Technological Changes, Covid-19 and Women's Employment: A Qualitative Review

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Abstract:

Since the early days of the Industrial Revolution, women unemployment has become a central issue for almost all countries. Hence, researchers have shown an increased interest in the nexus between technological changes and women's employment. On the other hand, the most recent health crisis, which originated by Covid-19, have been attracted the attention of researchers on women employment.

This study has two main aims. The first aim is to build a general perspective on the terms of technological changes and women employment. The second is to provide an overview the link between the Covid-19 and women employment in the light of qualitative approaches with the most recent studies. According to the findings of the study, it has been elaborated that women employed particularly in the service sectors have been severely affected since the outbreak of the Covid-19, a huge amount of women have lost their jobs and some women's income reduced as well.

Keywords: Technological Changes, Women Employment, Service Sector, Covid-19

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Teknolojik Gelişmeler, Covid-19 ve Kadın İstihdamı: Nitel Bir İnceleme

Özet

Sanayi Devrimi'nin ilk günlerinden beri, kadın işsizliği hemen hemen tüm ülkelerin temel bir sorunu haline gelmiştir. Bu nedenle, araştırmacılar, teknolojik gelişmeler ile kadın istihdamı arasındaki ilişkiyi artan bir ilgi göstermişlerdir. Öte yandan Covid-19 kaynaklı son yaşanan sağlık krizi, kadın istihdamı konusunda araştırmacıların dikkatlerini çekmiştir.

Çalışmanın iki temel amacı vardır. Birinci amacı, teknolojik değişimler ve kadın istihdamı açısından genel bir bakış açısı oluşturmaktır. İkincisi, en son çalışmaların nitel yaklaşımları ışığında Covid-19 ile kadın istihdamı arasındaki ilişkiyi genel olarak değerlendirmektir. Araştırmanın bulgularına göre, Covid-19'un patlak vermesinden bu yana özellikle hizmet sektörlerinde istihdam edilen kadınların ciddi şekilde etkilendiği, çok sayıda kadının işini kaybettiği ve bazı kadınların gelirlerinin de azaldığı görülmektedir.

Anahtar Kelimeler: Teknolojik Gelişmeler, Kadın İstihdamı, Hizmet Sektörü, Covid-19

1. Introduction

Relationships between the technological changes and women employment have been one of the most attractive topics among the researchers who study on this field since the industrial revolution. Technological changes have both positive and negative effects on gender employment. Not only the technological changes have positive effects on employment due to facilitating human life; but it also has negative effects on employment by substituting technology for human labour as well. There is a growing body of literature that recognises technological developments have positive effects on employment by creating new employable opportunities (Brouwer et al.,1993; Evangelist & Savona, 2003; Wood 2004; Evangelista and Savona, 2010; Feldman, 2013; Vivarelli, 2014). However, the concept of employment includes both male and female dimensions. The research to date has tended to focus on the effects of technological changes on employment rather than women employment. This study covers the effects of technological changes on women employment and the effects of covid-19 on women employment as well. Due to practical constraints, this paper cannot provide a

comprehensive review of all components of women employment. According to the findings of several previous studies, two major questions have been raised, such as;

How do technological developments impact on women employment?
How does covid-19 effect on women employment?

Technology is knowledge of production of goods and services which facilitate our daily activities and solve the problems. As it is understood in the definition of technology, it is fully positive for the humankind. But technology has inevitably bad side in terms of generating unemployment (Van Reenen, 1997; Peters, 2004; Pianta, 2004; Feldmann, 2013; Vivarelli, 2014). Human needs and technology should mutually impact each other. The latest technological level, it is usually called "Information Age" or "Robotic Age", needs a highly skilled employee. Due to the mismatch of the employee skills to the technological development, a great number of people are left unemployed. This process, which is broadly called as business cycles, generates an increasing unemployment (Liso and Leoncini, 2011). Besides the negative sides of the technological development on employment, COVID-19 has also had sever negative impact on women employment (Alon et al. 2020; ILO 2020), particularly mothers have had to reduce working hours due to the childcare responsibilities (Collins et al. 2020). The childcare has historically nominated to mothers (Thistle, 2006). Since the future uncertainty, it is very difficult to estimate fully effects of the Covid-19 in the long-term (Jorda, Singh, & Taylor, 2020). The COVID-19 pandemic outbreak has hit the several sectors such as the activities of tourism, sales, marketing, entertainment, education and the supply chain in different levels (Wenham et al., 2020). These sectors, which are vulnerable, mostly employ female.

Women have generally suffered during the macroeconomic turbulences (Federici, 2018). For example, during the early months of the COVID-19 pandemic outbreak more than 60% of women lost their jobs in the USA (Cahn, 2020).

This study has two main aims; first aim of the study is to build a general perspective on the terms of technology and unemployment in the light of qualitative approaches. Due to technological innovation creates labour-saving business ecology, which can be named as much more demand on mechanical muscle and mind than labour muscle and mind,

macroeconomic policies must pay attention on unemployment issue in order to protect women unemployment. The second aim is to evaluate the impacts of the Covid-19 on women employment.

To sum up, in this study the impacts of technology and Covid-19 on women employment will be elaborated in terms of theoretical approaches by qualitative methods. Although unemployment has been a major economic issue from industrial revolution to present, but the impacts of technological development and Covid-19 on women unemployment is a complex phenomenon due to women preferences to certain occupations and their education based skills.

2. History of Technological Developments

The technology is one of the central concepts to economic development of societies. There is a growing body of literature that recognises the importance of technology for the social development (Klein & Kleinman, 2002; Smith, 2003; Turner, 2015). Since the Schumpeter's contributions to the classification the term of technology, scientists have been interested in the role of technology in enhancing the development of the society. Despite its historical success in development of societies, technology has a number of negative consequences (Van Reenen, 1997; Peters, 2004; Pianta, 2004; Feldmann, 2013; Vivarelli, 2014).

It is known that technological developments have undergone four main stages of transformation from the first industrial revolution to the present day. The first industrial revolution begins with the invention of the steam engine and its effects on society and employment. It is known that the second industrial revolution started with the electricity and oil, which are the important energy sources, to be used as the energy sources in the early 1900s. After the electricity and oil started to be used as energy sources in production sector, employment policies have been changed dramatically. In the third industrial revolution,

electronic circuits and control panels in the 1960s played an important role in the process of transformation in production systems. This transformation in industrial sector impacted to change employment policies as well. Changes in employment policies observed basically in shifting working population from the industrial sector to service sector. In the point of view of this transformation, the third industrial revolution is called as service sector revolution. As emerging retailing and financial sector started to employ people who have appropriate skills matching to the requirements of these sectors (Musso, 2018).

The process of substituting technologies, which are named as data mining, artificial intelligence, Internet of things, cyber security, cloud technology, robot technology, and computer-based product design (3D) technologies is called as the fourth industrial revolution (Xu et al., 2018).

Along with four industrial revolutions, societies have introduced five different era of socialization, which are categorized as follows;
(1) Age of hunting and gathering, (2) Agricultural age, (3) Industrial age, (4) Information age, (5) Evolving age of mind (Groff, 2011)
The relevant industrial revolution influenced on the transformation of each age. In addition, the industrial revolution, which played an active role in the emergence of ages, had important effects on employment. With the transition from the agricultural society to factory production system, as a result of the first industrial revolution, employment started to shift from agriculture to factories. Along with the second industrial revolution, electricity was an important energy input; mass production system was introduced in industrial sector, employment policies encountered with the labour-intensive and massive employment practices. However, we observe that employment policies transformed at the same pace as the speed of technological development in the age of knowledge during the third and fourth industrial revolution. The transformation of employment policies generally resulted from the qualifications required in the male and female labour force, which are two important components of labour force. While the low skills and talents were satisfactory for the employers during the first and second industrial revolution, high skilled and knowledge-based labour have been required in both third and fourth industrial period. In the third and fourth industrial revolution processes, the workforce maintains its importance, but the automation and robot technologies have increased substitution for the labor force (Hawkes et al, 2018).

As a result of technological development and productivity increase, particularly in the process of the third and the fourth industrial revolution, investors have gained cost diminishing opportunities due to the substitution technological devices for the labour force. In this case, there are two results of technological development that affect employment. First, with the creation of information and technology based new business areas will be required high level of technology than labour demand that mean a large number of employment areas will be shrunk. Second, it is undeniable that new technologies will also contribute to employment by creating new jobs. The impact of new technologies on employment can be evaluated in the context of creative destruction within the framework of the Schumpeterian approach. In other words, the result can be evaluated by comparing how technological developments can destroy and create professions (Bartel et al, 2007).

There are a large number of studies (Sachs, 1995; Mesthene, 2000; Roy, 2006) that describe the link between technology and societal transformation. It has been conclusively shown that the word machinery had broadly been used instead technology up to 1930s. Because techniques were reported in the first study by Lewis Mumford titled "Techniques and Civilization" (1934: 14). But what is known about technology is largely derived from brief conceptual details by J. A. Schumpeter (as cited in Nitzan).

Table 1 provides a timeline of inventions of several techniques which have impacted on the life of societies.

Table 1: Major Invention and Impacts on Societies

Time	Techniques	Impact
Western technology (1500–1750)	Steam engine	Development of transport and communications
The Industrial Revolution (1750–1900)	Steam locomotive Water turbine, dishwasher Liquid crystals	Automated cloth-weaving loom, military devices, chemicals, agriculture
The 20th century (1900 to 1945)	Fuel and power Space exploration Microwave ovens Robots, Nuclear power	Development of automation and the computer Development of transport and communications
Science and Tech (Since 1945-To Present)	Computer-Aided Design Radio, Television Telephones and cellular phones, automobiles, jet engine, Artificial Intelligence (robots)	Development of computer networks, development of internet, development of wireless Internet, development of nanotechnology

Source: britannica.com

It can be elaborated in the light of the table 1 above that every invention of technique created a new social transformation stage and a new set of occupations as well. This cycle of process, from the invention of the steam engine to present, has arrived in different level according to the absorption capacity of nations. The concepts of employment and unemployment were not clear concepts before the industrial revolution; they appeared after the industrial revolution. An increase in industrialization triggered productivity, so unemployment increased in the result of labour saving employment policies.

3. Impacts of Technological Developments on Gender Employment

Historically, research investigating the factors associated with the women employment has focused on technological developments and the changes in workplaces. These changes can be categorized in four patterns.

First, before the Industrial Revolution women had mostly been employed in farm land. Women's employment has been changed under the effects of the Industrial Revolution since the 18th century. These changes can be elaborated in two patterns, such as;

(i) Women's labor participation rates have increased outside the home

(ii) Women's occupational categories have changed and increased

Just after the Industrial Revolution, women's employment has mostly appeared in the following sectors respectively, textiles and clothing, domestic work and agriculture (Mitchell, 1962). Domestic works, which are named unpaid work, consisted of caring for children and the sick, cleaning, cooking, fetching water, making and mending clothing during the industrial revolution period. In the textile sector, women faced severe difficulties due to the shipment of the textile work out of the home towards factories run by the steam power. Women who self-employed and handmade specialized lost their jobs.

Second, the other change in women employment was appeared after the Mines Act 1842. It can be elaborated that the act prevented women and girls of any age to be employed at hard work as mines and collieries. Due to dangerous conditions, these kinds of jobs considered not for the women and girls (CMHRC.co.uk).

The third is the features of education and skills of female to be employed. Due to the lack of higher education and appropriate skills for the well-paid and prestigious occupations, female have left behind the female labour force participation. The occupations like engineering, medicine, law and management, have been considered as the occupations for male. Mostly since the mentioned reasons, low paid occupations left for women during the 19th and 20th centuries. However, through the 20th century, the new employment opportunities, which do not require higher education degrees and high skills, were created in service sectors for female expectations. Early 20th century, one of the most important women employment developments that appeared with participation rates about 50 per cent of single women and about 12 per cent of married women. Up to 1970s, married women participating in the labour force increased by 40 per cent. The reasons of increasing married women employment caused by in the changes of demand networks education and office work policies which taken on by women. After the 1990s, new employment opportunities have appeared for female according to their education degrees. These employment opportunities can be listed as follows; doctors, lawyers, managers, and professors (Brookings.edu).

The fourth one is the cultural barriers to women employment (Alesina et al., 2013). On the one hand, in some countries, particularly developing countries, traditional idea that male and female have naturally different abilities for different occupations. On the other hand, traditions force to women to do house works such as raising kids, clothing, feeding, cooking, ironing, sewing, ironing, and cleaning. These kinks of works considered as indoors female's work while some works such as such as fetching water grocery shopping or food foraging, and gardening considered as outdoors female's work (Barry and Schlegel, 1982).

In previous studies on women employment, different findings have been found to be related to technological developments. Some studies can be listed as follows; Brynjolfsson, McAfee, and Spence (2014:93), Leswing (2017), Wolf (2015:125) argue that the main factors of production determined by skilful and experienced labour rather than physical capital (as cited in Xu et al., 2018). To better understand the mechanisms of technological developments and its outcomes, some studies reveal that there is a controversial finding between technological developments and employment outcomes (Table 2).

Table 2: Technological Developments and Employment

Researchers	Technological developments	Outcomes
Wood (2004), Feldman (2013)	Technological development	Create unemployment
Liso and Leoncini (2011)	Technological development	Increased demand for high skilled workers
Piva et al. (2006)	Technological development	Negative for skilled and unskilled workers
Alonso-Borrego and Collado (2002)	Technological innovation	Creation and destruction for jobs
Acemoglu and Autor (2011)	Technological development	Less employment in routine jobs
Van Reenen (1997), Peters (2004) Pianta (2004), Vivarelli (2014)	Process innovation	Negative effect on the labour force (Contradicts Schumpeterian idea)
Van Reenen (1997) Bogliacino and Vivarelli (2012) Vivarelli (2014), Marcolin et al. (2016)	Product innovation	Positive relationship between technology and employment (Contradicts Marxist philosophy)
Feldmann (2013)	Technological development	Increase unemployment in the long run

As shown in Table 2, the impacts of technological developments on employment can be evaluated as positive and negative categories.

1. Technological developments will create new jobs, and technology will affect employment positively

2. Product and process innovations, which are the two most important consequences of technological developments, will affect employment differently, that is, process innovations will affect employment negatively while product innovations will affect employment positively

3. Due to technological developments provide labour cost opportunities, new technological devices will be substitute instead of labour, and technology will affect employment negatively

4. Due to high wages are paid to high-tech knowledge and talented labour force, technological developments will have a positive impact for high-talented labour while it will have a negative impact for low-talented labour

As can be seen from the table 2, it is difficult to conclude a clear-cut impact of technological developments on employment. But some factors can play more determining roles on unemployment than technological factors. Some of these factors can be listed as follows; the structure of technological developments, employee's skills, employee's motivation and education level, and social constraints of countries (Manning, 2004; Hornstein et al., 2005). Together the literatures in table 2 also provide important insights into the women employees' preferences and social constraints of the societies can be summarised as follows;

1. Women particularly choose professions that will be less affected by technological developments such as elderly care, child care and office jobs.

2. Traditional reactions and perceptions towards female education and women employees (religious factors can also be evaluated in this regard)
3. Worldwide male dominant social structure
4. The perception and social pressure of unpaid housework should be done by women, and that it negatively affects female labour force participation and women employment.

4. The Impacts of Covid-19 on Women Employment

The impacts of Covid-19 on women employment can be evaluated in terms of occupations and skills by two broad different ways. The first is some occupations such as engineering, production management, laboratory, R&D, marketing and sales, research scientists, database managers, cyber security analysts, and cloud technical solutions engineers require high knowledge. Since the lack of the education and field experience male graduates have been employed in the mentioned occupations (Karasek, 1990). The second factor is not only technological developments impact on women employment but also feature of the job, health and socio-cultural dynamics of the society impact on women unemployment (Koning et al., 1990). Due to the future risks, job seekers particularly females wish to be employed for a long time. That is why the feature of the job carries on priority for women employment (Atkinson, 1998). Occupations such as waiters, retail clerks, salespersons, librarian, nurses, secretaries, elementary school teachers and receptionist had been less impacted by the technological developments (Karasek, 1990; Lips-Wiersma, 2016), but after the COVID-19 broke out firstly in China, even the mentioned occupations have been negatively affected on women employment (Cahn, 2020; Collins, 2020). Some jobs, which can be run from home, are not severely at risks for women employment. But some jobs require face-to-face interaction with others. Based on these criteria, which jobs have been under the risks because of the COVID-19, risky jobs for the future can be at most for women employment in Table 3 below.

Economic sector	Share of women (%)	Current impact of crisis on economic output
Education	61.8	Low
Human health and social work activities	70.4	Low
Public administration and defence; compulsory social security	31.5	Low
Utilities	18.8	Low
Agriculture; forestry and fishing	37.1	Low -Medium
Construction	7.3	Medium
Financial and insurance activities	47.1	Medium
Mining and quarrying	15.1	Medium
Arts, entertainment and recreation, and other services	57.2	Medium- high
Transport; storage and communication	14.3	Medium high
Accommodation and food service	54.1	High
Real estate; business and administrative activities	38.2	High
Manufacturing	38.7	High
Wholesale and retail trade; repair of motor vehicles and motorcycles	43.6	High

Table 3: Share of Women at Risk: Sectoral Perspective

Source: International Labour Organization (ILO) Monitor (2020)

According to the data of the ILO, approximately 38 per cent of the workforce has been faced high-risk to be employed. Low-paid and low-skilled requirements are the main features of this workforce. For example food and accommodation, retail and wholesale, business services and administration and manufacturing sectors are mostly suffered from the Covid-19 process. The tourism sector, which impact directly or indirectly all countries, is one of the most important sector contribute to employment. Why tourism sector is very important because tourism sector creates 10 per cent employment opportunities globally, and female prefer to be employed in tourism sector due to low skills are needed in this sector. But the main risk in tourism sector is sharply closed international borders and how long this disruption will remain is not clear. Why Covid-19 have severely impacted women employment in education, human health, social work activities, arts, entertainment, recreation, other services, accommodation and food service is because more than 50 per cent of these sector consist of women workers shown in Table 3 above.

Conclusion

A number of studies have attempted to examine the nexus between technological changes and women's employment. Since the outbreak of the Covid-19, a lot of researchers have been trying to realize the impact of the Covid-19 on employment. This study has investigated both the link between technological development and women's employment and the link between Covid-19 and women's employment. According to some studies, technological development has positive impact on employment Brouwer et al.,1993; Evangelist & Savona, 2003; Wood 2004; Evangelista and Savona, 2010; Feldman, 2013; Vivarelli, 2014), however, others have found that technological development has negative impact on employment (Van Reenen, 1997; Peters, 2004; Pianta, 2004). These controversial outcomes mostly related to the employees' skills. Liso and Leoncini (2011) found that if employee has lack of skills to the requirements of the sector, they are left unemployed. But Manning (2004) and Hornstein et al., (2005) emphasized that employee's motivation and social constraints of countries much more determining in employment than employee's skills. Although Liso and Leoncini (2011); Manning (2004) and Hornstein et al., (2005) highlighted that employee's skills, motivation, and social constraints of countries are important in employment, but Mitchell (1962) claimed that employee's preferences to the features of occupations are much more important in employment.

This study confirms that impact of Covid-19 on women's employment is associated with pandemic outbreak has hit the several sectors such as the activities of tourism, sales, marketing, entertainment, education and the supply chain in different levels (Wenham et al., 2020). Why Covid-19 have severely impacted women employment in education, human health, social work activities, arts, entertainment, recreation, other services, accommodation and food service is because more than 50 per cent of these sector consist of women workers globally (ILO, 2020). What is surprising is that during the early months of the COVID-19 pandemic outbreak more than 60% of women lost their jobs in the USA (Cahn, 2020).

Overall, as this research was based on a review on technological development, Covid-19 and women employment three general conclusions are drawn:

(1) The study suggests that skills, education and female preferences to workplaces are very determining in women employment.
(2) Social constraints are also very important factors that impact on women employment
(3) Covid-19 has hit the activities several sectors such as tourism, sales, marketing, entertainment, education and the supply chain in different levels.

Policy makers should seek to determine adequate employment policies to increase women employment particularly for women employees who have lost their job and income. In addition, policy makers should design education and training programs in order to increase women's skills. The last recommendation raised by this study is to improve entrepreneurship opportunities to provide employment for women employees.

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