

# Leveraging ICT Technologies in Closing the Gender Gap

Marie Sicat<sup>1</sup>,  
Ankai Xu, Ermira Mehmetaj<sup>2</sup>,  
Michael Ferrantino, Vicky Chemutai<sup>3</sup>

## Abstract

In recent decades, the growth of information and communications technologies (ICT) and the move toward the digitalization of trade and global value chains has been radically transforming the global trade scene, with important implications for women engaged in trade. In order to identify adequate measures to reduce gender disparities, this paper reviews and discusses evidence from the existing literature, as well as presents evidence from a number of new empirical analyses. It also introduces two new frameworks to analyze the gender dimensions of e-commerce.

Digital technologies have the potential to empower women socially and economically by creating new employment and entrepreneurial opportunities, removing trade barriers for women, enhancing access to finance and information and optimizing their business processes. For example, e-commerce substantially lowers the barriers to entry for micro-, small- and medium sized enterprises by reducing the investment needed to launch and run a business. Digital solutions that remove the need for face-to-face interactions when trading can help reduce the difficulties women business owners face, such as mobility constraints, discrimination, and in some countries even violence.

As workers, digital technologies may help women overcome time and mobility constraints by connecting women to work from different locations and in flexible hours through emails, instant messaging and tele-conferences. It will also benefit women as consumers by saving time, providing access to information, reducing transaction costs, or giving them more control over the purchasing process.

Yet, technology is not the silver bullet in resolving all the gender gaps in trade. This is because women's access and use of ICTs and digital technologies tend to lag in contrast to men. The benefits of digital technologies hinges on well-designed and specifically targeted policies.

**JEL Categories: F13, F19, F6, J18**

---

<sup>1</sup> Marie Sicat works at the United Nations Conference on Trade and Development (UNCTAD)

<sup>2</sup> Ankai Xu and Ermira Mehmetaj work for the World Trade Organization

<sup>3</sup> Michael Ferrantino and Vicky Chemutai work for the World Bank Group

# Leveraging ICT Technologies in Closing the Gender Gap

## Table of Contents

### Abstract

1. Introduction
2. Methodology
3. The impact of technologies on women as entrepreneurs, workers and borrowers
  - 3.1 How technologies empower female entrepreneurs
    - 3.1.1 Reducing cost of trade
    - 3.1.2 Opening new opportunities to trade in services
    - 3.1.3 Providing training and information
      - Box 1: Shop Soko
      - Box 2: Taking potatoes' sale online
      - Box 3: ICT's use by women-owned micro-enterprises in Egypt
      - Box 4: Making technology work for female entrepreneurs in Burkina Faso
    - 3.1.4 Enhancing women's access to finances
  - 3.2 How technologies help women as workers
    - 3.2.1 Increasing demand for female skills
    - 3.2.2 Overcoming time and mobility constraints
    - 3.2.3 Facilitating households' access to financial services
  - 3.3 How technologies benefit female consumers
    - Case study 1: E-commerce substituting paid market time for household shopping time
4. New frameworks for analyzing the gender dimension of e-commerce
5. Conclusion

### Annex

Case study 2: Gender Dimensions of the Alibaba E-marketplace in China

Case study 3: Gender Dimensions of E-commerce and E-platforms in South Asia and Southeast Asia

## 1. Introduction

In recent decades, the growth of information and communications technologies (ICT) and the move toward the digitalization of trade and global value chains has been radically transforming the global trade scene, with important implications for women engaged in or affected by trade, whether this be as traders, workers or consumers. By enabling the expansion of markets and the entry of large numbers of women into the labor force, trade has been recognized as playing an important role in helping to create opportunities for women and in bridging the gender gap. At the same time, there continue to exist differential impacts of trade on women and men. ICTs can give rise to new windows of opportunity to bridge the gender gaps. This paper argues that digital technologies provide an opportunity to empower women and to close key gender gaps between men and women. Policies need to be in place, however, to ensure that women benefit from the digital transformation.

Due to the rapidly changing ICT and digital landscape, a volatile global trade scene and their interface with persisting gender barriers, it is challenging to assess the extent to which ICTs and new technologies can be leveraged to close the gender gaps. Assessing the situation becomes even more complex today with the emergence of new digital technologies such as artificial intelligence (including automation), robotics, and big data in key trade-related sectors, which stand to transform society and to revolutionize trade, business and industrial production processes. Compounded by the scarcity of sex-disaggregated data, gaining a clear picture of the interplay between gender, trade and technology to close the gender gap is difficult.

To help fill this knowledge gap and in order to identify adequate measures to reduce gender disparities, this paper reviews and discusses evidence from the existing literature, as well as presents evidence from a number of new empirical analyses. It also introduces two new frameworks to analyze the gender dimensions of e-commerce. Specifically, the paper sheds light on the underlying dynamics interlinking gender, trade and technologies and seeks to elucidate key mechanisms by which technology can be leveraged to empower women traders, close key gender gaps, and provide evidence-based analysis to enable policymakers to take informed decisions on gender-sensitive policies that can strengthen opportunities for both men and women in reaping the benefits of trade reforms.

Digital technologies bring transformative forces to global trade and commerce, and while they may simultaneously affect men and women, their impacts on women can be different due to

the gender-specific needs and preferences and unique barriers women face as workers, traders and consumers. Leveraging digital technology to empower women's businesses can help drive trade, create jobs and foster economic growth.

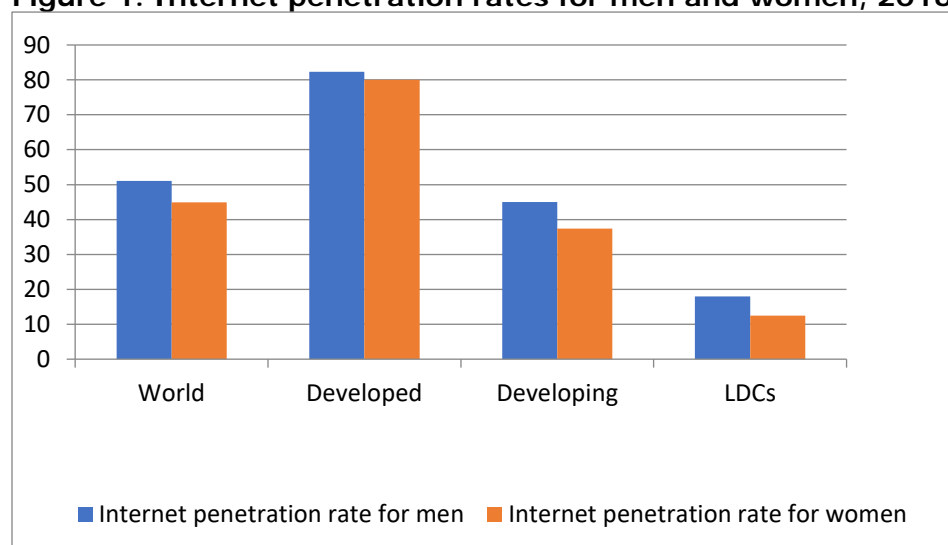
### **1.1 A persisting gender digital divide**

Despite evidence indicating the beneficial effects of empowering women through ICTs, women's access and use of ICTs and digital technologies tend to lag in contrast to men. Past data indicate that the digital gender gap is persistent and tends to get deeper over time (ITU, 2016). For instance, the internet user gender divide increased from 11 percent in 2013 to 12 percent in 2016, with more than 250 million fewer women now online than men at the global level. Figure 1 illustrates the higher internet penetration rates for men than for women in all regions of the world in 2016.

While this digital gender divide is prominent globally, the gap in ICT access between women and men varies significantly across countries, ranging from 2.3 percent in developed countries to 7.6 percent in developing countries. The rate of female online presence has reached 80 percent in advanced economies in contrast to the world average among developing countries of 37.4 percent. LDCs lag even further behind with less than 13 percent of women online. This suggests that the lack of women's online empowerment in these countries could further hamper their attempt to participate more actively in digital trade.

With the trend toward the provision of services online (e-services), in particular through the internet, in both the public and private sector, women entrepreneurs and consumers without access to this technology have a clear disadvantage. In addition, in recent times, the advent of emerging technologies, including automation and artificial intelligence, is redefining the future of jobs, with particular impact on women. While this is offering opportunities, it may also require mitigating measures to ensure no widening of the gender gap, particularly in developing countries.

**Figure 1. Internet penetration rates for men and women, 2016**



## **2. Methodology and New Analytical Frameworks for Leveraging Technology to Close the Gender Gap in Trade**

As there has been considerable work to date in reviewing and studying empirical evidence of the gender dimensions of trade and technology, this paper aims to contribute to this effort by revisiting the issue of closing the gender gap through technology and trade, in particular through the narrower lens of e-commerce for trade, and to use new empirical data to shed light on new trends in the evolving gender, e-commerce and emerging ICT technologies landscape.

For the following review, the authors took stock of rigorous quantitative and qualitative studies in gender, trade and technology with the objective aimed at identifying key policy insights and intervention measures and highlighting key areas for future consideration. Case studies were identified and collected applying primarily to developing countries, but also gleaning findings from the experience of developed countries where relevant empirical data and evidence was available. Women's online consumer behavior and its link with employment trends in e-commerce related jobs is examined through an analysis of official occupational employment statistics and time use surveys in the US (case study 1). The gender dimension of e-commerce trade in South East Asia and South Asia was examined through a sex-disaggregated analysis and survey of 2,880 merchants and 1,174 e-commerce ecosystems conducted in the two sub-regions (case study 3). More detailed methodological information is provided in each of the respective case studies. Following the literature review and case

studies, two analytical frameworks were constructed for this research paper to reflect on and help collect, sort and systematize the review findings.

### **3. The impact of technologies on women as entrepreneurs, workers and consumers**

The literature review elucidated the following key ways in which technologies are impacting women in the trade sector as entrepreneurs, workers and consumers.

#### **3.1 How technologies empower women entrepreneurs for trade**

It is estimated that globally there are roughly 9.34 million formal women-owned small-to-medium enterprises (SMEs) in over 140 assessed countries, which make up roughly one-third of all formal SMEs (IFC 2014)<sup>4</sup>. These businesses and the women who lead them have the potential to be a powerful force for building prosperity through GDP growth and job creation.

While the potential for economic contributions is significant, female business owners face challenges in accessing the support services they need to grow, such as access to networks, training, financing and markets (ITC, 2017). Digital technologies such as e-commerce platforms have, thus, the potential to bring female producers and traders closer to the markets, offer female consumers a larger variety of products at lower costs, and make it easier for female entrepreneurs to borrow.

The premise of our analysis is that digital technologies, in particular online platforms, can enable women to leverage their comparative advantages and overcome a range of hurdles in traditional modes of trade. Specifically, technologies enhance women's participation in trade by reducing the cost of trade, opening new opportunities to trade in services, enabling them to better use their skills and facilitate women's access to finances.

##### **3.1.1 Reducing the cost of trade and barriers to entry**

Technological developments help to reduce the information and transaction cost traditionally associated with cross-border trade. Several studies show that easier access to market information through even relatively simple technology such as mobile phones can decrease spatial variation in prices in developing countries and especially in agricultural markets (Bernard et al. 2007; Aker and Mbiti, 2010). More sophisticated technologies such as e-

---

<sup>4</sup> SMEs are defined as formal (registered) enterprises in the non-agricultural private sector with 5 to 250 employees. The analysis is intended to be viewed as approximate data points, rather than absolute numbers. In fact, these estimates could be presented as a range with a variation of +/- 10 percent.

commerce platforms reduce searching costs dramatically by matching buyers and sellers. Online rating systems and e-payment solutions enhance trust between buyers and sellers (Resnick and Zeckhauser, 2002; Ba and Pavlou, 2002). Digital solutions that remove the need for face-to-face interactions when trading can help reduce the difficulties women business owners face, such as mobility constraints, discrimination, and in some countries even violence (ITC, 2017).

The Internet allows more micro-, small- and medium sized enterprises to trade online by lowering the entry cost for trade, and women disproportionately benefit from this cost reduction. Some evidence points to the fact that women business owners are more present online than they are in traditional businesses.

For example, a 2015 survey of Pacific Island exporters showed that firms that are active online have a greater concentration of female executives under 45 years of age than those that are active offline (DiCaprio and Suominen, 2015). Etsy, a creative commerce platform, reported that 86% of its sellers in the United States are women, and they are more likely to be younger than the typical business owner (Etsy, 2017). On Alibaba, a Chinese e-Commerce platform, more than half of all online shops are owned by women. In comparison, only 17.5% of small enterprise in China has a female top manager, and the figure globally stands at 18.6% (World Bank Enterprise Surveys).

E-commerce, often referred to as an industry made for “start-ups”, substantially lowers the barriers to entry for SMEs by reducing the costs and investments needed to launch and run a business. One of the most characterizing features of the e-commerce sector is the prevalence of e-marketplaces or virtual marketplaces bringing together buyers and sellers in the online space, whether this be for the sale of goods or services, between businesses and consumers (B2C), between businesses (B2B), between business and government (B2G), to name a few. As e-marketplaces help to bridge asymmetric information gaps in market access, eliminate the need for investing in physical retail space and also often build in the provision of service delivery in payment services and logistics, they offer particular benefits and opportunities to women entrepreneurs and traders who typically face inequitable access to market information, capital for the purchase or investment of land and retail space, electronic payment solutions, and logistics services.

There exist strong gender dimensions in e-marketplaces. Bhutan's e-auctioning platform illustrates how e-commerce platforms can help reduce the cost of trade for women traders, access market information, increase productivity and earn higher profit margins from cross-border trade (see Box 1). Additionally, there are two case studies shedding further light on some of the gender dimensions characterizing regional e-marketplaces and online trading. See case studies: Women traders on the Alibaba E-marketplace in China and Women-led e-commerce trading firms in South and Southeast Asia in the Annex of the paper.

**Box 1: Taking Potatoes Sale Online @e-auctioning – fetching better returns for Bhutanese women farmers**

Bhutan's ICT sector is being re-made as a matter of national priority. With the help of the Enhanced Integrated Framework (EIF), a multilateral partnership dedicated to assisting Least Developed Countries (LDCs) in trade, the Bhutanese government has been building e-infrastructure for its trade and services development. Through this project support, Bhutan has launched the Bhutan Commodity Exchange (BCE), an online commodity exchange system for e-auctioning of agricultural commodities, piloting first potatoes, one of the top ten Bhutanese exports. With the help of information technology, the online marketplace matches buyers and sellers and enables women farmers to benefit from greater price transparency, ease and efficiency of search, and reduction in transaction costs. The online system is currently successfully used by 266 Bhutanese farmers, of which 40 are women, most of whom do not have ICT proficiency. As a result of a nationwide market awareness and farmer sensitization program, 1021 women farmers received ICT training to participate in BCE (62% of total trainees).

In contrast to the conventional auction platforms, where farmers were required to weigh and grade the potatoes manually, BCE weighing is now carried out by machines and the potatoes are graded using automated grading machines. With EIFs' support, BCE has procured two potato grading machines with a capacity to grade and weigh around ten truckloads of potatoes in a day. The use of these machines has reduced processing and payment time to one day, as opposed to three working days in the conventional system. The potatoes are packed and marketed in specially designed packaging, which help Bhutanese potatoes gain recognition and build a brand in the international markets.

Through the use of ICT in commodity markets, BCE has helped to create incentives for market participants to produce commodities that meet quality specifications, and to behave



according to commodity market standards, thereby increasing their sales. Through this online system farmers are able to sell their products faster, more efficiently and with higher margins. Building on this success, the government of Bhutan intends to introduce the trade of cardamom in the online commodity exchange system.

### ***3.1.2 Opening new opportunities to trade in services***

New technologies enable traditionally non-tradable services to be traded online, which can bring more economic opportunities for women. In addition, these opportunities are multiplying with the increasing trend toward e-services in both the public and private sector. In Upwork, an online marketplace for freelancers to provide services, 44% of the workers are women, compared to an average of 25% of non-agricultural economy globally (World Bank, 2016). Airbnb, an online marketplace for hospitality service, estimates that more than 1 million women host on Airbnb, making up 55 percent of the global Airbnb host community. In addition, women host on Airbnb at 120 percent of the rate of men, with a higher percentage of the women hosts report part-time employment and earning lower income outside of the hosting activity (Airbnb, 2017).

Women are also discovering new opportunities in online teaching. Kim and Bonk's (2006) survey results showed that the number of female instructors online had increased dramatically over a few years. More than half of the respondents (53%) were women compared to a similar survey conducted a few years earlier, which was dominated by male instructors.

Data from e-marketplaces, often supplemented by online customer service, also appear to indicate women's predilection for customer service, online marketing and other communication and social interaction skills important for raising credibility in the online space.

Kricheli-Katz and Regev (2016) studied the auction transactions of private sellers on eBay and found that women online sellers generally received higher ratings than men on e-commerce platforms. While the women sellers engaged in trade in goods, the skills they displayed support findings from previous studies indicating that women have a predilection for customer service, online marketing and other online sales qualities. The study documented that women sellers on eBay tended to have better reputation as men sellers. Alibaba also reports that women-led enterprises receive higher ratings in customer service, logistical service, and give more accurate descriptions of their products. In particular, the advantages of women are more prominent in markets of highly differentiated consumer products and

services and, in particular, in markets geared toward women clientele and household. Women-led enterprises are concentrated in sectors such as cosmetics, clothing, jewellery and baby products.

### **3.1.3 Providing training and information**

ICT can bring benefits for women traders by providing training, improving access to information, facilitate business planning, and optimizing their business processes. For instance, mobile phones facilitate access to agricultural market information, in many cases replacing the message boards and radio programs of traditional market information systems. Farmers in countries as diverse as Niger, Senegal, and Ghana receive the price of a variety of goods immediately on their mobile phone by simply typing a code and sending a text message. In Kenya, Uganda, and India, farmers can call or text hotlines to ask for technical agricultural advice (Aker and Mbiti, 2010). Törenli (2010) also argues that ICT can be of benefit to the information poor if it is used to generate ‘solidaristic’ practices in order to combat labour exploitation by the subcontractors.

Despite the potential benefits of digital technologies, the gender digital divide risks to ill equip women for the digital and technological advances ahead. Effective measures to educate and expose these women to the digital environment and to obtain digital skills will be crucial at all levels, including among informal women entrepreneurs and women at low socio-economic levels. Peer to peer learning initiatives as well as initiatives leveraging digital tools and combining the efforts of high-growth women entrepreneurs with informal sector entrepreneurs are other approaches being pursued. Shop Soko with its business model recruit tech savvy and entrepreneurial community agents to provide ongoing training and mentorship to subsistence entrepreneurs is one example (see Box 2).

Progress in strengthening women’s ICT access and use in many countries has led to increasing numbers of women in possession of ICT devices and tools, in particular mobile phones. Nonetheless, many women entrepreneurs lack knowledge or competence in effective use of these tools. Strong measures are needed to provide practical training and guidance for productive utilization. Increasingly, there is a gap among entrepreneurs possessing mobile phones and ICTs between those who are effective “digital users” and those who are not. Strong measures are needed in order to address this so called “gender digital-use divide” (US Department of Education, 2015). See Box 3 on ICT, e-commerce, and digital technologies among women-owned micro-enterprises in Egypt on bridging this divide.

Continuing efforts to encourage women in STEM fields and ensuring women entrepreneurs' ability to enter the tech market and make effective use of business software will also be key (see Box 4 on Making technology work for women in Burkina Faso). Strong initiatives to re-skill and re-tool women, including in the ability to work closely with digital technologies and machines, will be crucial.

### **Box 2: Shop Soko in Kenya**

Recognizing the challenges faced by artisans in emerging markets, the mobile-based online marketplace for artisanal jewelry, shopsoko.com, was created to sell artisanal goods made in Kenya capturing Kenya's rich cultural heritage and indigenous designs. Via mobile phones, local artisans can now have a visible web presence and do business as global entrepreneurs directly with international consumers.

Shop Soko has also introduced a number of innovations to support local artisanal micro-entrepreneurs. It has a mobile-enabled "virtual factory" which operates at a fraction of the cost of traditional production, thus increasing earnings for entrepreneurs. In addition, one of the key innovative approaches it employs is the recruitment of tech savvy and entrepreneurial community agents to provide ongoing training and mentorship to poor women, as well as providing quality assurance and logistics.

With the majority of the working population in Sub-Saharan Africa (up to 90% in Kenya) employed in the informal sector and barely earning enough to survive, challenges in basic ICT literacy and skills, internet access, access to electronic payments plague most of Kenya's micro-entrepreneurs in artisanal arts. Women, in particular, are disadvantaged, due to the gender digital divide. The peer to peer learning approach leveraging high-growth women entrepreneurs as community agents to support largely subsistence entrepreneurs aims to create a sustainable network to support the development of ICT and entrepreneurial skills which are necessary to close the gender gap. By developing an e-commerce curriculum for community groups throughout Kenya, the Shopsoko team of community agents is now focused on scaling their impact <https://shopsoko.com/pages/impact>

### **Box 3: ICT, e-commerce, and digital technologies among women-owned micro-enterprises in Egypt**

As part of the development of its national e-commerce strategy in 2015, the Government of Egypt, in cooperation with UNCTAD, conducted its first nationwide official e-commerce

survey of its micro-enterprises in the handicrafts sector which helped illuminate important information on the size, scale and scope of its women entrepreneurs in e-commerce. The national survey found that the majority of enterprises in the formal sector are owned by men (96%) in contrast to only 4% of the businesses which were women-owned. (UNCTAD, 2015).

The small numbers of women entrepreneurs in the formal sector and even smaller numbers of these women entrepreneurs using internet pointed to the likelihood of a strong presence of women entrepreneurs in the informal sector not captured by standard national statistics. Subsequently, the national survey was further supplemented by focus group consultations of women entrepreneurs in the informal sector, as well as findings from face-to-face interviews with Egyptian women entrepreneurs in the informal sector through UNCTAD cooperation with the ILO (ILO, 2015). Although obtaining accurate quantitative data on the numbers of women entrepreneurs in the informal sector nationwide was not feasible, the focus groups and face-to-face interviews played an important role in obtaining qualitative information on ICT and e-commerce use among the micro-entrepreneurs in this sector.

The findings from consultations with more than 20 focus groups of some 100 women entrepreneurs in handicrafts, primarily in the informal sector, in the cities of Aswaan, Sohag, Cairo and Alexandria showed that few were familiar with the concept of e-commerce and online shopping or knew existent e-marketplaces in Egypt such as Jumia or Souq. However, mobile phone use was common across entrepreneurs. Among informal women entrepreneurs with whom there were face-to-face interviews, 50.7% made use of a regular mobile phone to run their business, 8.2% made use of a smart phone, 4.1% a desk top computer, 6.8% a portable laptop computer, 7.5% fixed line internet subscription, 8.2% mobile internet subscription, and .7% internet café, telecentre or kiosk.

Focus groups consultations showed that, while the majority of women informal micro-entrepreneurs had a basic mobile phone rather than a smartphone, they made elementary use of their mobile phones for their businesses. Many of the entrepreneurs were on Facebook and used Facebook to market their products. In Nubia, some entrepreneurs communicated with their customers and received orders through mobile phone messaging. Some took photos of their products and sent them to their customers using WhatsApp. They sometimes received photos from customers showing model products the customer wanted them to produce.

Informal sector entrepreneurs communicated that, with the exception of mobile phones, they did not have the necessary ICT knowledge and skills and so could not identify opportunities that could be generated through ICTs. Only 7.5% of the informal entrepreneurs were aware of the different ways in which they could use the Internet in their businesses and 5.5% expressed confidence in their ability to use Internet for their business operation. The findings showed that, while progress had been made and continuing progress was needed in ensuring women entrepreneurs' physical access to ICT devices and tools in Egypt, effective use and application of these tools in possession was a major challenge. Many of the micro-entrepreneurs that were consulted communicated an eagerness to gain capacity to make use of ICT and e-commerce for their businesses and called on the Government to build an e-marketplace to market their local specialty handicrafts. Measures are needed to close the gender gap particularly relating to reducing the "gender digital use divide".

Source: UNCTAD 2017, ILO 2016

#### **Box 4: Making technology work for women in Burkina Faso**

In Burkina Faso, IT training in enterprise resource planning (ERP) software for women producers is enabling them to address supply side constraints and strengthen their productive capacities in key sectors such as sesame, shea almond, processed cashew and dried mango. With EIFs' support, Burkina Faso has developed a special ERP software system which helps to empower women's MSMEs. This software allows women to input data on processing and raw material and forecast the final outputs, thereby enabling women to track the entire production cycle optimise their business management and production. The software also has an order and sales management modalities which permits women to sell their products online. They can create a stock of the finished products, by product type and packaging, manager customer information, deliver orders and charge and collect their bills. This modality has created a convenient alternative to face-to-face trading. The software has been rolled out in 35 processing regions and is effectively boosting productive capacity and raising the business competitiveness of women-led MSMEs.

#### **3.1.4 Enhancing women's access to finance**

A growing literature documents the gender gap in access to credit (Klapper and Parker, 2011; Johnson, 2004). The International Finance Corporation (IFC) estimates that as many as 70

percent of women-owned SMEs in developing countries are unserved or underserved by financial institutions, resulting in a total credit gap of \$287 billion, which is 30 percent of the total credit gap for SMEs. Most of the financial and non-financial barriers affecting women-owned SMEs occur at the start-up stage of the business life cycle (IFC, 2014).

Women entrepreneurs are more likely than male entrepreneurs to rely on internal or informal financing and are charged higher interest rates than men (Richardson et al, 2004; Muravyev et al, 2009). Reasons for such a gender gap could vary from taste-based discrimination (Beck et al, 2011) to lower overall financial literacy among women (Lusardi and Tufano, 2009). According to Aterido et al (2013), firm size, age and a lower likelihood to be an exporter and have foreign ownership participation explain the difficulties that female-led companies face in accessing finances in nine countries in Southern and East Africa.

Gender differences in access to and use of financial services can have direct negative ramifications for the whole economy (Aterido et al., 2013), since barriers to finances reduce the efficient capital allocation and aggravate income inequalities (Beck et al., 2007).

Technology advancements, such as mobile money, digital platforms that match start-ups and providers of financial services, as well as blockchain may help women overcome barriers they face in accessing necessary capital for their economic empowerment.

Some studies show that peer-to-peer crowd-funding platforms allow women to access trade finance at much lower costs, even if women tend to ask for less money than men. For example, Marom, Robb, and Sade (2014) studied data from the crowd-funding platform Kickstarter and find that women are 35 percent of the project leaders and 44 percent of the investors on the platform. On average, men seek significantly higher levels of capital (and raise more) than women. However, women enjoy higher rates of success, even after controlling for category and goal. Similarly, Barasinska and Schäfer (2014) provided evidence on the success of female borrowers at a large German peer-to-peer lending platform. Their results show that there is no effect of gender on the individual borrower's chance to receive funds on this platform. In other words, online crowd-sourcing platforms seem to be "gender blind" and eases female discrimination in access to finance. In developing countries, mobile phones can dramatically reduce the costs of sending and receiving money relative to traditional mechanisms, an important issue for rural farmers and traders (Aker et al., 2016).

### **3.2 How technologies affect women as workers**

Automation will likely eradicate many jobs in the low skilled sectors, where women make a higher share of the labor force (Autor, 2015). For example, many jobs in manufacturing, office and administrative support occupations are predicted to be at risk of being automated (Frey and Osborne, 2017; Goos et al., 2014). Brussevich et al (2018) estimated that women on average perform more routine tasks than men across all sectors and occupations, and thus automation could cause more female jobs to disappear. However, at the same time, thanks to the technological change, many jobs are being transformed and new jobs are being created (Bessen, 2015). As analyses of data on the United States, Japan and European countries reveal, employment shares for skilled workers, high-paid professionals and managers, have been rising in the industries that experienced the fastest growth in ICT (Michaels et al., 2014; Goos et al., 2014). ICT substitutes for unskilled workers in performing routine tasks, but it complements skilled workers in executing nonroutine abstract tasks (Akerman et al., 2015; Atalay et al., 2018).

In a nutshell, technology will likely cost women jobs, but it will also likely create new employment opportunities for women. Technology has the potential to empower female labour force through different channels and these are explored below.

#### **3.2.1 Increasing demand for female skills**

Technology-driven shifts in demand for female-specific skills can enhance women's economic opportunities and reduce the wage gap between genders. Women are well positioned to gain from a shift in employment toward non-routine occupations, and away from physical work. Their often superior social skills present a comparative advantage in the age of digitalization (Krieger-Boden and Sorgner, 2018). According to Deming (2017), high-paying jobs increasingly require social skills and the fastest growing cognitive occupations — managers, teachers, nurses and therapists, physicians, lawyers, even economists — all require significant interpersonal interaction.

Using data from West Germany, Black and Spitz-Oener (2010) found that women have witnessed relative increases in non-routine analytic and interactive tasks, which are associated with higher social skill levels. Similarly, Cortes et al. (2018) found that since 1980 the probability of working in a cognitive/high-wage occupation has risen for a college-educated woman in the US (Cortes et al., 2018). This is attributed to a greater increase in the demand for female-oriented skills, in particular social skills which have gained importance in cognitive/high-wage occupations relative to other occupations. Also, Lindley (2012)

documented demand shifts in favor of skilled women that are positively correlated with technical change and occurred mainly in sectors where social skills are important, such as education and health sectors.

Some empirical evidence shows that women benefit disproportionately from technological upgrade induced by access to foreign markets. Juhn et al (2013) documented that the increased access to US market after the entry-into-force of the North American Free Trade Agreement (NAFTA) induced more productive firms in Mexico to modernize their technology in order to enter the export market. These new technologies involved computerized production process, which disproportionately benefited female workers since they lowered the need for physically demanding skills. As a result, the relative wage and employment of women improved, especially in blue-collar tasks.

### **3.2.2 Overcoming time and mobility constraints**

A growing literature on gender income gap shows that women are less flexible to work long hours given their responsibilities as primary caregivers. This disadvantage pertaining to inflexible working hours for women is particularly pronounced in exporting firms, since exporters may require greater commitment from their employees such as working particular hours to communicate with partners in different time zones or travelling at short notice, and they may therefore disproportionately reward employee flexibility. In a paper studying the Norwegian manufacturing sector, Bøler et al (2018) find that a firm's entry into exporting increase the gender wage gap by about 3 percentage points for college educated workers. Goldin (2014) argues that the gender gap in pay would be considerably reduced and might vanish altogether if firms did not have an incentive to disproportionately reward individuals who laboured long hours and worked particular hours.

Digital technologies may help women overcome time and mobility constraints by connecting women to work from different locations and in flexible hours through emails, instant messaging and tele-conferences. The flexibility provided by digital technologies can therefore help women participate in the workforce while balancing their work and family obligations. In the study cited above, Goldin (2014) finds that women working in science and technology have higher labour force participation rate and lower gender wage gap and attributes this pattern to the fact that technology appears to enable women to work part-time or to work more flexibly.



In developing countries, basic technologies such as stoves, water-harvesting technologies, solar panels, washing machines, etc. could have a large effect in narrowing gender inequalities, since women often take disproportional responsibilities for household chores such as collecting water and timber, taking care of the children and the elderly. Therefore, basic technologies would likely reduce the time spent in household chores, leaving women and girls with extra time to educate themselves or engage in economic activities. Emerging technologies such as smart homes also hold the prospect of reducing women's household burden.

### **3.2.3 Facilitating households' access to financial services**

ICTs can dramatically reduce the costs of sending and receiving money enabling women to smooth consumption over time and allocate their labor more efficiently. A study in Kenya estimates that access to the Kenyan mobile money system M-PESA increased per capita consumption levels and lifted 2 percent of Kenyan households out of poverty. The impacts are more pronounced for female-headed households. Mobile money has increased the efficiency of the allocation of consumption over time while allowing a more efficient allocation of labour, resulting in a meaningful reduction of poverty in Kenya (Suri and Jack, 2016). In Niger, evidence from the social cash transfer program demonstrates that the greater privacy and control of mobile transfers compared to manual cash transfers shifts intra-household decision-making in favour of women (Aker et al, 2014).

### **3.3 How technologies benefit female consumers**

ICT and digital industries such as e-commerce have grown tremendously in past years with gendered impacts on women both as consumers and as members of the workforce. This section examines some of these dynamics, in particular what appears to be some phenomena of potential efficiencies in women's time use made possible through digital technologies correlating with increased job creation in traditional male-dominated fields.

Technology might benefit women as consumers by saving time, providing access to information, reducing transaction costs, or giving them more control over the purchasing process (Elliot and Meng, 2009). For example, e-commerce technologies unusually lower consumers' expenditure as it is not necessary for consumer to travel abroad and to waste time on the road (Burinskiene and Burinskas, 2012). Mobile phone-based applications have the potential to facilitate the delivery of financial, agricultural, health, and educational

services. Mobile phones also facilitate communication among social networks in response to shocks, thereby reducing households' exposure to risk (Aker and Mbiti, 2010).

ICT can also benefit female consumers by decreasing discrimination they might face when purchasing offline. A study examining racial discrimination found that compared to offline, minority buyers pay online nearly the same prices as do white consumers, controlling for consumers' income, education, and neighborhood characteristics. The Internet facilitates information search and removes cues to a consumer's willingness to pay. The results imply that the Internet is particularly beneficial to those whose characteristics disadvantage them in negotiating (Morton et al., 2003).

Comparing traditional markets with the Internet, Rezabakhsh et al. (2006) show that the Internet enables consumers (a) to overcome most information asymmetries that characterize traditional consumer markets and thus obtain high levels of market transparency, (b) to easily band together against companies and impose sanctions via exit and voice, and (c) to take on a more active role in the value chain and influence products and prices according to individual preferences. Since women many times assume most of household chores including purchasing for the household, the results are likely to apply more to female consumers and make a case for how ICT benefits/could benefit female consumers.

The inter-relationship between consumer online consumption and the growth of e-commerce-related sectors and the impact on jobs is another important area relating to the gender dimension of e-commerce consumerism and its link with women's uptake of technology. In recent times, strongly competitive forces leading to a struggling "bricks and mortar" retail sector in the face of competition from e-commerce players has led to concerns regarding the loss of traditional sectors.

The case study below, based on analysis of new, empirical data, illustrates the time-saving, efficiencies, and beneficial aspects of e-commerce for women as online consumers, its link with reducing women's household burdens, supporting women's needs to meet household responsibilities, and what appears to be its interface with a virtuous cycle feeding into the growth of jobs and e-commerce-driven sectoral growth in the economy.

### **Case study 1: E-commerce substitutes paid market time for household shopping time<sup>5</sup>**

---

<sup>5</sup> This sub-section draws inferences with a gender lens from the forthcoming publication, Ferrantino and Koten (2019)

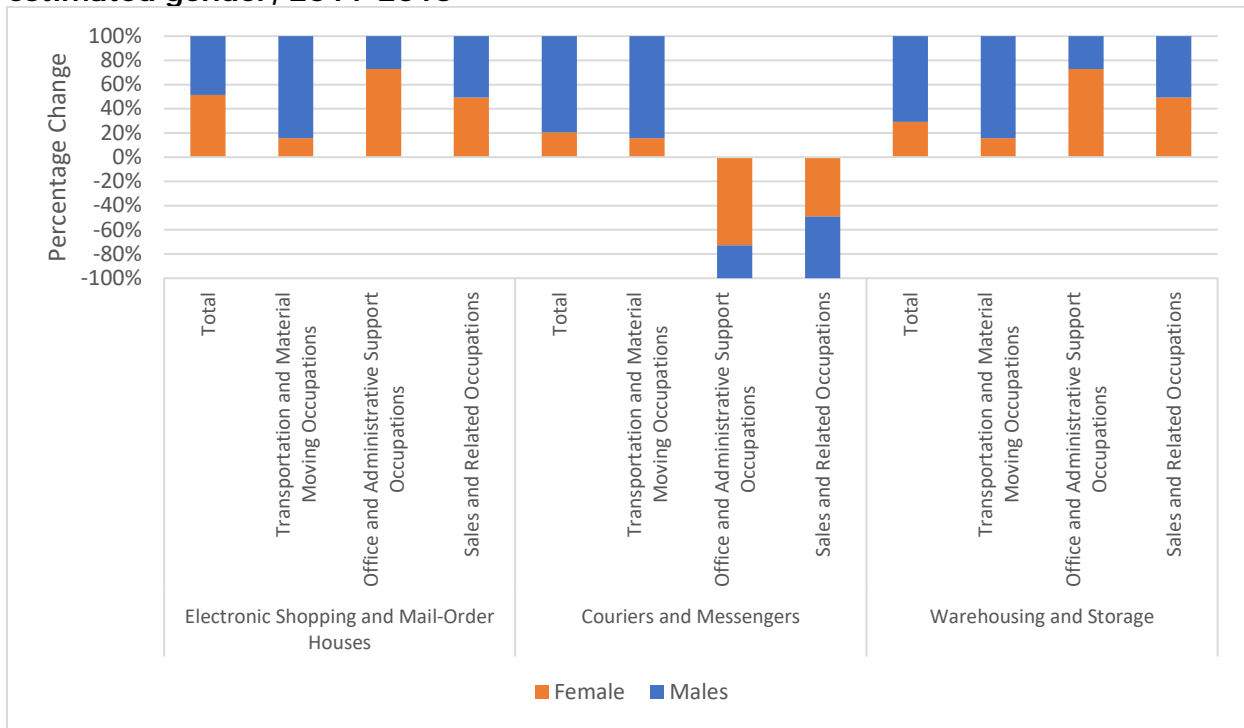
The study assessed linkages between women's online consumer behavior and its potential impact on employment trends in e-commerce related jobs. The analysis was done making use of data from the Occupational Employment Statistics (OES) of the U.S. Bureau of Labor Statistics to track sector-level employment as well as employment in individual occupations in each sector and used data from the American Time Use Survey (BLS) to assess whether hours spent in shopping activities are mostly female.

It examined the issue by first conducting a gender analysis of employment trends and by measuring the female share of employment in e-commerce supply chain sectors. Data showed that employment in the most dynamic parts of the e-commerce supply chain has grown at a rate substantially exceeding that of the overall economy. These sectors include warehousing and storage (used by all retailers, Wal-Mart as well as Amazon), couriers and messengers (the sector including UPS and Federal Express) and non-store retailers (particularly electronic shopping and mail-order houses, the sector inhabited by Amazon and eBay).

The dominant category of employment which has expanded in the current supply chain boom is "transportation and material moving operations", which is mainly male-dominated. Figure 2 reveals that over 2011-2016, these occupations accounted for an increase in employment of over 350,000 in warehouses and courier services, with men accounting for the larger share of these jobs. This could be caused by various factors, including the fact that most of the jobs being created involve machine operation or robotics, moving goods around either in warehouses or delivery vehicles and have many of the characteristics of factory work (Ferrantino and Koten, 2019).

The overall effect on women's employment in the three rapidly-growing supply chain sectors has been positive, even though the dominant growing category (transportation and material moving occupations) has been male-dominated. Of the three largest categories of occupations in these sectors, growth is observed in all occupations, with the exception of "office and administrative support" (largely female) and "sales and related occupations" (slightly more male than female). Assuming that the gender division by occupation in the U.S. economy as a whole can be applied to each sector individually, an estimate of the gender-driven occupational changes for the largest occupations in rapidly-growing supply chain sectors amounts to about 318,000 net male jobs (around 68 percent of new jobs) and about 152,000 net female jobs (around 32 percent of new jobs).

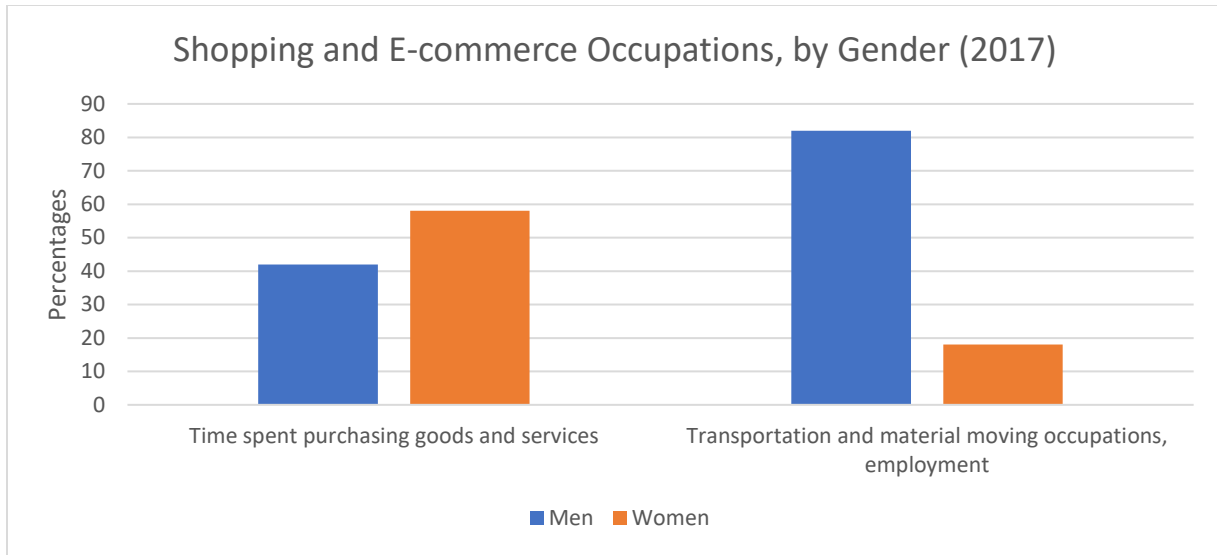
**Figure 2: Gain/loss in employment in rapidly-growing supply chain sectors, by estimated gender, 2011-2016**



Note: Estimated total employment is rounded to the nearest 10 (excludes self-employed)  
 Source: Author's construction using data from the U.S. Bureau of Labour Statistics (BLS) <https://www.bls.gov/cps/cpsaat18.htm> and <https://www.bls.gov/cps/cpsaat11.htm>, assuming that the gender distribution of occupations is constant across sectors.

Noting that the distribution of household hours and market hours varies by gender, the study proceeded to explore whether there may be benefits for both men and women in e-commerce. In particular, the study examined how e-commerce also replaces unpaid household hours of shopping time, with paid market hours of work in warehousing and transport. Figure 3 shows the gender divisions in shopping and e-commerce occupations. The study found that women on average spent more time purchasing goods and services whereas men were significantly more involved in transportation and material moving occupations. Women on average spent 0.82 hours per day on purchasing goods and services, whereas men spend only 0.61 hours.

**Figure 3: Distribution of shopping hours vs employment in transportation (percentages) by gender**



Source: BLS American Time Use Survey, BLS Current Population Survey, and authors' calculations

In summary, on the basis of the data analysis, it became clear that e-commerce has gender implications in that it replaces unpaid household hours of shopping time, mainly done by women, with paid market hours of work in warehousing and transport, mainly done by men. The data also showed that per week, the number of hours spent by each individual shopping declined from 4.9 in 2005 to 4.4 in 2012, recovering slightly to 4.5 in 2016. At the same time, the brick-and-mortar share of retail sales declined from 98 percent to 92 percent. Instead of consumers spending time shopping, workers in warehouses and on delivery trucks are picking goods off warehouse shelves and bringing them to the consumer's front door. Since time is a scarce resource, particularly in an affluent society, the implications of e-commerce for social welfare are potentially profound. This includes implications for the gender distribution of labor.

#### **4. New Frameworks for Analyzing the Gender Dimensions of E-commerce**

The literature review and case studies provided an objective analysis highlighting a number of key issues, trends and themes critical to gender analysis in technology and trade. Building on this, this section takes on a normative lens and proposes two new analytical frameworks which were constructed for this research paper to reflect on and help collect, sort and systematize review findings. The new frameworks aim to contribute to the body of analytical tools to conduct future gender analysis on e-commerce and to facilitate the formulation of effective evidence-based policies, measures, recommendations and strategies to leverage the gendered impacts of technology to close the gender gaps.

The new frameworks help to contextualize key issues emerging from the literature review with consideration to the gender dimensions of the following: (1) technology and trade dynamics at the micro level in e-commerce; and (2) e-commerce dynamics within the context of a holistic, integrated framework for the e-commerce ecosystem.

The first framework provides a normative lens for looking at issues relating to the use of ICTs and e-commerce for the empowerment of women at the micro-level, in particular women traders and women entrepreneurs. The second framework provides a method for gender analysis of e-commerce cross-sectoral, taking in consideration the multiple and inter-related enabling pillar areas which lay the foundation for e-commerce growth.

Both frameworks highlight the importance of considering the gender dimension in electronic platforms which emerge as a critical success factor for growing e-commerce in a country. This includes e-marketplaces - which in the past two decades have been the most widespread and typically representative form of electronic platform in e-commerce – as well as e-retailing, e-auction, e-services, e-payment, e-government, and crowdsourcing platforms. Inter-related with the issue of electronic platforms are issues relating to both businesses and consumers and the inter-relationship between them, including issues of business competitiveness, household consumption and the growth of supporting services and industries.

### **Framework 1: The gender prelude to digital trade - Empowering women traders and entrepreneurs for e-commerce through ICTs**

Studies from the literature review provided evidence of numerous ways in which digital technologies reduce the cost of trade and barriers to entry for a wide range of women traders and entrepreneurs. The case studies also provided evidence of how certain e-commerce tools were playing an important role in empowering women entrepreneurs whether their trade be in goods or services.

In an increasingly digitalized world, digital technologies have become an essential tool for running a competitive business for women across all walks of life. The range of potential benefits ICTs offer is extensive. For the segment of high-growth-oriented women entrepreneurs, this includes access at low cost or no cost to crucial information in areas such as business development, market and pricing information, production technologies, compliance, forecasts and training. Affordable access to digital technologies is increasingly

becoming an imperative for entrepreneurs to participate in the global value chains and to create the necessary seamless and efficient back office administration.

On the other end of the spectrum, women entrepreneurs are largely under-represented in contrast to men as business owners of formally registered enterprises. In low-income countries, women-owned businesses tend to be clustered in the micro and informal sector. Women entrepreneurs in the informal sector have limited legal rights, social protection, status or recognition. Compounding their disadvantage, and vulnerability, due to lack of literacy, skills, access to economic resources, and financing, the gender digital divide is particularly prevalent among this segment of women entrepreneurs (UNCTAD 2014)

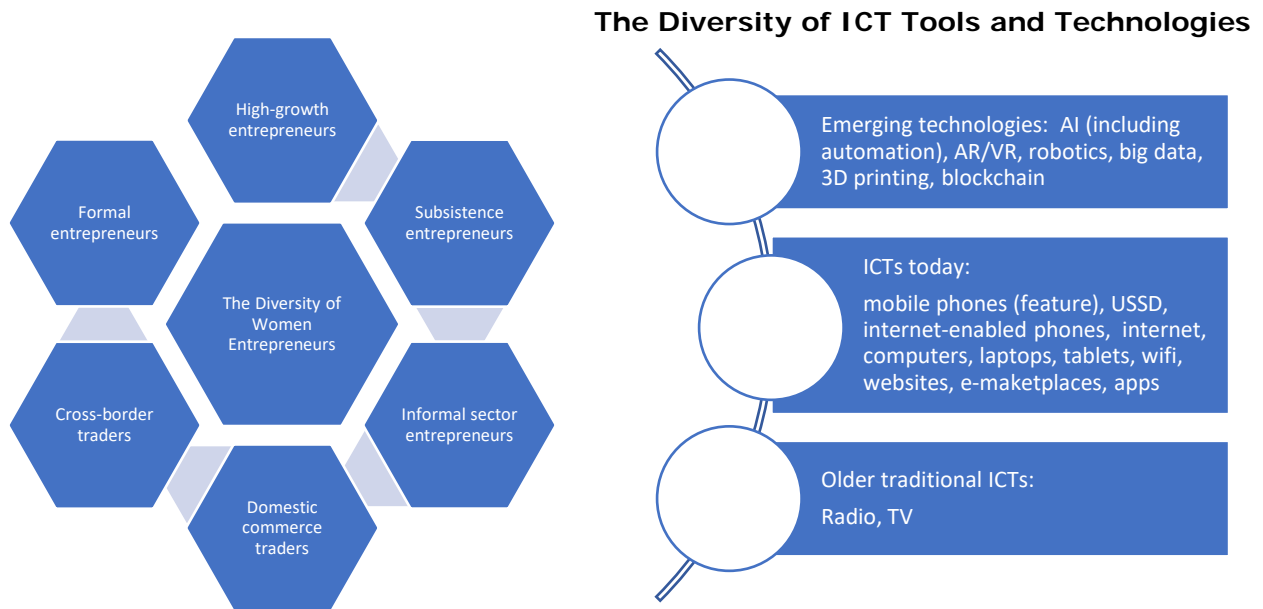
The framework illustrating the interplay of these diverse factors is shown below (see Figure 4). The framework sets out a four step gender and e-commerce analytical process involving the mapping of: (1) the type of women trader or entrepreneur being targeted for e-commerce; (2) the diversity of ICT and e-commerce tools available in the market and their viability with regard to the existent ICT infrastructure, telecommunications and related power infrastructure and services in the country; (3) the primary e-commerce strategic objective and confluence of strategic considerations; and (4) the generation of a menu of policy measures, recommendations and strategic approaches. Ensuring appropriate fit of ICT technologies, approaches and strategies with the digital skills level, needs and unique circumstances faced by diverse women entrepreneurs is crucial to effectively harness ICTs, e-commerce and digital tools to close the gender gap.

As seen from the literature review, the most effective electronic platforms are those which have taken into account the digital skills level and capacity of the women traders and entrepreneurs and built in training consideration. For example, both the Bhutanese Commodity Exchange and Kenya's Shop Soko were set up to ensure women farmers and agri-entrepreneurs with even minimal ICT skills capacity could participate. The study of online trading in South Asia and Southeast Asia also showed that the availability of full-service exports online platforms including e-payments and logistics services were attractive to more high growth-oriented women traders and entrepreneurs who possessed the skills set to make optimal use of them.

The Framework also highlights the range of strategic objectives policymakers may wish to pursue. This may range from gender measures and policies targeting high-growth women entrepreneurs – for example, women entrepreneurs with technical expertise in the

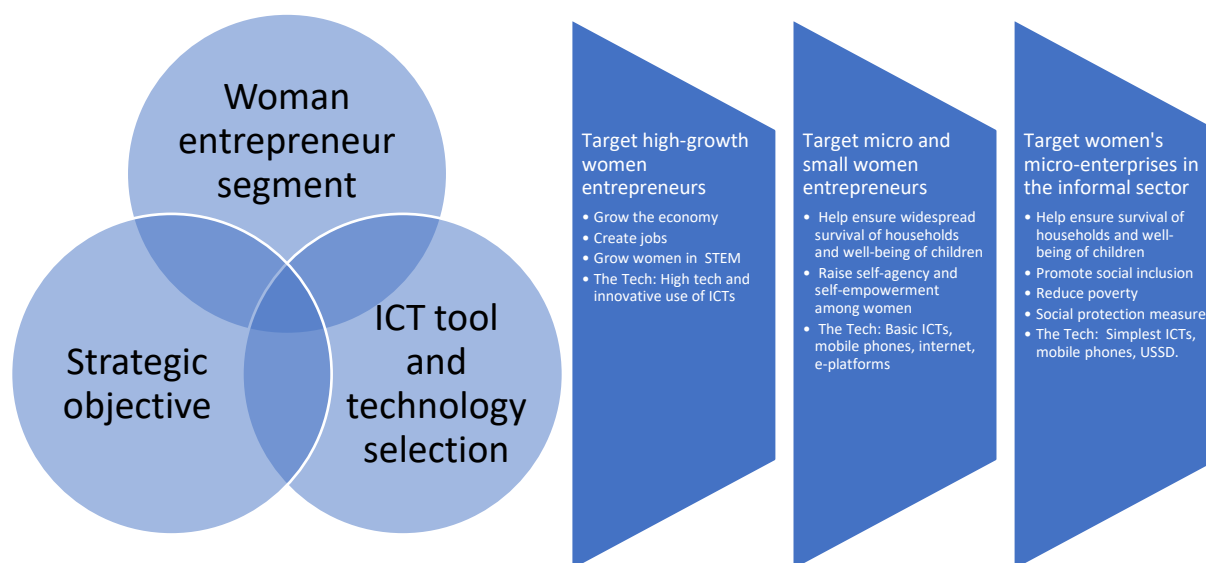
technology sector - aimed at leveraging e-commerce to spur major GDP growth and job creation to those targeting micro and small subsistence women entrepreneurs and traders aimed at supporting family livelihood, helping to provide a wide social safety net for low income families, reducing poverty and promoting social inclusion.

**Figure 4: A Multi-Pronged Approach: Matching Women E-commerce Traders and Entrepreneurs with the Right ICT Tools and Strategies to Close the Gender Gap**



**The confluence of strategic considerations**





Source: Adapted from UNCTAD 2014

## **Framework 2: Gender Dimensions of the UNCTAD Integrated Enabler and Assessment E-commerce Framework**

Studies from the literature review made clear that ensuring women's effective participation in e-commerce requires a multiplicity of simultaneous favourable conditions ranging from the existence of sound ICT infrastructure and women's access to and use of ICTs and internet to the availability of payment solutions and logistics and delivery services. The review also showed a strong gender dimension in the high interplay and inter-relationship between various sectors in the economy for the growth of e-commerce. For this reason, a second framework is provided which sets out an integrated, holistic diagnostic approach to analyse the gendered dimension of e-commerce and to support the effective identification of policy measures, recommendations, and actions.

In order to build a more gender-inclusive e-commerce sector, it is essential to enable women in this field to participate to policy-making dialogues. For this purpose, UNCTAD launched the initiative eTrade for Women which aims at enabling women digital entrepreneurs in developing countries to be more prominent contributors to policy processes and become levers to the prosperity of their regions.

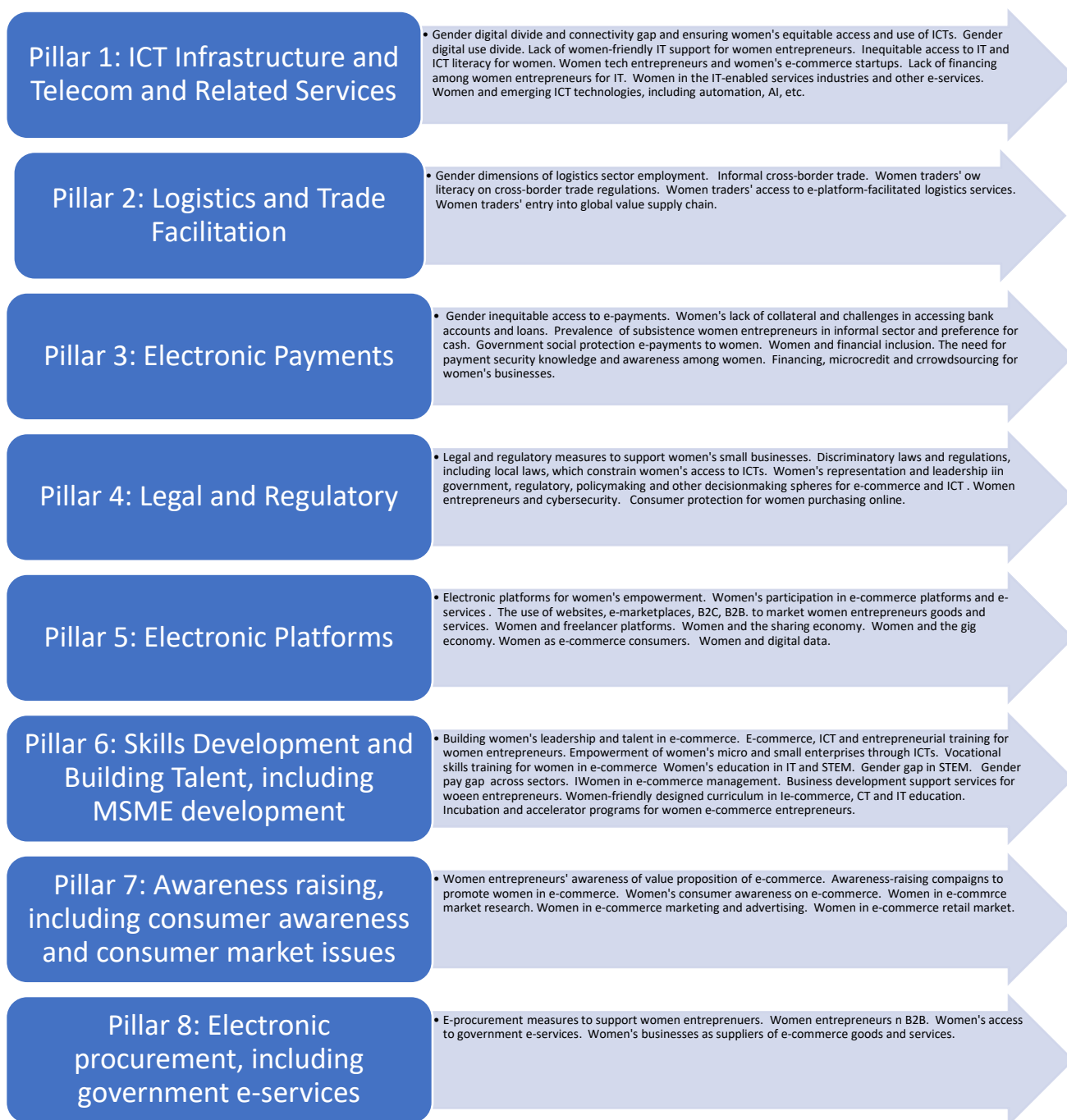
UNCTAD's ICT Policy Review Integrated E-commerce Enabler and Assessment Framework - comprised of eight key pillars in enabling areas for e-commerce – provides a systematic integrated and holistic analytical framework for conducting e-commerce diagnostics on the

current status of e-commerce in a country and is also relevant for capturing gender dimensions of e-commerce (UNCTAD 2015). The Framework's key pillar areas are: (1) ICT infrastructure and telecommunications services and related infrastructure; (2) logistics and trade facilitation; (3) e-payments; (4) legal and regulatory environment; (5) e-platforms; (6) skills development and building talents; (7) awareness raising, including consumer awareness and consumer issues; (8) e-procurement, including e-services. Figure 5 indicates some of the gender dimensions for each of the pillar areas in the Framework.

Relating to the Framework's first pillar, for example, a gender analysis for e-commerce may wish to take into consideration issues relating to ICT infrastructure and telecommunications and related services, including the IT sector. This may include: the gender connectivity gap and ensuring women's equitable access and use of ICTs; the need for women-friendly IT support for women entrepreneurs; the need for IT and ICT literacy for women; ensuring women's representation as tech entrepreneurs; the need to modernize women entrepreneurs' IT back office processes, to name a few.

The Framework also helps to highlight, raise clarity and elucidate linkages among and between sectors in the e-commerce ecosystem. The Framework's Pillar 2 on logistics and trade facilitation and Pillar 7 on consumer market issues, for example, serve to help highlight and explore interlinkages such as those described in the case study "E-commerce substitutes paid market time for household shopping time" which provided empirical evidence of the correlation between women's online consumer behavior and the generation of jobs in the logistics sector.

**Figure 5: Gender Dimensions of the UNCTAD ICTPR Integrated Enabler and Assessment E-commerce Framework**



Source: Adapted from UNCTAD 2015, 2017

## 5. Conclusion: Challenges for women in digital transformation

We have so far examined how digital technologies offer opportunities for women and identified several mechanisms through which technologies empower women entrepreneurs for trade, help women as workers, and benefit female consumers. This includes reducing the cost of

trade and barriers to entry for women entrepreneurs, opening new opportunities to trade in services, facilitating women's access to training, knowledge and finance, etc.

Yet technology is not the silver bullet in resolving all the gender gaps in trade. The benefits of digital technologies do not automatically accrue to women without well-designed and specifically targeted policies. For this reason, two new frameworks have been provided in this paper aimed at contributing to the body of analytical tools and frameworks available to the development community and gender practitioners to support strong gender analysis on e-commerce and the formulation of effective policy measures, recommendations and strategies to leverage e-commerce to close the gender gap in trade.

Effective measures are needed to address several persisting challenges faced by women in the digital economy. Some of these reflect to a large extent some carryover from challenges pre-dating the digital economy, for example in women's inequitable access to key resources in developing countries. The first persisting challenge to reap the benefits of digital technology is the continuing gap in access to digital infrastructure and digital technologies both across countries and between genders. Developing countries, especially least-developed countries (LDCs), lag behind in all indicators of ICT development but especially so in access to broadband Internet and mobile access. The disadvantages in terms of internet access are magnified by other obstacles, including low download and upload speeds and relatively expensive broadband services compared to income levels in developing countries. These factors, in turn, make consumers in these countries less likely to use the internet for economic purposes (UNCTAD, 2017).

Similar divides exist within countries, particularly between men and women. Recent estimates by the Global System for Mobile Communications (GSMA) reveal that 184 million fewer women own mobile phones in low- and middle-income countries compared to men. Women are on average 10% less likely to own a mobile phone than men, in part due to costs and gendered social norms (GSMA, 2018; Uruquieta and Alwang, 2012). Even if women own mobile phones, there is a significant gender gap in usage, particularly for more transformational services, such as mobile internet. Over 1.2 billion women in low- and middle-income countries do not use mobile internet. Women are, on average, 26% less likely to use mobile internet than men (GSMA, 2018).

Even in those countries where progress has been made in women's access to ICTs and e-commerce tools, for example mobile phones and internet, merely possessing this access is not enough, as many women continue to lack the ability to make effective use of these ICTs and tools. Further efforts are needed to eliminate this "gender digital use divide".

Secondly, discrimination linked to gender stereotypes still presents a challenge for women to flourish economically and socially. Though online platforms could reduce the gender-based discrimination, they do not eliminate gender bias. Kricheli-Katz and Regev (2016) found that women sellers on eBay receive on average about 80 cents for every dollar a man receives when selling the identical new product and 97 cents when selling the same used product, even though women receive higher reviews. Although eBay does not reveal the gender of its users in online transactions, it appears that the price differences can still be attributed to the ability of buyers to discern the gender of the seller, though more study is needed to clarify the underlying dynamics. Another study shows that digitization could even worsen the discrimination against women (Malmstrom and Wincent 2018). In particular, it shows that bankers' analysis of a borrower's creditworthiness had a greater gender bias against women when the bankers made their loan decisions only based on data and papers than when the bankers met the borrower (Malmstrom and Wincent 2018).

Another imminent challenge is the gap in education and skills needed for women to benefit from the technological advancements. For example, numeracy task inputs are highly correlated with technological change in the digital age (Lindley, 2012). Graduates in fields which provide useful numerical skills often see productivities increase, such as physical science, mathematics, computer science, engineering, economics and business degrees. These fields typically have fewer female graduates (Lindley, 2012; Akerman et al., 2015). Enhancing women's higher levels of education in Science, Technology, Engineering and Mathematics (STEM) are often of crucial importance for the decision to set up a business in such sectors.

Similarly, in developing countries, women face constraints in making the most of technological change due to low levels of language and technical literacy (Geldof, 2011; GSMA, 2018; Wyche and Steinfeld, 2015). A study of Ugandan farmers in the Kamuli District find that approximately 62% of men and 32% of women use the calculator function of the mobile phone to calculate proper market prices. Not understanding how to use the calculator function was the main reason, given by 40% of the women surveyed compared to 13% of men (Martin

and Abbott, 2011). Another study by Scott, McKemyey, and Batchelor (2004) reveals that many women in rural Uganda were not using mobile phones because of the cost of making a phone call and their lack of knowledge of how to use the device.

However, the underlying challenges that prevent women to benefit from the technological change are structural issues due to cultural and social norms. Gender and racial inequality may thus be exacerbated by automation, as women and some ethnic minority groups are more likely to work in the lower-skilled jobs that are susceptible to automation (IPPR, 2018). While digital technologies are playing an important role in empowering women socially and economically by creating new employment and entrepreneurial opportunities, there are also indications that, unless mitigating measures are undertaken, some of the new forms of emerging technologies such as artificial intelligence and automation can exacerbate existing gender inequalities by replacing low- and medium-skilled jobs held by women and complementing male-specific skills. Measures to ensure that the gender digital divide does not leave women behind with the advent of these new technologies are necessary to ensure progress is made in closing the gender gap in the future.

Lastly, the lack of sex-disaggregated data presents a big challenge. Not being able to measure the gendered impact of technological change makes it difficult to design good policies to help all the stakeholders. Measures to ensure the existence of sex-disaggregated data are needed for strong evidence-based policymaking in gender, trade and technology and to reap the full benefits of ICTs and e-commerce for women entrepreneurs, works and consumers.

## **5. ANNEX**

### **Case Study 2: Gender analysis of China's Alibaba e-marketplace**

This case study explores women's entrepreneurial activities enabled by e-commerce platforms. It is based on gender-disaggregated statistics of Alibaba group, the largest retail commerce platform in the world, based in China. The Group includes several online platforms for e-commerce transactions, among which Taobao.com and Tmall.com focus on Business-to-Consumer (B2C) commerce and Alibaba.com focuses on Business-to-Business (B2B) transactions. Alibaba has also developed microcredit platform Ant Financial that provides loans to small businesses. To open an account as an online shop owner, users need to register identity information including gender and date of birth. This information has made it possible to obtain gender-disaggregated data on small firms.

Some preliminary analysis on women-led enterprises on Alibaba reveals that (1) the share of women-led enterprises is higher on e-commerce platforms compared with offline businesses, (2) women-led enterprises are on average smaller in size compared with men-led firms, however, the average sales of women-led firms are higher than men-led firms among the larger firms online, (3) women entrepreneurs are more successful in highly differentiated product sectors including cosmetics, clothing, grocery and baby products, etc. and (4) women entrepreneurs are less likely to borrow through microloan but they are more likely to repay.

Online platforms drastically reduce the entry barrier to start a business and allow small enterprises to access the market. Half of the start-ups registered on Tmall.com, a platform for B2C sales for higher quality products, have less 5,000 RMB as registered capital (\$720) and the average registered capital of a business on Tmall.com is about 210 000 RMB (\$3000). This figure is significantly lower than the average registered capital of a typical Chinese enterprise at 5 million RMB (China State Administration for Industry and Commerce, 2015). As a result of the lower entry cost, more than 7 million small businesses are registered on Alibaba platforms. Among these enterprises active on the platforms, over half (50.79%) are led by women.

More than 7 million small businesses are registered on Alibaba platforms. Among these enterprises active on the platforms, over half (50.79%) are led by women. Table 1 shows the relative share and the size of women-led firms according to their annual sales revenue. The share of female entrepreneurs is higher among small- and micro-size firms and relatively lower among larger firms. However, the average revenue of women-led firms displays a reverse trend: women-led firms have higher average sales among large firms, but lower average sales revenue among smaller firms. The reason behind this trend may be due to the fact that women are more likely to open an online shop as a part-time job, which prevents them from scaling up the businesses, although more evidence is needed.

**Table 1 – The share of women-led firms in number and revenue**

<b>Firm size (Average annual sales in RMB)</b>	<b>Percentage of women-led firms among all firms</b>	<b>Average sales revenue per year (compared to men-led firms)</b>	<b>Average age of female entrepreneurs</b>	<b>Average age of male entrepreneurs</b>
>5 million RMB	45.86%	9% higher	37.54	35.44
1 million – 5 million RMB	44.25%	5% higher	37.25	35.24

36 000 – 1 million RMB	44.23%	Same as men-led firms	37.13	35.09
<36 000 RMB	51.08%	21% lower	31.72	31.60

Note: online firms are divided into four group according to their annual revenue:

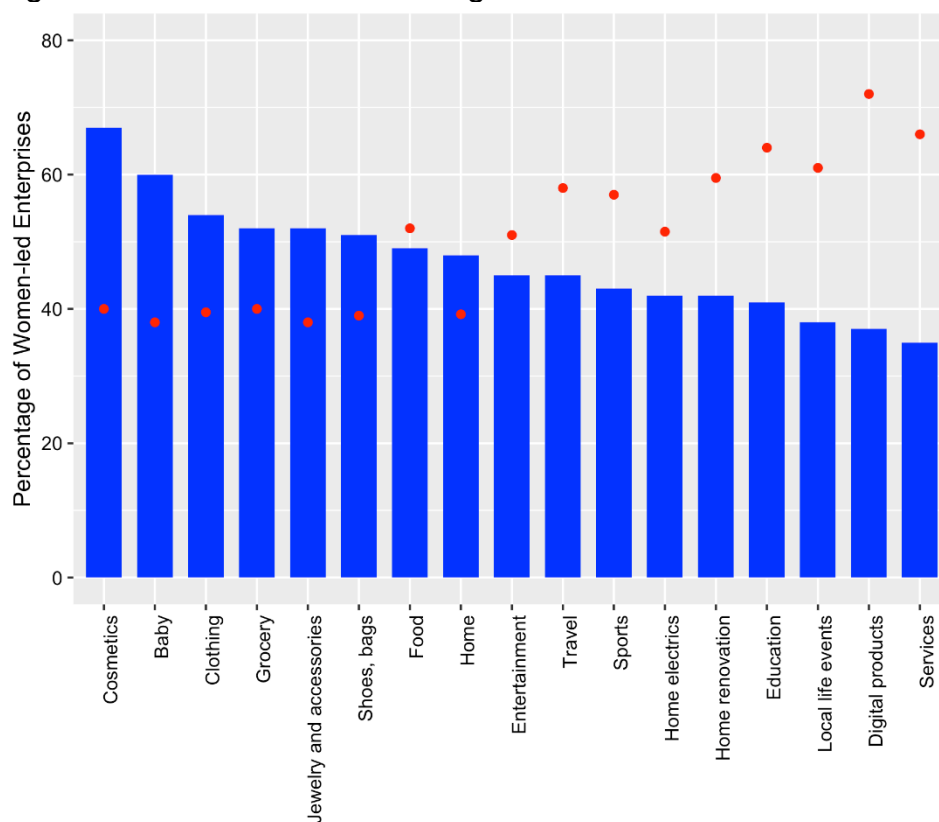
- an online shop with over 5 million RMB in annual revenue is considered a large-sized online firm;
- an online shop with annual revenue between 1 and 5 million RMB is considered a medium-sized firm;
- an online shop with an annual revenue of less than 1 million is considered a small firm, and
- an online shop with less than 360 000 RMB annual sales is considered a micro-sized firm.

Women-led online firms are concentrated in specific sectors and product groups. Figure 6 depicts the share of women-led enterprises in different sectors and product groups: 67% of firms selling cosmetic products are led by a woman, and the share of women-led enterprises is 60% for baby products, 54% for clothing, 52.% for jewelleries and accessories, 52% for groceries and 51% for bags, shoes and suitcases.

Although women-led firms account for half of all firms selling on Alibaba platforms, their average sales are lower than men-led firms. On average, the sales revenue of women-led firms is 18% lower than that of firms led by men. Somewhat surprisingly, in sectors where women are dominant in numbers of firms, women-led enterprises have relatively smaller sales. The medium sales are lower for women-led enterprises in all sectors compared with men-led online shops, although the difference is smaller when it comes to sectors such as digital products and services.



**Figure 6. Share and Average Sales of Women-led Enterprises by Sector**



Source: Alibaba Group 2015

Note: The blue bars represent the share of women-led firms in all Alibaba platforms in each sector. The red dots show the medium sales of women-led firms as compared to medium-sales of men-led firms.

Women entrepreneurs online also tend to be younger. The average age of a female shop owner on Alibaba is 32 years old, whereas women entrepreneurs starting businesses offline in China are on average 48 years old. Close to one-third of all women entrepreneurs starting up a business on Alibaba are between 25-29 years old (33%), followed by women between 18-24 years old (28%).

Financial services such as loans, savings, and money transfers help businesses build assets and increase their income and make them less vulnerable to economic stress. Ant Financial, an affiliate of China’s Alibaba Group, uses Internet-based financing to expand lending to more Chinese micro and small enterprises and women-owned businesses. Its microloan business, Ant Credit, provides microloans to small businesses and individual entrepreneurs over the Internet. It evaluates potential borrowers’ creditworthiness based on transactional and behavioural data, such as timely delivery of products and settling of bills, which is gathered as they do business online. Ant Credit’s clients are mostly small businesses—more than half of which are owned by women—on Alibaba Group’s online marketplaces such as Taobao.com and Tmall.com (IFC, 2017).

Data of Ant Credit indicate that women are less likely to borrow online but they have higher rate of repayment. On average, only 36% of all women-led enterprises operating on Alibaba borrow through Ant Credit. The amount of loans women apply for is on average 6% higher than loan requests filed by men, and the average amount of approved loan for women is slightly higher for women than for men (2%). Remarkably, the ratio of default is significantly lower for women who borrow. The default rate within 90 days is 27% lower for female than for male borrowers, and financial non-performing rate is 28% lower for women than for men.

These evidence echoes findings in studies based in developed countries, where women business owners are found to received be significantly less early-stage capital than men, yet businesses founded by women ultimately deliver higher revenue than those founded by men (BCG, 2018). More in-depth research is needed to investigate the reasons behind the lack of finance for women.

### **Case Study 3: Gender analysis of e-commerce and online trading in South Asia and Southeast Asia**

The study sought to examine the depth of e-commerce engagement in South Asia and South East Asia, and to identify the priority challenges to e-commerce faced by men and women in different types of companies e.g. small vs. large companies; non-exporter vs. exporter, offline sellers vs. online sellers etc. <sup>6</sup>

The study found that the share of women-led firms engaged in e-commerce remains small and reflects the share of women-led firms in the overall economy. The response rate of firms in the survey with male CEOs was approximately 70% higher than that of firms with female CEOs. Analysis of responses from responding traders, however, found that

---

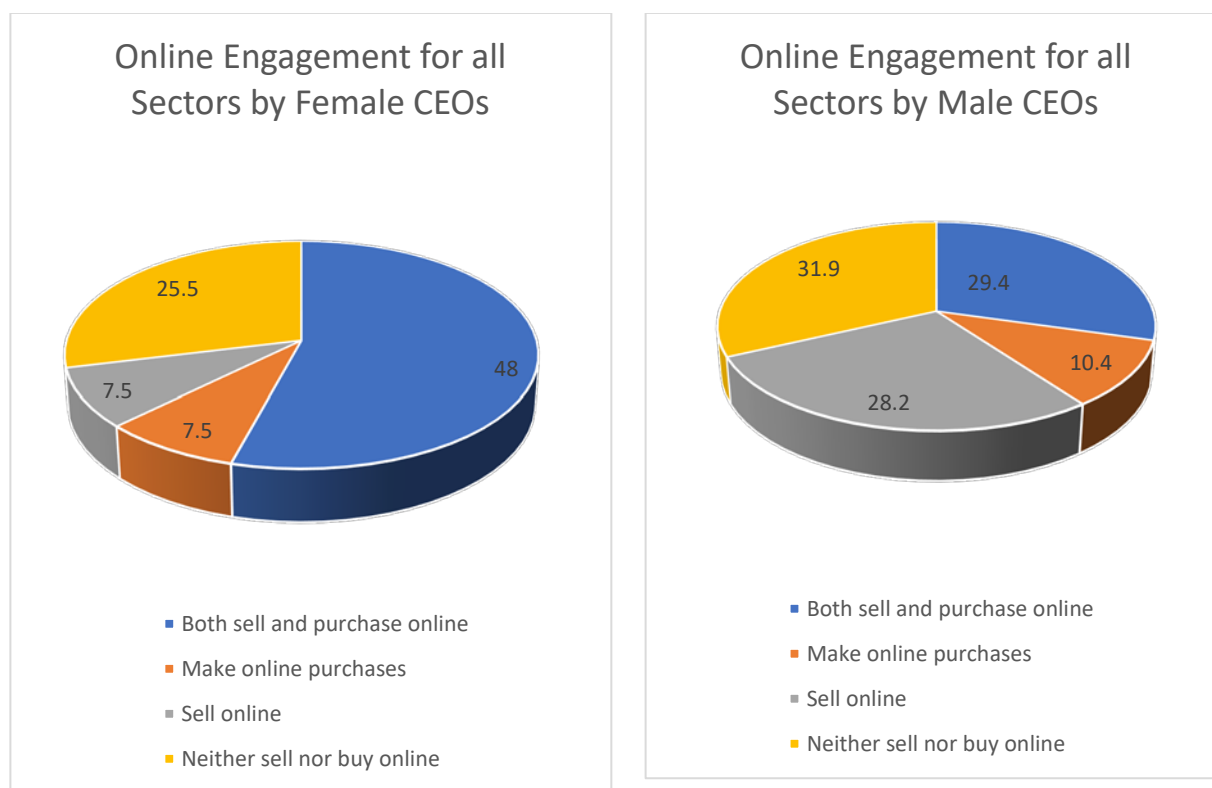
<sup>6</sup> This survey complements the World Bank's efforts on building fundamental ecommerce diagnostic tools such as the Enterprise Surveys and the Doing Business platform which, *inter alia*, provide an overview of the effects of customs procedures and trade regulations. The survey was done in partnership with NexTrade Group to systematically collect data on issues critical to ecommerce players, such as legal liability rules for internet intermediaries and the quality and cost of urban last-mile delivery particularly at a regional level.

A sample of 2,880 merchants and 1,174 ecommerce ecosystems in both South East Asia and South Asia were surveyed. In Southeast Asia, the survey was run in March-May 2018 and covered 1,192 merchants in nine major sectors, and 635 ecommerce ecosystem firms (such as ecommerce and payment platforms and logistics, financial services, IT services firms) that service merchants across five economies (Indonesia, Malaysia, Myanmar, Thailand, and Vietnam). In South Asia, the survey was run in March-May 2018 and covered 1,688 merchants in nine major sectors, and 539 ecommerce ecosystem firms (such as ecommerce and payment platforms and logistics, financial services, IT services firms) that service merchants across seven economies (Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka) (Suominen, 2018).

there were no meaningful differences between women and male-led firms in terms of their e-commerce performance and that women-led firms face the same regulatory barriers as their male equivalents.

Data from responding firms furthermore showed that firms with female CEOs were 18.6 percentage points more active than their male counterparts in two-way trade i.e. both selling and purchasing online (see Figure 7). Aggregating the two-way trade and those who sell online, the female/male distribution was relatively the same i.e. 55.5% and 57.6%.

**Figure 7: Online engagement for all sectors by firm CEO**



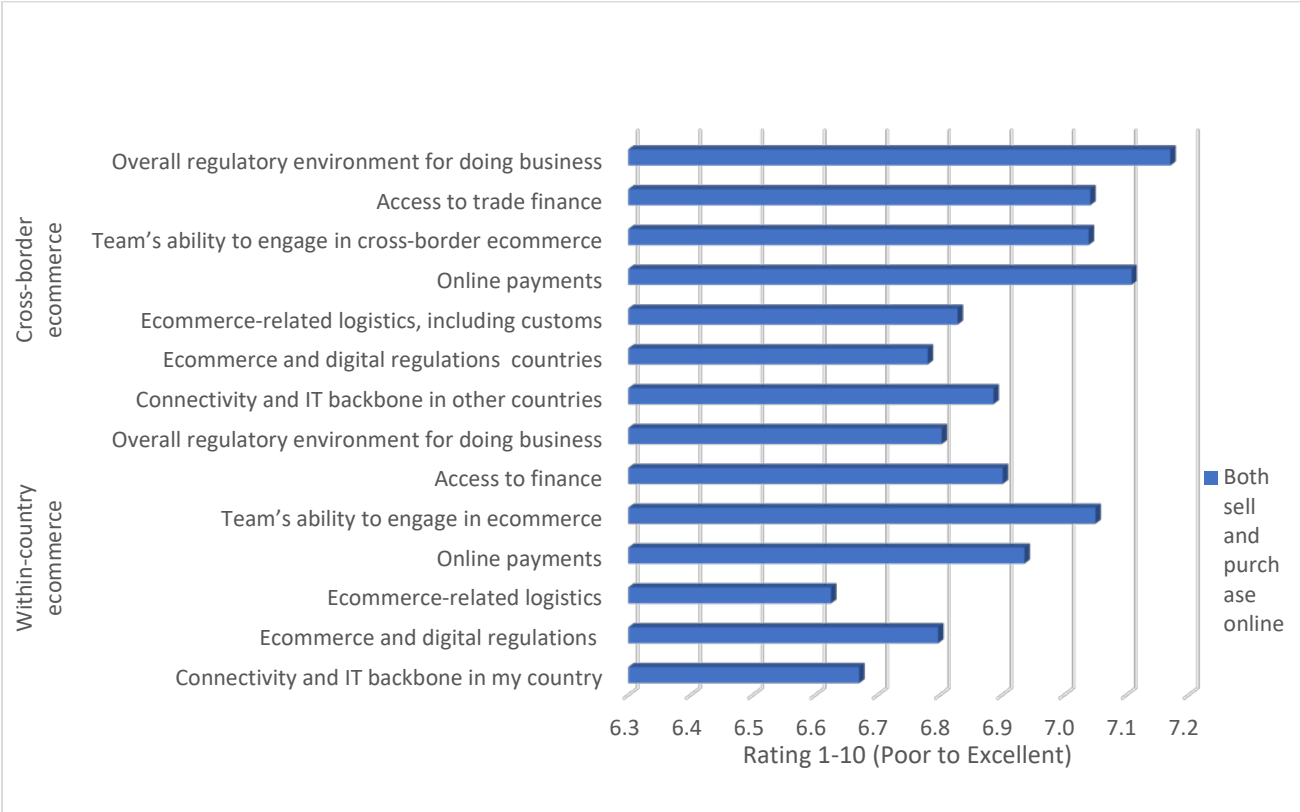
Source: Author’s calculations based on survey data produced by the World Bank in partnership with NexTrade

The analysis further found that gender coupled with whether the survey respondent was a firm owner or a CEO was a deciding factor in whether the firms tended to engage in e-commerce. Firms in both South Asia and South East Asia that had female survey respondents reported that they were more engaged in e-commerce as both buyers and sellers online. In South Asia, the likelihood for this increases for firms with female owners/CEOs. Additionally, the analysis also revealed that male survey respondents and firms with male CEOs are more likely to be neither buyers nor sellers online, particularly in South Asia. Firms with male CEOs in South Asia tended to sell online whereas firms with a male owner had a higher likelihood

of being an online buyer. In South East Asia, male survey respondents were more likely to be sellers online than their female counterparts.

Key impediments reported by respondents as preventing merchants from engaging in e-commerce within the country and across the border were: a poor regulatory environment for doing business, minimal access to trade finance, low technical capacity to engage in ecommerce, lack of access to online payment mechanisms, difficulties in ecommerce-related logistics, lack of/unclear digital regulations and a poor degree of connectivity and IT infrastructure. Merchants in South Asia who both sell and purchase online (Figure 8) tended to rate the overall regulatory environment for doing business as the largest impediment to doing cross-border ecommerce (7.17/10) and regulations on e-commerce and digital services (6.78/10) as the least constraint. With regards to buying and selling online, the highest impediment reported was team’s ability to engage in e-commerce (7.04/10) and the least impediment reported was ecommerce-related logistics (6.62/10).

**Figure 8: Impediments to ecommerce by merchants who both sell and purchase online in South Asia**



Source: Source: Author's calculations based on survey data produced by the World Bank in partnership with NexTrade

The data showed that firms with female CEOs generally had a more optimistic view of the existing impediments to ecommerce trade within the country and across the border (Figure 9). On average, they rated the existing impediments at 7.65/10 whereas their male counterparts rated them at 6.64/10. Taking into account variables such as firm size, the CEO's gender, and the firm's past history of export activity, information from responding firms indicated that there tend to be minor differences in the experiences of firms with male and female CEOs among small firms that export and engage in e-commerce. However, data did show that within the country, small firms (under 50 employees) with female CEOs tended to suffer more from inefficiencies in IT connectivity and infrastructure and digital regulations. For cross-border e-commerce, medium firms (51-500 employees) with female CEOs reported gaps in connectivity and IT infrastructure, e-commerce related logistics, online payments and shortages in the team's capacity to engage in e-commerce as the major constraints.

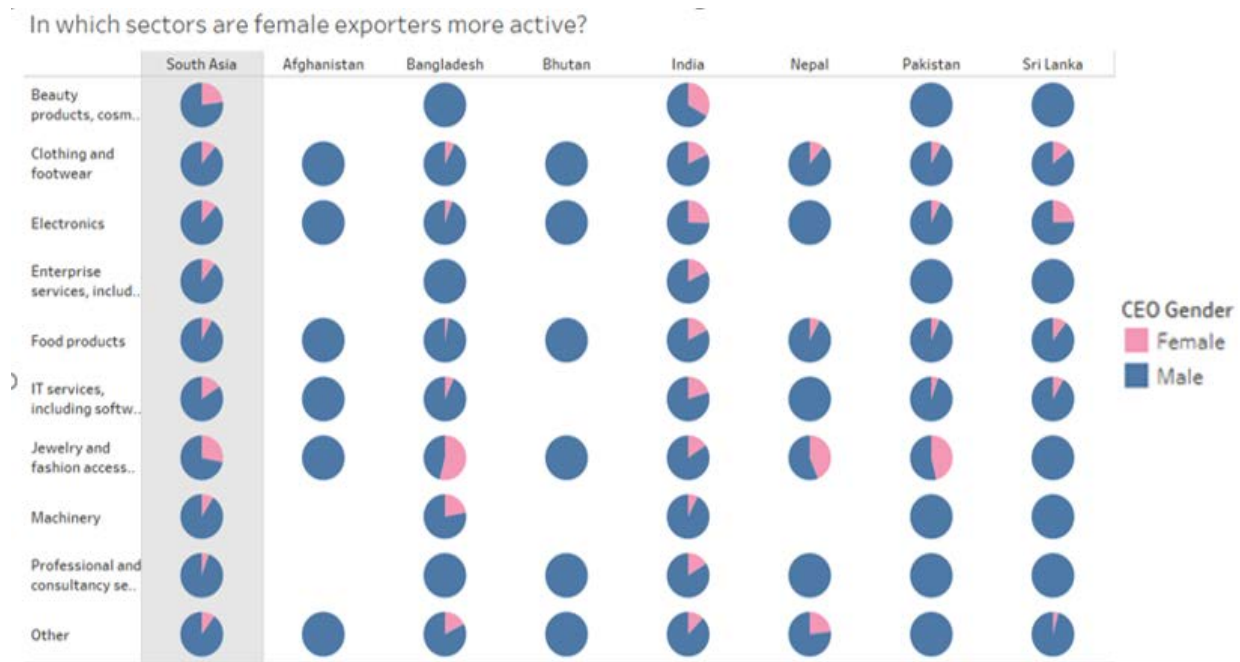
**Figure 9: Impediments to doing ecommerce by gender of firm CEO in South Asia**



Source: Author's calculations based on survey data produced by the World Bank in partnership with NexTrade

The analysis found that there exist differences in the types of exporting sectors that men and women are engaged in. By analyzing the types of sectors that female exporters are most active in, it is shown that, for example, in Bangladesh in South Asia, female-led exporting firms were most engaged in exports relating to 'jewelry and fashion accessories' as shown in Figure 10 below. Other exporting countries include China, India, Japan, Korea, Indonesia, Malaysia, Thailand, Vietnam, Singapore, Pakistan and 'other Asia'.

**Figure 10: Sectors of Exporting Firms by CEO Gender**



Source: World Bank Group

Female-led firms' inclination to export more was evident in data reporting a 4.5-6% higher amount of export sales over total sales by these firms in 2016-17 than firms of their male counterparts. Additionally, firms with female CEOs in South Asia reported that they were 11% more likely to export to foreign markets in 2016-17 than firms with male CEOs.

In summary, the study found that on average, interviewed firms with female CEOs are 18.6 percentage points more active than their male counterparts in selling and purchasing online. Additionally, on average, interviewed firms with female CEOs reported that the impediments to engaging in e-commerce were not as significant for them, as they were for men.

Small, medium and large firms engaged in both selling and buying online have a higher tendency to export than those firms that neither buy nor sell online. Notwithstanding the numerous impediments to engaging in ecommerce, female-led firms (CEOs) have a tendency to export more. For small firms that export, there are minor differences between the impediments faced by firms with either gender of CEO.

However, given the small sample size of female respondents/ firms with female CEOs, it is difficult to make representative inferences. Recognizing that both men and women face the same impediments to engaging in ecommerce, the main policy message would be for governments to address the regulatory challenges which include, inter alia, customs procedures for e-commerce in both imports and exports, logistics costs and digital regulations.

## References:

- Airbnb. (2017). Women Hosts and Airbnb: Building a Global Community
- Aker, J. C., Ghosh, I., Burrell, J. (2016). The promise (and pitfalls) of ICT for agriculture initiatives, *Agricultural Economics*, Vol. 47, 35-48.
- Aker, J. C., & Mbiti, I. M. (2010). Mobile phones and economic development in Africa. *Journal of Economic Perspectives*, 24(3), 207-32.
- Aker, J. C., Boumniel, R., McClelland, A., & Tierney, N. (2016). Payment mechanisms and antipoverty programs: Evidence from a mobile money cash transfer experiment in Niger. *Economic Development and Cultural Change*, 65(1), 1-37.
- Akerman, A., Gaarder, I., Mogstad, M. (2015). The skill complementarity of broadband internet, *Quarterly Journal of Economics*, Vol. 130, No. 4, 1781-1824.
- Alibaba Group (2017). Annual Report. Form 20-F 2018.
- Aterido, R., Beck, T., Iacovone, L. (2013). Access to finance in Sub-Saharan Africa: Is there a gender gap?, *World Development*, Vol. 47, 102-120.
- Autor, D. H. (2015). Why are there still so many jobs? The history and future of workplace automation, *Journal of Economic Perspectives*, Vol. 29, No. 3, 3-30.
- Ba, S., Pavlou, P. A. (2002). Evidence of the effect of trust building technology in electronic markets: Price premiums and buyer behavior, *MIS Quarterly*, Vol. 26, No. 3, 243-268.
- Barasinska, N., & Schäfer, D. (2014). Is crowdfunding different? Evidence on the relation between gender and funding success from a German peer-to-peer lending platform. *German Economic Review*, 15(4), 436-452.
- Beck, T., Behr, P., Madestam, A. (2011). Sex and credit: Is there a gender bias in microfinance?, European Banking Center Discussion Paper No. 2011-027.
- Beck, T., Demirgüç-Kunt, A., Levine, R. (2007). Finance, inequality, and the poor, *Journal of Economic Growth*, 12, 27-49.
- Bernard, A. B., Jensen, J. B., Redding, S. J., & Schott, P. K. (2007). Firms in international trade. *Journal of Economic perspectives*, 21(3), 105-130.
- Bessen, J. (2015). Toil and technology, *Finance and Development*, Vol. 52, No.1.
- Black, S. E., Spitz-Oener, A. (2010). Explaining women's success: Technological change and the skill content of women's work, *Review of Economics and Statistics*, Vol. 92, No. 1, 187-194.
- Bøler, E. A., Javorcik, B., & Ulltveit-Moe, K. H. (2018). Working across time zones: Exporters and the gender wage gap. *Journal of International Economics*, 111, 122-133.
- Boston Consulting Group (BCG). (2018). Why women-owned startups are a better bet. Retrieved from <https://www.bcg.com/en-ch/publications/2018/why-women-owned-startups-are-better-bet.aspx>



Brussevich M., Dabla-Norris, E., Kamunge, C., Karnane P., Khalid S., Kochhar K. (2018). Gender, technology, and the future of work. IMF Staff Discussion Note.

Burinskiene, A., Burinskas, A. (2012). Consumer demand: E-commerce or traditional technologies, *Economics and Management*, Vol. 17, No. 3.

China State Administration for Industry and Commerce. (2015). National market subject development report.

Chester, A., Glass, C. A. (2006). Online counselling: a descriptive analysis of therapy services on the Internet, *British Journal of Guidance & Counselling*, Vol. 34, No. 2, 145-160.

Cortes, G.M., Jaimovich, N., Siu, H.E. (2018). The 'end of men' and rise of women in the high-skilled labor market, NBER Working Paper, No. 24274.

Deming, D. (2017). The growing importance of social skills in the labor market, *Quarterly Journal of Economics*, Vol. 132, No. 4, 1593-1640.

DiCaprio, A., Suominen, K. (2015). Aid for Trade in Asia and the Pacific: Thinking Forward about Trade Costs and the Digital Economy. Report for the Asian Development Bank for the Global Aid for Trade Review, July. <https://www.adb.org/sites/default/files/publication/167344/aft-report-2015.pdf>.

Etsy (2017). Crafting the future of work: the big impact of microbusinesses. Retrieved from [https://extfiles.etsy.com/advocacy/Etsy\\_US\\_2017\\_SellerCensus.pdf](https://extfiles.etsy.com/advocacy/Etsy_US_2017_SellerCensus.pdf)

Ferrantino, M.J. and Koten E., (2019), "How Might Supply 4.0 Affect Global Value Chains?", chapter in World Bank GVC Development Report II.

Geldof, M. (2011). Earphones are not for women: Gendered ICT use among youths in Ethiopia and Malawi. *Information Technologies and International Development*, Vol. 7, No. 4, 69–80.

Goldin, C. (2014). A grand gender convergence: Its last chapter. *American Economic Review*, 104(4), 1091-1119.

Goos M., Manning A., Salomons A. (2014). Explaining job polarization: Routine-biased technological change and offshoring, *American Economic Review*, Vol. 104, 2509–2526.

GSM Association (2018). Connected women - The mobile gender gap report, <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/04/GSMA-The-Mobile-Gender-Gap-Report-2018-32pp-WEbV7.pdf>

International Finance Corporation. (2014). Women-owned SMEs: A Business Opportunity for Financial Institutions. A Market And Credit Gap Assessment and IFC's Portfolio Gender Baseline.

International Finance Corporation. (2017). Using the Internet to Expand Microfinance in China.

International Labour Office, (2016). Women's Entrepreneurship Development Assessment : Egypt. Access at: [https://www.ilo.org/wcmsp5/groups/public/---ed\\_emp/---emp\\_ent/---ifp\\_seed/documents/publication/wcms\\_551168.pdf](https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/---ifp_seed/documents/publication/wcms_551168.pdf)

Institute for Public Policy Research (IPPR) (2018). Managing automation: Employment, inequality and ethics in the digital age.

ILO (2014). Global Employment Trends 2014. Geneva: International Labour Organization.

International Telecommunications Union (ITU) (2016). *How can we close the digital gender gap?*, Geneva: ITU.

Johnson, S. (2004). Gender norms in financial markets: Evidence from Kenya, *World Development*, Vol. 32, 1355-1374.

Juhn, C., Ujhelyi, G., & Villegas-Sanchez, C. (2013). Trade liberalization and gender inequality. *American Economic Review*, 103(3), 269-73.

Kim, K-J., Bonk, C.J. (2006). The future of online teaching and learning in higher education: The survey says..., *Educause Quarterly*, No. 4.

Klapper, L., Parker, S. (2011). Gender and the business environment for new firm creation, *World Bank Research Observer*, Vol. 26, 237-257.

Kricheli-Katz, T., & Regev, T. (2016). How many cents on the dollar? Women and men in product markets. *Science advances*, 2(2), e1500599.

Krieger-Boden, C., Sorgner, A. (2018). Labor market opportunities for women in the digital age, *Economics: The Open-Access, Open-Assessment E-Journal*, Vol.12, No. 28, 1-8.

Lipowiecka, J., Kiriti-Nganga, T. (2016). The gender dimensions of services. Geneva: International Centre for Trade and Sustainable Development (ICTSD).

Lusardi, A., Tufano, P. (2009). Debt literacy, financial experiences, and overindebtedness. NBER Working Paper 14808.

Malmstrom, M., Wincent, J. (2018). The digitization of banks disproportionately hurts women entrepreneurs, *Harvard Business Review*.

Mandel, Michael (2017), "How Ecommerce Creates Jobs and Reduces Income Inequality," Washington, DC: Progressive Policy Institute, September.

Marom, D., Robb, A., & Sade, O. (2016). Gender dynamics in crowdfunding (Kickstarter): Evidence on entrepreneurs, investors, deals and taste-based discrimination.

Morton, F. S., Zettelmeyer, F., Silva-Risso, J. (2003). Consumer Information and Discrimination: Does the Internet Affect the Pricing of New Cars to Women and Minorities?, *Quantitative Marketing and Economics*, Vol. 1, No. 1, 65–92.

Muravyev, A., Schäfer, D., Talavera, O. (2009). Entrepreneurs' gender and financial constraints: Evidence from international data, *Journal of Comparative Economics*, Vol. 37, 270-286.

PwC (2018) Will robots really steal our jobs? An international analysis of the potential long term impact of automation.

Resnick, P., Zeckhauser, R. (2002). Trust among strangers in Internet transactions: Empirical analysis of e-Bay's reputation system, *The Economics of the Internet and E-Commerce*, Vol. 11, 127-157.

Rezabakhsh, B., Bornemann, D., Hansen, U., Schrader, U. (2006). Consumer Power: A Comparison of the Old Economy and the Internet Economy, *Journal of Consumer Policy*, Vol. 29, No. 1, 3–36.

Richardson, P., Howarth, R., Finnegan, G. (2004). The challenges of growing small businesses: Insights from women entrepreneurs in Africa, ILO Geneva, SEED WP No. 47.

Scott, N., McKemyey, K., & Batchelor, S. (2004). The use of telephones amongst the poor in Africa: Some gender implications. *Gender Technology and Development*, 8(2), 185–207.

Suominen, K. (2018). Women-led firms on the web: Challenges and solutions. Geneva: International Centre for Trade and Sustainable Development (ICTSD).

Suri, T., Jack, W. (2016). The long-run poverty and gender impacts of mobile money, *Science*, Vol. 354, No. 6317, 1288-1292.

Törenli, L. (2010). The potential of ICT to generate 'solidaristic' practices among women home-based workers in Turkey, *New Technology, Work and Employment*, Vol. 25, No. 1, 49-62.

United Nations Conference on Trade and Development (UNCTAD) (2014). Empowering Women Entrepreneurs through Information and Communications Technologies: A Practical Guide, Geneva: UNCTAD

United Nations Conference on Trade and Development (UNCTAD) (2015). Information Economy Report 2015: Unlocking the Potential of E-commerce in Developing Countries, New York and Geneva: UNCTAD

United Nations Conference on Trade and Development (UNCTAD) (2014). Trade and gender: Unfolding the links, Geneva: UNCTAD

United Nations Conference on Trade and Development (UNCTAD) (2017). ICT Policy Review: National E-commerce Strategy for Egypt, Geneva: UNCTAD

United Nations Conference on Trade and Development (UNCTAD) (2017). UNCTAD Trade and Gender Toolbox, Geneva: UNCTAD

United Nations Conference on Trade and Development (UNCTAD) (2017). Maximizing the development gains from e-commerce and the digital economy: Note by the Secretariat for the First Session of the Inter-governmental Group of Experts on E-commerce and the Digital Economy, Geneva: UNCTAD

US Department of Education, 2015, access at: <https://tech.ed.gov/files/2015/12/NETP16.pdf>

World Bank. Enterprise Surveys (<http://www.enterprisesurveys.org>)

World Bank Group (2015). In Ethiopia, female entrepreneurs get a chance to pursue their dreams. Retrieved from:  
<http://www.worldbank.org/en/news/feature/2015/11/16/in-ethiopia-female-entrepreneurs-get-a-chance-to-pursue-their-dreams>

World Trade Organization (WTO) (2018). *World Trade Report 2018. The future of world trade: How digital technologies are transforming global commerce*, Geneva: WTO.

Wyche, S., Steinfield, C. (2016). Why don't farmers use cell phones to access market prices? Technology affordances and barriers to market information services adoption in rural Kenya, *Information Technology for Development*, Vol. 22, No. 2, 320-333.

Zarrilli, Simonetta, article "The Case for Mainstreaming Gender in Trade Policy". *Bridges Africa*, No.6, Volume 4, 2017.