerable towards technological unemployment.

In addition to intersectional feminism, third-world feminism is necessary to understand how international policies ought to be shaped in a future of scarcer labor. The fourth industrial revolution will potentially alter global linkages and the job market relation between developed and developing nations in fields other than domestic work[20]. The global south stands at yet another circumstance of power asymmetry. Reports estimate that the share of jobs susceptible to automation is higher in developing countries than in developed nations: around two-thirds of jobs (Baweja et al, 2016). This is due to the fact that emerging market economies have not directly endured the challenges of being industrially revolutionized. The World Economic Forum's White Paper on extreme automation and connectivity appropriately elaborates on this conundrum:

> (Developing countrie's) output and employment are still largely driven by agriculture, small-scale manufacturing and lowskilled services, large parts of which are in the informal economy. These are economies with low capital stock and high population growth rates. They will face the threat of the Fourth Industrial Revolution compromising lowskilled jobs via extreme automation, but may not have the technological ability to enjoy the relative gains that could be re-distributed via extreme connectivity. (Baweja et al. 2016, 26)

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[19] According to the same source, "Hispanics are 25 percent more likely than Whites to lose their jobs to automation. For African Americans, this number is 13 percent." (Chen, 2017).

[20] For example, multinational companies in developed countries may reshore their manufacturing processes, leading to a massive loss of jobs in the developing nations that hosted off-shored production.

Developing economies that once possessed the relative competitive advantage of abundant low-skill labor will face challenges as business firms cut costs by replacing such labor with advanced technologies (Baweja et al. 2016, 21). The situation of women in sweatshops across the global south, for example, becomes further intractable in circumstances where automation is easily adopted by transnational enterprises. There have been important breakthroughs for fair trade, as countries that host the outsourced production of developed nations have committed to achieve economic justice for these women by negotiating wages with transnational corporations. The mainstreaming of automation and the subsequent reduction of its costs, however, may make it more palatable for multinationals to invest in automation instead of increasing the wages of the workers in their outsourced supply chains. The progress made so far to economically empower low-skilled women in developing regions faces decisive challenges. Research has shown that the business process outsourcing (BPO) industry in the Philippines, for example, holds a substantial amount of its jobs at risk of automation; this affects women as they comprise almost 60% of the industry (Faith 2017, 3). Most specifically, the women that comprise 70% or more of the workers in the garment manufacturing industry of Southeast Asia are vulnerable to displacement by robots (Faith 2017, 3).

The gender dimension of automation is also a dimension of class, race, and international political economy. As the studies reviewed in this section show, economically underprivileged women and women from the developing world may not only be incapable of harnessing the benefits of automation, but also find themselves in an exacerbated state of threat to their livelihoods by the fourth industrial revolution. Women in off-shored industries, domestic workers, women with low income and low educational attainment are at a marked disadvantage.

(6)

A Critical Stance Towards Policy Proposals

The policy guidelines recommended by the ILO, the World Economic Forum, and the United Nations' Commission on the Status of Women designed to mitigate the risks of automation are hardly applicable to the global south. Their recommendations are not attentive to the economic problems which emerging and underdeveloped markets are likely to experience. The incompatibilities between international guidelines and political economies in the global south urge us to reevaluate the available options to surmount automation, locating women and advanced technologies at the heart of the discussion.

The proposals regarding the granting of universal public education and reskilling programs designed to level women's skills are particularly problematic. Developed nations could draft robot taxes[21] that could be invested in public services such as free education, including programs to help workers acquire new skills if their previous skillset is no longer compatible with labor needs. Developing economies, on the other hand, exhibit a much narrower capacity to apply and invest taxes on automated industries[22]. The main obstacle for these economies is that multinationals that choose to automate may freely migrate between nations if taxes on robots between these nations are substantially different. A first possible scenario sees most enterprises choosing to produce goods in the developing nation(s) with the least amount of taxation placed on robots. A second scenario sees developing nations managing to combine robot taxes with protectionist measures in order to avoid enterprises

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[21] These are taxes laid upon robot capital itself or upon the products these robots produce.
[22] Taxation systems on robots can take on a vast variety of forms. The capability of nations to implement tax schemes depends on effectively managing the macroeconomic and microeconomic effects of different tax combinations.

migrating while simultaneously taxing automated production and investing in reskilling programs. Although this scenario remains a possibility (albeit an improbable one), the volume of workers requiring reskilling is substantially higher in developing nations than in developed nations, reducing the feasibility of deploying taxes for these programs[23].

Policymakers also ought to bear in mind that education is not an all-encompassing solution for female unemployment. Providing women with higher education was a meant to help access to managerial positions, yet female representation in decision-making areas has remained low in spite of high educational progress. In fact, "Even though there is near gender parity in employment for professional and technical workers, … women hold less than a third of senior roles" (World Economic Forum 2016c). Additionally, there is a disconnect between the remaining educational gender gap (standing at 5%) and the economic gender gap (standing at 41%) (World Economic Forum 2016c). Women's skills are being leveled, yet they still face sexist discrimination in terms of access to formal work, equal salaries, and managerial positions. These challenges question the net impact of education on employment. Further studies are needed to determine whether reskilling programs aimed at women will truly surmount sexist work structures already in place.

Complementary education such as reskilling and upskilling programmes should be mainly deployed through public means. Leaving the supply of these programmes to the private sector could further disempower underprivileged women without the economic means to enroll in their required courses. With the increasing costs of global educational debts, it is uncertain whether people earning low and middle incomes will be able to even afford complementary

education after their third-level degree, especially if automation threatens their economic stability and their yearly wage[24]. Government subsidies for these courses are a necessary expenditure for equality.

The recommendations evaluated above are counterintuitive to the economic models these countries may develop in the future given the dynamics of the fourth industrial revolution. The institutional guidelines provided by these organizations would need nations to increase the size of their governmental apparatuses in some form or another if the goal is to mitigate automation's impact on women. The establishment of a third-degree public education system, for example, would require considerable expenses. The aforementioned fact that emerging and underdeveloped economies are expected to become less competitive and thus poorer during the fourth industrial revolution makes the expansion of government an unattainable task since economic prosperity and high commerce revenues are needed for the increase of government size.

These challenges hamper policymaker's ability to discern what decisions to make. In spite of the convoluted set of problems and possible solutions, a certain alternative is lobbying with governments to guarantee the elimination of laws that cripple female empowerment. 155 countries still uphold at least one gender-based restriction for employment and entrepreneurship (United Nations Commission on the Status of Women 2017, 4), making the revision of sexist legislature an important measure.

Civil society and the private sector may also provide valuable alternatives to foster female empowerment. Female worker unions are crucial to seize political power and communicate the demands of women regarding their vulnerability in the circumstances of the fourth

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[24] The issue is a priority for countries where private education outweighs public education.

industrial revolution. Formulating a clear script of action to reject the further disempowerment of women is key for worker unions worldwide. As for the private sector, companies from the global south ought to strengthen their commitments to female leadership and inclusion through regional associations with partner companies. These associations are useful in establishing general goals and targets for women's empowerment and producing incentives to advance the companies' interests through the diversification of their workforce.

To a large degree, the reports from the United Nation's agencies and the World Economic Forum are not negligible omissions of the global south and disadvantaged women, but are rather deliberate in their specific focus on the global north. This is mainly due to the fact that the fourth industrial revolution is still in its infancy and its effects on global economic structures remain to be set off in their entirety. The formulation of proposals for the global south in the presence of automation require an exhaustive amount of data. In order for intergovernmental organizations to produce sound alternatives for public policy management in the global south, a series of institutional partnerships, global-scale research agendas and research plans must be agreed upon and executed with immediacy. The following section details upon these suggestions.

(7)

Limitations to this Study and a Future Research Agenda

This paper sought to discuss the policy options endorsed by international fora to curb the disadvantageous results that massive productive automation will exert on women. The foundational assumptions that underlie the formulation of these policies have been critically addressed by examining their biases and their incompatibilities with the alternatives that are

feasible, focusing mainly on education. There are methodological and empirical limitations that may have hampered the fulfilling of these research goals to varying degrees. This section elaborates upon these probable limitations.

The availability of interdisciplinary data and literature is seriously challenged. An important issue is the lack of case studies assessing how automation is morphing gendered labor patterns in the developing world. Reports by international agencies have illustrated a general outline of how automation is set to heterogeneously affect different nations and demographical groups. International organizations have effectively deployed statistical information in these reports, generating awareness on the scope of the problem. What is lacking in academic knowledge is a thorough analysis on the technological and economic causal mechanisms that foster female disempowerment and their social consequences overall.

The studies presented by the Institute for Spatial Economic Analysis, for example, statistically demonstrate how being African-American, young, and female highly increase the probabilities of becoming substituted by a machine. The methodology for the data collection, however, is exclusively quantitative, implying that their seemingly intersectional results are not intersectional, only additive. The institute's methodology generates an aggregate rate of the risk of technological automation, adding the rates by race, by gender, and by age. However, it fails to elucidate how these effects should not be simply added, but they should be analyzed on how these vectors interact with each other and with effects of automation. The same principle applies to the women from diverse ethnicities, social classes, and professions in the developing world. The emerging field of technofeminist research must urgently develop a qualitative research agenda that investigates the experiences of these women. This approach could improve researcher's capacity to unveil the details of how

different racial, economic, and geographical positionalities lead women to experience automation heterogeneously.

In light of the need for qualitative data, the responsibilities for academia and researchers are broad. There is the need for interdisciplinary and transnational partnerships to produce in-depth knowledge of automation and female precariousness. Additionally, academia could function as a medium for the coordination of multi-stakeholder response plans to counter the negative effects of automation (Faith 2017, 3). Such transnational and interdisciplinary practices are vital to address this insufficiency of empirical knowledge in the area. Professionals in these partnerships ought to incorporate these queries in their research agendas:

How does culture and religion interact with women's access to the use of technology in different geographies?

How should Universal Basic Income experiments be carried out and evaluated in a way that gender and class specificities are approached?

How does automation effect emerging economies and the women in them, considering the fact that emerging economies remain understudied?

How may tax systems on robots be set up in a social responsible way where underprivileged women are prioritized?

This list is in no regard exhaustive, yet the queries refer to priority fields of research. The fourth industrial revolution brings forth an array of possibilities for theoretical research, yet I've contended throughout this research piece that the development of a feminist, third-world, and intersectional theory of automation is of utmost priority. The research agenda of scholars

and institutions alike would benefit from incorporating these theoretical junctions in their discussions.

(8)

Concluding Remarks

The fourth industrial revolution presents an opportunity for feminist movements to galvanize themselves and help amend the shortcomings of structural sexism. This research has detailed the nature of such shortcomings, paying particular attention to how preexisting work structures articulate with automation to economically impair women from developing nations. Occupational segregation by gender, lack of access to leadership positions, unequal participation in STEM and ICT fields among others constitute some of these shortcomings. International organizations such as the World Economic Forum, the International Labour Organization, among others are responsive to the multiple complications women endure while encompassed by the effects of automation. These organizations ground their strategies around inconclusive premises. Entrenched in a technofeminist, third-world, and intersectional theoretical site of enunciation, this paper argues that their proposals are both partially inattentive to the class and racial positionalities of women, and unobservant of the discordances between their strategies and the circumstances required for their implementation throughout the global south.

It is of utmost necessity that national governments and civil societies alike become aware of gendered implications of automation in order to discontinue the androcentricity that governs technological innovation. Otherwise, the male gaze may remain as the perpetual shaper of the world's technical future, distributing the gains of *andromation* among men

while eroding the past achievements of women movements the world over. National governments will be ill-equipped to truly cater to the needs of *all* women if the guidelines provided by international organizations are skewed to benefit only the already privileged proportion of women from the global north. There is the need for further research on the theoretical and empirical specificities of the symbiosis of women and automated technology within the global south in order to elaborate sound and inclusive policies to protect female labor and the future of womanhood.

References

Autor, David H., Frank Levy, and Richard J. Murnane. 2003. "The skill content of recent technological change: An empirical exploration." *The Quarterly journal of economics* 118, no. 4: 1279-1333.

Baweja, Bhanu., Donovan, Paul., Haefele, Mark., Siddiqi, Lutfey., & Simon Smiles. 2016. *Extreme automation and connectivity: the global, regional, and investment implications of the Fourth Industrial Revolution.* Geneva, World Economic Forum.

Brynjolfsson, Erik, and Andrew McAfee. 2014. *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. New York: WW Norton & Company.

Chaney, Elsa M. 1991. Muchachas no more: household workers in Latin America and the Caribbean. Pennsylvania: Temple University Press.

Cockburn, Cynthia. 1985. Machinery of Dominance: Women, Men and Technical Know-How. London: Pluto Press.

Collins, Patricia Hill. 2002. *Black feminist thought: Knowledge, consciousness, and the politics of empowerment*. Routledge.

Chen, Jess. 2017. "Automation expected to disproportionately affect the less educated". Institute for Spatial Economic Analysis. Last modified June 26, 2017. Accessed November 23, 2017. http://www.press.uchicago.edu/books/turabian/turabian_citationguide.html

Datta, Amit., Michael Carl Tschantz, and Anupam Datta. 2015. "Automated experiments on ad privacy settings." *Proceedings on Privacy Enhancing Technologies* 2015, no. 1: 92-112.

Deloitte. 2014. "Value of connectivity: Economic and social benefits of expanding internet access." *Deloitte UK Economic Consulting*.
Directorate-General for the Information Society and Media. 2013. Women Active in the ICT Sector. Accessed 23 November, 2017.https://publications.europa.eu/en/publication-detail/-/publication/9153e169-bd6e-4cf4-8638-79e2e982b0a3/language-en/format-PDF/source-50117257

Eisenstein, Zillah. 1997. "Constructing a theory of capitalist patriarchy and socialist feminism." *Insurgent Sociologist* 7, no. 3): 3-17.

Faith, Becky. 2017. Automation, Women, and the Future of Work. The Impact Initiative, Rapid Response Briefing 1. Brighton, IDS.

Firestone, Shulamith. 1970. The Dialectic of Sex. New York: William Morrow and Co.

Frey, Carl Benedikt, and Michael A. Osborne. 2017. "The future of employment: how susceptible are jobs to computerisation?." *Technological Forecasting and Social Change* 114: 254-280.

Galeano, Eduardo. 1997. *Open veins of Latin America: Five centuries of the pillage of a continent*. New York: NYU Press.

Goos, Maarten., Alan Manning, and Anna Salomons. 2009. "Job polarization in Europe." *The American Economic Review* 99, no. 2: 58-63.

Hartsock, Nancy CM. 1983. The Feminist Standpoint: Developing the Ground for a Specifically Feminist Historical Materialism. *Discovering Reality*: 283-310.

ILO. 2017. *World Employment and Social Outlook: Trends 2017*. Geneva: International Labour Organization.

ILO. 2013. *Rural-urban migrants employed in domestic work: Issues and Challenges.* Geneva: International Labour Organization.

Keller, Evelyn Fox. 1985. *Reflections on Gender and Science.* New Haven: Yale University Press.

Lovell, Terry, Carol Wolkowitz, and Sonya Andermahr. 1997. *A concise glossary of feminist theory*. London: Edward Arnold.

McNeil, Maureen. 1987. Gender and Expertise. London: Free Association Books.

Merchant, Carolyn. 1981. *The Death of Nature: Women, Ecology and the Scientific Revolution.* New York: Harper and Row.

Mohanty, Chandra Talpade, Ann Russo, and Lourdes Torres, eds. 1991. *Third world women and the politics of feminism*. Vol. 632. Bloomington: Indiana University Press.

Pettman, Jindy. 2010. *Migration*. Gender Matters in Global Politics ed. Laura Shepherd. New York: Routledge.

Tayah, Marie-Jose. 2016. *Global Action Programme on Migrant Domestic Workers and Their Families*. Geneva, International Labour Organization.

The World Bank. 2016. *World Development Report 2016: Digital Dividends*. Washington, DC: The World Bank.

United Nations Commission on the Status of Women. 55th Session. 2011. Agreed conclusions on access and participation of women and girls in education, training and science and technology, including for the promotion of women's equal access to full employment and decent work.

United Nations Commission on the Status of Women. 61st Session. March 2017. Women's economic empowerment in the changing world of work, report of the secretary general.

United States Department of Education. 2011. *The Condition of Education 2011*. National Center for Education Statistics. Accessed December 14, 2017. https://nces.ed.gov/pubs2011/2011033.pdf

United States Department of Labor. 2017. *Employment Projections and Occupational Outlook Handbook News Release*. Bureau of Labor Statistics. Accessed November 20, 2017. https://www.bls.gov/news.release/ecopro.htm

Varia, Nisha. 2007. *Globalization Comes Home: Protecting Migrant Domestic Workers' Rights*. Human Rights Watch.

Wajcman, Judy. 2006. "Technocapitalism meets technofeminism: women and technology in a wireless world." *Labor & Industry: a journal of the social and economic relations of work* 16, no. 3: 7-20.

Webster, Juliet. 1990. Office Automation: The Labor Process and Women's Work in Britain. Hemel Hempstead: Wheatsheaf.

Watson Kakar, Yana., Hausman, Vicky., Andria Thomas and Chris Denny. 2012. *Women and the Web*. Intel Corporation. Accessed November 23, 2017. https://www.intel.com/content/www/us/en/technology-in-education/women-in-the-web.html

WEF. 2016. *The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution*. Geneva: World Economic Forum.

WEF. 2016b. *The Industry Gender Gap: Women and Work in the Fourth Industrial Revolution*. Geneva: World Economic Forum.

WEF. 2016c. Global Gender Gap Report: Gender Parity and Human Capital. World Economic Forum. Accessed November 23, 2017. http://reports.weforum.org/global-gender-gap-report-2016/gender-parity-and-human-capital/