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IDEA 4 TRANSFORMATION

The Rise of Business Services and Structural Transformation in India, Kenya and South Africa: Role of Female Labour Supply[a]

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The developing economies of India, Kenya and South Africa have witnessed a sharp rise in the value-added share of business services sector over the past decades, which has contributed to economy-wide productivity growth both by drawing labor from low-productivity sectors and by experiencing rapid productivity improvements. However, shortages of adequately skilled workforce in all the three economies act as a major constraint to their sustainable growth. These gaps stem from the fact that the average ICT (Information & Communication Technology) task intensity of jobs in business services is much higher through the intensive use of digital technologies, which have made these services an unlikely destination for low-skilled workers. These barriers are even more acute for women, where a significant proportion of women in these economies are engaged in the low-productive and low-paying agricultural and informal sectors that also grow at slower rates. In light of this, we demonstrate that there is room for supply-side policy intervention to promote inclusive growth and development in these economies by addressing the digital gender divide friction that acts as a constraint to the mobility of female labour force towards business services sector. Accordingly, we identify and draw relevance to suitable channels of policy intervention that address the issue of skill gaps and mismatches amongst the marginalized women workforce, which facilitate in targeting not only the falling female labour force participation and the skilling paradox in ICT-intensive sectors, but also enable the inclusivity in structural transformation process towards the services-led growth in these countries.

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1 Introduction

One of the central insights of development economics literature is that structural change is a fundamental feature of economic growth (Kuznets, 1973), where the transition to modern economic growth necessitates a structural transformation of the economy among sectors, from agriculture to manufacturing and then subsequently to services. As countries diversify away from traditional economic activities, labour and other resources move from agriculture into modern economic activities resulting in a rise in overall productivity and per capita incomes. Stylized facts of the pattern of structural change over the course of development indicate that as countries grow, the share of economic activity in agriculture monotonically decreases, while the share in services monotonically increases. At the same time, the share of manufacturing activity follows an inverted U-shaped trajectory that increases at low levels of per-capita incomes as capital is accumulated and then decreases for higher stages of development (Herrendorf et al, 2014; Duarte and Restuccia, 2010; van Neuss, 2019).

Structural change, defined as the reallocation of labour and output across sectors, features prominently in the debate on growth in India and Sub-Saharan Africa. In particular, the experience of India seems to suggest that the country has been pioneering a stage of development that defies the conventionally hypothesized structural transformation (Krishna et al, 2016a). This is because the Indian economy has been witnessing a services-driven growth since 1990s that follows the unique growth pattern of skipped industrialization, where services share in Gross Value Added (GVA) increased to 54.6 percent in 2010, though it still remains in the category of low-middle income emerging countries (Eichengreen and Gupta, 2011, 2013). In the same way, Sub-saharan Africa has grown rapidly since the year 2000 with its growth rate inching close to 3 percent per annum in per-capita terms (Rodrik, 2016; African Transformation Report, 2014), where a curious feature of this growth is that the region is largely bypassing industrialization as a major driver of growth and jobs (World Bank, 2014). This indicates that structural change in Sub-Saharan Africa has been undergoing a shift in the share of labour employment from agriculture to services, without observing a significant increase in the share of labor force employment in manufacturing. This is substantiated by the fact that agricultural employment share declined from 61.6 to 49.8 percent during 1990 to 2010, while manufacturing employment share fell from 8.9 to 8.3 percent over this period, where workers who were moving out of agriculture and industry were absorbed in market services sectors, whose employment share increased from 12.8 to 23.4 percent in these years (de Vries et al, 2015).

However, Africa exhibits a lot of heterogeneity through varied patterns in cross-country trends in structural change so it is difficult to map the movements in structural transformation from a single, continent-wide perspective (McMillan et al, 2014). So when we consider the disaggregated country-wise analysis of structural change in Africa, we observe that the economies of both Kenya and South Africa have experienced ‘services-led growth’, where services sector in these two countries has speedily expanded since the decade of 2000s. This marked acceleration in services growth can be observed from its share in GVA that rapidly increased to 56 percent for Kenya and 65 percent for South Africa during the 2000s (Africa Sector Database, 2014). So over the last couple of decades, the three economies of India, Kenya and South Africa (abbreviated as IKS henceforth) have primarily been driven by the growth in services sector, whose respective value-added share has already reached the highest amongst all the sectors during the decade of 2000s, while the industry has prematurely stagnated, despite the fact that these countries remain in the category of low to low-middle income economies.

However, what is common in the growth patterns of IKS is that the services growth is primarily propelled by financial and business services. These services have witnessed the highest annual growth rate amongst all the subsectors in each economy over the period of 1970 to 2010: 8.2 percent for India, 5.7 percent for Kenya and 5.9 percent for South Africa (Enache et al, 2016). In addition, the disaggregated data for services subsectors from the India KLEMS[c] (2015) and the Groningen Growth and Development Centre (GGDC)[d] (2014) databases show that the value-added share of business services has sharply increased from 4.8 to 10.3 percent for India, 5.7 to 9.3 percent for Kenya and 9.5 to 16.3 percent for South Africa during 1990-2010.

But the distinguishing feature of IKS is that the sharp rise of business services in these economies is also accompanied by substantial increases in the growth of labor productivity in this subsector, which grew annually by 3.9 percent in India, 4 percent in Kenya and 3.4 percent in South Africa during the period 2000-2010 that has consequently driven much of the service sector productivity growth during these years (Enache et al, 2016; Krishna et al, 2016a). By contrast, labor productivity growth has decelerated in the business services sector of industrialized economies, which increased by 0.63 percent in Japan, -1.69 percent in Singapore, -2.17 percent in South Korea and 1.93 percent in Unites States over the same period (Enache et al, 2016). This not only corroborates the similar trend in structural change in IKS over the given period, but substantial increases in the growth of labor productivity in business services subsector in these economies also runs counter to the evidence on Baumol's disease observed in most developed countries (Jorgenson and Timmer, 2011).

1.1 Large Inter-sectoral Labour Productivity Gaps

In addition to the high rates of *within* sector labour productivity growth in business services sector, the economies of IKS have also witnessed large inter-sectoral labour productivity gaps that is found to be a common feature across many developing countries. For instance, the coefficient of variation of log of sectoral productivity is 0.087 for India, 0.158 for Kenya and 0.074 for South Africa for the year 2005, while for high-income countries, the coefficient is 0.062 for United States, 0.047 for France and 0.064 for Japan (McMillan et al., 2014). Although high degrees of labour productivity gaps across sectors are indicative of allocative inefficiencies, they also provide a potential opportunity to be an important engine of growth because when labor moves from less productive to more productive activities, the economy grows even if there is no productivity growth *within* the sectors, which results in growth-enhancing structural change that can play an important contributor to overall growth process (McMillan and Rodrik, 2011; McMillan et al., 2014).

However, even as IKS have experienced growth-enhancing structural change at economy-wide aggregate level during the decade of 2000s, the reallocation of labour across sectors is tiny and primarily limited to static effects despite the existence of large inter-sectoral productivity gaps. Workers in these economies have moved into industries with above average productivity levels,

[c] KLEMS stand for capital (K), labor (L), energy (E), materials (M), and services (S). The India KLEMS version 2015 provides data on value-added, gross output, intermediate inputs (in both current and constant prices), employment, labor quality, wage share, capital investment and capital services by asset type along with indicators of labor productivity growth and total factor productivity growth. All these data are available for 27 detailed industries comprising the Indian economy over the 1980–2011 period.

[d] GGDC 10-sector database provides a long run, internationally comparable dataset on employment and value added for ten disaggregated sectors in Africa, Asia, and Latin America. Variables covered in the data set are annual series of value added, output deflators, and persons employed for 10 broad sectors that comprise agriculture, mining, utilities, construction, manufacturing, wholesale and retail trade, FIRE industries, transport, government services and other services.

while the dynamic reallocation term is mostly negative when workers move to industries with faster productivity growth (Krishna et al., 2016a; de Vries et al., 2015; McMillan and Rodrik, 2011).

In India, agriculture remains the major employment provider even as its relative share in total output has diminished substantially over time. But this decline in employment share in agriculture is largely compensated by jobs creation in the construction sector, whose share increased to 10.5 percent in 2011, followed by some increases in trade and distribution services, which has mostly contributed to static structural change in India during the 2000s on account of relatively higher productivity levels in construction compared to agriculture (Erumban et al., 2019; Krishna et al., 2016b). Since the expansion of jobs in the construction sector is mainly due to its lower skill requirement compared to services, it explains the large-scale movement of workers from agriculture to construction, where productivity growth has also been consistently negative.

For Kenya and South Africa, they belong to the set of African countries that are characterized by weak structural change component and high *within* sector labour productivity growth. Using the shift-share decomposition analysis, there is a weak negative correlation (with coefficient of −0.246) between the 'within' and 'structural change' components of labor productivity growth at economy-wide level (Diao et al., 2019). But for business services, these countries indicate a weak positive correlation coefficient of 0.695, which implies that this subsector has contributed to economy-wide productivity growth both by drawing labor from lower-productivity sectors and by experiencing rapid productivity improvements so that the growth-enhancing structural change driven by business services in these economies has the scope of raising economic growth in the long run.

1.2 Potential Linkage Effects of Business Services

Considering the employment share of business services in IKS, we find that it barely increased during the 2000s[e] (Krishna et al., 2016b; Enache et al, 2016), despite the sharp rise in their value added share and productivity growth over the given period. This shows that these services have not been able to absorb much of the labour force released from the traditional activities, which has, thereby, also reduced the speed of structural transformation in these countries.

For India, the study by Bhattacharya, Bhandari and Bairagya (2020) indicates that within the services sector, the percentage share of high-skilled employment is found to be the highest in '*financing, real estate and business*', which increased to 57.8 percent in 2011-12. But as business services provide inputs to many other economic activities, they have significant positive spillover effects throughout the economy, which has additionally resulted in above unitary backward and forward linkages with respect to high-skilled employment category. This implies that growth in business services in India create strong high-skilled employment linkage effects both within the sector as well as in other sectors.

In South Africa and Kenya, estimates by the World Bank indicate that 26 and 18.4 percent respectively of all the formal sector employment increase occurred in occupations with high ICT intensity since 2000s because these economies have successfully positioned themselves as hubs for the global business process outsourcing (BPO) sector (World Economic Forum, 2017; Dihel et al., 2011). In South Africa, financial and business services has seen the largest increase in employment share that expanded by 2.4 percentage points between 2010 and 2018 (Asmal et al., 2021). However, in order to raise the long-term benefits of ICT intensive jobs in modern services, it is imperative to focus on enhancing ICT literacy skills that can enable greater flexibility and ease the worker mobility towards these high-productive sectors.

[e] 2.5 percent in India, 1.2 percent in Kenya and 11.3 percent in South Africa

1.3 Dearth of Skilled Workforce

Since business services is a high-skilled services sector, shortages of adequately skilled workforce in IKS act as a major constraint to sustainable growth driven by these services. In view of the fact that the average ICT task intensity of jobs in business services is much higher due to the intensive use of digital technologies, skill gaps are likely to become more binding in these economies as this subsector grows further in the coming years. This is also why these services have become an unlikely destination for low-skilled workers who reallocate among marginal jobs rather than climb the job ladder and persist in high-paying work, which suggests that they face barriers to move towards stable, high-wage work.

In India, although the proportion of workers with tertiary education increased from 2.6 to 10 percent from 1980s to 2000s, the scale and impact of formal post-school training remains modest with less than 3 percent of the workforce undergoing formal skill training, and only about 9 percent acquiring skills through informal modes (Krishna et al., 2016b; Bhandari et al., 2018). In addition, with 92 percent of the workforce being employed in the informal sector, India faces a skilling paradox, where despite the declining opportunities in agriculture and rising potential of jobs in modern services, there aren't enough people with the right skills (Bhandari et al., 2018).

Correspondingly, informal sector employment constitutes nearly 83 percent of total employment in Kenya (ILO, 2021). According to a survey by the World Bank (2018), university graduates in Kenya make up less than 10 percent of the adult population, of whom 10 percent of male graduates and 15 percent of female graduates are unemployed that suggests significant skills mismatches in the labor market, where advanced computer skills was identified as the most significant skill gaps in the current workforce (Sanchez et al., 2018).

In South Africa, although the share of informal economy in total employment is relatively lower at nearly 33 percent (Kiaga and Leung, ILO, 2020), there is a high unemployment rate of 27.1 percent, where the youth unemployment rate increased to 29 percent in 2018 (Asmal et al., 2021). This is intimately connected to persistent weakness in export-oriented manufacturing growth that has deprived the economy of growth opportunities as well as of job creation at the relatively low end of the skill distribution (Rodrik, 2008). Even as there is a surplus of individuals with less than secondary education relative to the skill requirements, projections for South Africa suggest that the challenges in terms of supply of individuals are particularly acute in relation to new jobs in high-skilled occupations in financial and business services (Asmal et al., 2021).

1.4 Barriers to Entry for Women

Considering the large and persistent backlog of low-skilled informal workers in IKS, the share of informality is found to be even higher for women who are predominantly employed in sectors with low wages, high vulnerability and poor working conditions. The share of female informal employment is close to 85 percent in India, where women are primarily involved in transportation, construction and trade (Bhandari et al., 2018). In Kenya, 40 percent of men are formal workers compared to 26 percent of women, while 58 percent of men are informal workers compared to 66 percent of women, who are primarily employed in trade, services and domestic work (Budlender, 2011a). In South Africa, the labour market is more favorable to men because not only is the unemployment rate higher among women at 36.8 percent compared to 32.4 percent amongst men in 2021 (Statistics South Africa, 2021), but 39 percent of employed women and 29 percent of employed men work in the informal sector (Budlender, 2011b).

Furthermore, women are also missing from the workforce in these economies. In India, the female labour force participation (FLFP) is not only extremely low, but has fallen sharply between 2004 and 2011, where a total of 15 million women dropped out of the labour force during this period (NSSO; 2004-05, 2005-06, 2007-08, 2009-10, 2011-12). Also, as younger women in the age cohort 15–19 years pulled out of the labour force to attend educational institutions, fewer women aged 20–24 years joined the workforce, which contributed to a net decline in women's labour force participation, where this loss is greater in rural areas (Bhandari et al., 2018).

By comparison, the FLFP in Kenya and South Africa has remained relatively higher at nearly 49 and 44 percent respectively since 2000s (World Bank Data), although it is lower by international standards. Besides, Kenya faces significant labor market challenges in the forms of unemployment and underemployment, which are more severe for women. According to the Kenya Integrated Household Budget Survey (KIHBS) (2015-16), unemployment rate of the working-age group (15–64 years) was estimated at 5.6 percent for men and 10.6 percent for women, whereas time-related underemployment rate was 20.4 percent for the overall population and 26 percent for women.

In South Africa, even as there is a steady increase in women's share in the working-age population over the period 2004-2014, women's employment mostly remains concentrated in positions that are low paying and have high rates of turnover within the traditional domestic and farming occupations, which implies that improvements in female labour market outcomes are needed to enable women to move towards high-productive sectors (OECD, 2012). These statistics, therefore, reveal that despite the increase in job opportunities in business services sector in IKS since 2000s, the barriers to entry towards high-paying regular jobs in this sector are even more pronounced for women in these countries, where much of the female labor market flows have constituted frequent transition between unemployment, underemployment and low-earning informal jobs.

1.5 Steering Female Workforce towards High-paying Business Services: Role of Digital Technologies

With more women getting absorbed into low-productivity and low-paying sectors that also grow at lower rates than other sectors with structural transformation in IKS, this provides room for policy intervention through imparting digital skills training to the female workforce that is tailored to the skills requirements of the rapidly growing business services. In the economic transformation towards ICT-intensive services, the opportunities for women become restricted due to the existence of *'digital gender divide'*, which is used to refer to gender differences in resources and capabilities to access and effectively utilize ICTs within and between countries, regions, sectors and socio-economic groups (OECD, 2018). This amounts to a persistent gender gap in access and use of digital technologies, digital skills and digital labour market, where these gaps widen on account of non-technological barriers such as inadequate economic resources, lack of training and socio-cultural assumptions about women's roles and place in society and the labour market. Moreover, existing gender gaps in digital inclusion in these economies have spilled over into gender inequalities in not only the labour markets, but also in the financial sector through lower rates of digital financial inclusion of women, which further puts them at a disadvantage in accessing finance.

Considering that digital technologies represent a potential opportunity to overturn the many challenges of gender inequalities, they must be targeted in unleashing their ability in empowering women and girls. This should be channelized through gender-responsive government services that provide medium for increased usage of mobile phones, Internet access and digital payments, which

can facilitate in fostering safe discussion spaces for women, building peer networks and instilling confidence to participate in the labour market. Digital technologies can be leveraged to reduce gender gaps in labour force participation by making work arrangements more flexible, connecting people to work, and generating new opportunities in online work, e-commerce, and the gig economy, which is likely to benefit women in a shift towards non-routine occupations, and away from physical work. The focus on digital alternatives to facilitate access to knowledge, skills training, skills matching and general information that benefit women and girls hold the ability in paving the path of narrowing gender gaps in ICT skills, female labour market participation, wages and entrepreneurship.

In this context, for structural transformation processes to be inclusive in order to benefit women in these countries, supply-side gender-sensitive policy measures hold the potential to reduce structural constraints, improve job search and job matching that can overcome imbalances in the gender composition of wage employment and thereby, reduce discrimination in the labor market. This is expected to not only raise the FLFP and narrow the digital gender gap, but would also create a cascading effect on human capital formulation through inter-generational transmissions at the household level.

The focus of this paper is to demonstrate the existence of digital gender gap in the three economies of IKS that act as a constraint to the mobility of female labour force towards business services sector. Accordingly, we identify and draw relevance to the suitable channels of policy intervention that address the issue of skill gaps and mismatches amongst the marginalized women workforce, which facilitate in targeting not only the falling FLFP and the skilling paradox in ICT-intensive sectors, but also enable the inclusivity in structural transformation process towards services-led growth in these countries. In Section 2, we provide the country-wise background and specificities in terms of gender-based digital reach and the current policy context in IKS. Section 3 brings to light the policy problem and the common policy gap observed across the three economies with regard to digital gender divide. Section 4 identifies and analyzes the key channels of policy intervention through data collection, digital literacy, digital finance and labour market opportunities. Section 5 concludes.

2 Country-wise Synopses and Policy Setting

2.1 India

The persistent decline of FLFP in India since the mid-2000s, particularly when the economy was experiencing unprecedented economic growth during this period, is a puzzling phenomenon. Given that labour market participation for women in India is just 22.8 percent compared to 56.8 percent for men (Periodic Labour Force Survey, 2019-20), this indicates that gender gap in employment has significant macroeconomic implications as there is an untapped opportunity for growth in light of the rising potential of jobs in modern services. Analysis by Organization for Economic Co-operation and Development (OECD) shows that in India, raising the participation of women in the labour market through pro-women policies can boost the growth rate by about 2 percentage points over time (Sorsa et al., 2015).

The underlying reasons behind the low FLFP include mechanization in agriculture, fall in exports demand for textile and textile products that have a concentration of female workers and increase in educational enrolment for girls especially for the age cohort 15–24 years (Mehrotra and Sinha, 2017). Also, the decline in labour force participation rate (LFPR) is the highest in the age cohort 30–34 years followed by 35–39 years, which indicates the involvement of women in domestic duties and

unpaid care work. In addition, not only is the FLFP low in India, but the proportion of employed women in high-productive and high-income jobs is also low, where the distribution of female employment is largely concentrated in the agricultural and allied sectors (66.7 percent in 2009), and in informal manufacturing. Within services, women are mainly involved in low productivity sectors, while only 2.2 percent of employed women work in high-productivity services, which suggest that Indian women face larger costs of working in the high-productive services sector that are also ICT-intensive (Serrano-Quintero, 2021). Moreover, even as young women are permitted to attend educational institutions, they do not enter (or are not allowed to enter) the labour force once they attain marriageable age, which might indicate either the non-availability of adequate opportunities (Chatterjee et al. 2015) or the greater involvement of women in unpaid household care work and children's education or caste and cultural norms (Eswaran et al., 2013; Choudhuri, 2021).

In order to construct a broad picture on women's access to, and use of the Internet, we find that robust gender-disaggregated ICT statistics at the national level is nonexistent in India, which limits an in-depth assessment on the analysis of digital gaps from a gender perspective and thereby, evaluation of its implications for women's economic empowerment and gender equality. According to research by GSMA (2015), women in India are 36 percent less likely than men to own a mobile phone, which means that there is an estimated 114 million fewer women than men owning a mobile phone. Even when women do own a phone, they are far less likely to use it. The research also shows that 50 percent of the women interviewed identified handset cost as a key barrier to owning a mobile phone, despite the emergence of lower priced smartphones, which results in either a shared household phone or borrowing of phone from friends/neighbours that is more common among rural women and women with lower levels of education. Barriers arising from lack of technical literacy and confidence is more acute for Indian women than men, with 34 percent of female respondents, compared to 23 percent of men, not knowing the usage of a mobile properly. Gender divide with regard to computer skills is also stark, with only 22.9 percent of the women knowing how to operate a computer, of which only 9.5 percent of females were able to use the Internet to find necessary information and 8.7 percent were able to send emails (Sinha, 2018).

With the objective of transforming India into a digitally empowered society, the Government of India launched the flagship *Digital India* programme in August 2014 so as to intensify the existing e-governance initiatives and promote job opportunities in electronic manufacturing and ICT-intensive services sectors. The program consists of key focus areas, which include provision of high-speed broadband to all 2,50,000 Gram Panchayats, universal access to mobile connectivity, public Internet access programme through setting up of common service centres, electronic delivery of services and ICT for jobs. However, the programme document does not specify any explicit gender-disaggregated training targets for bridging the digital divide (Gurumurthi & Chami, 2018). Given the lower uptake of the Internet usage among women in general and rural women in particular, nuanced data sets on household level broadband and smart phone ownership are needed to record women's patterns of use across socio-cultural dimensions.

Further, the Government launched the *Skill India Mission* in 2015 with the objective of providing skills training to over 400 million people in different industry-related jobs by 2022 in order to capitalize its potential demographic dividend, of which females could play an important part. Through an expansive set of vocational training programs, the initiative provides free-of-charge skills training to rural youth (15-35 years) by way of certified partner implementing agencies approved and funded by the government coordinating body. Women get special focus under this scheme through the provision of 30 percent reservation of seats in various training centres all over the country, which has equipped nearly 4.8 million women with market relevant skills as of November-2021 (Ministry of Skill Development and Entrepreneurship, 2019; PIB, 2021). However,

in a survey of 2,610 former skilling trainees, Prillaman et al. (2017) find significant 'leaks' in the skilling pipeline where trainees leave the labor force, which results in low retention and LFPR after training, especially for women. The survey findings indicate that female trainees were less likely to both receive job offers and accept them, which is accompanied by their reluctance to migrate if the jobs required them to move out of their place of residence considering that the demand for skilled workers is concentrated in cities. This is further constrained by family limitations that often inhibit women's ability to take up skilling and employment.

2.2 Kenya

Estimates from the World Bank show that 74 percent of Kenyans reside in rural areas, with 55 percent of the rural population being female. Although Kenyan women have increasingly joined the labour force over the past two decades, majority of them is still concentrated in traditional and informal sectors that are low paying and carried out under poor working conditions. Survey data from KIHBS indicates that although the share of formal wage employment increased from 14.2 to 24.5 percent between 1998-99 and 2015-16, larger proportion of men (31.1 percent) than women (17.7 percent) are employed in formal wage employment, which is likely due to inequality in terms of education and skill levels (Munga et al., 2021).

In order to analyze women's access to and usage of ICTs, we use the survey results for 2007-08 and 2011-12 from Research ICT Africa (RIA) that fills the gap by integrating gender splits into the design and methodology of the study at both the individual and household level. Given the nonexistence of gender disaggregated, nationally representative data on ICT access and usage in Kenya, RIA survey conducted in 17 African countries identifies areas of inequity in access to ICTs between men and women and any differences in their usage at the national level (Gillwald et al., RIA, 2010; Deen-Swarray et al., RIA, 2012). Although the ownership of mobile phones in Africa has increased dramatically since 2008, the survey finds that gender gap exists primarily in terms of use than access.

In Kenya, while female ownership of mobile phones increased to 67.9 percent in 2011, only 28 percent of women owning the mobile phones are capable of browsing the Internet, compared to 37.9 percent of men, where the gender gap is found to be significant in rural areas. In addition, the results show that there is a gender divide in ways in which mobile phones are being used, where the relatively advanced activities of downloading applications, browsing the internet and reading/writing emails are more common among men than women, which is attributed to underlying factors such as differences in skills, education or income. Even though Internet use among women has increased since 2008, it continues to be lower with 20.5 percent of women using Internet, compared to 35.8 percent of men. This indicates that the constrained usage of ICTs by women in Kenya create uneven developmental benefits, where the digital divide widens further as these technologies and services become more sophisticated and expensive.

In order to make Kenya a regional ICT hub and transition the country into a globally competitive digital economy, National ICT Master Plan was launched in 2014. In alignment with Vision 2030 targets, the Plan is centred on the critical pillars of connecting the underserved areas with ICT, provisioning and management of e-Government services to enhance efficiency, developing a digitally skilled workforce and collaborating with industry players for sustainable digital solutions. To develop ICT-ready workforce, a nationwide e-Education system is deployed under this plan that supports schools, higher education and training facilities across the country by interconnecting them with each other and with relevant knowledge centres, which provides curriculum integration and promotes e-learning at all levels (Ministry of ICT, Kenya, 2019). Besides, the plan lays significant

emphasis on the role of e-governance for the delivery of efficient and cost-effective public services that is expected to boost ICT connectivity and encourage ICT infrastructure deployment across the country, where the system allows citizens to sign up and pay conveniently for government services using mobile money and online banking (Banga, 2020).

Also, the digital skilling through the Presidential Digital Talent Programme offers ICT internships to young people, while the Ajira Digital Programme provides young people with access to digital job opportunities (Ndung'u et al., RIA, 2019). But these programs fail to identify women-oriented targets in terms of ICT access, usage and training considering that a significant proportion of women in Kenya are at a disadvantage on account of low affordability and lack of basic computer skills. This is further compounded by various cultural barriers such as harassment in public spaces or work overload or gendered perceptions that further limit the opportunities for women to access ICTs.

However, the introduction of mobile money services has revolutionized the way in which people transact in Kenya by providing financial services to individuals who could not afford to use traditional banking practices. In 2007, mobile money service through Safaricom's M-Pesa was initiated in Kenya that has become one of the most successful examples of financial innovation in developing countries. M-Pesa has rapidly expanded to cover 25 million subscribers in a population of 40 million (Jack & Suri, 2014), where the impact of mobile money on financial inclusion has resulted in 86 percent of the population having access to some sort of financial services in Kenya.

Experimental evidence on the long-run impact of M-Pesa on the economic lives of Kenyans indicates that access to a basic financial service in the form of M-Pesa, which provides the ability to safely store and send money across large distances at dramatically low transaction costs, has increased per capita consumption levels and lifted 1,94,000 households, or 2 percent of Kenyan households, out of poverty (Suri & Jack, 2016). These effects are more pronounced for female-headed households because easy availability of mobile money not only increased their financial resilience and saving, but also steered changes in the labor market outcomes, such as occupational choice for women by enabling them to move out of agriculture and into business, thereby resulting in a meaningful reduction of poverty. Thus, the unprecedented spread of low-cost mobile money has the potential to directly boost the economic lives of poor women, where these impacts derive from a more efficient allocation of labor, savings, and risk, which suggests the prospect of channelizing digital financial services to provide women with greater privacy and control over their finances as well as the flexibility to spend on mobile phone usage and other forms of household expenditures.

2.3 South Africa

Gender Series Volumes of Statistics South Africa Report (Statistics SA, 2014) indicate that even as the economy made significant progress in reaching gender equity in government institutions during 2001-2014, progress in the private sector appears to be lagging behind. Gender gaps in tertiary qualifications are significant as nearly 69 percent of women are clustered around social studies, arts and hospitality, while 71 percent of men have qualifications in mathematical sciences and engineering, which has the lowest gender parity with seven males for every ten individuals reporting qualification in this category (Statistics SA, 2014). Although the percentage of females in managerial positions tripled from 2.3 to 6.3 percent during the given period, it is much lower when compared to other female occupations. For instance, females are more likely to be employed as domestic workers, whose employment share stood at 14.4 percent in 2014, while informal employment share of Trade services amongst women is 47.6 percent, compared to 30.6 percent of men (Statistics SA, 2018; QLFS, 2018).
Also, women are more likely than men to be involved in unpaid work, where women constituted

55.2 percent share of non-market activities during the second quarter of 2018 (QLFS, 2018). The data further pinpoints the concentration of South African women in low-skilled and low-paying jobs, where the economic gender gap is magnified on account of difficulties in obtaining the same education and skills as men, unequal gender access to business and financial services and constraints that limit their ability to own and control assets. These differences have consequently also spilled over into digital divides. While the ownership of mobile phones amongst females increased from 65 to 82 percent during 2007-12, only 43 percent of women own internet-enabled mobile phones, compared to 60 percent of men (Gillwald et al., RIA, 2010; Deen-Swarray et al., RIA, 2012).

Like Kenya, South African women are more inclined to use mobile phones for more basic activities (calling/messaging/transacting money), while the mobile use for advanced applications such as browsing the Internet and reading/writing emails is more common among men. There are more men using the Internet than women because compared to 40.6 percent of men, only 28.6 percent of women were found to use the Internet according to the survey data of 2011-12 (Deen-Swarray et al., RIA, 2012). This shows that even as the gender gap in mobile ownership has reduced considerably in South Africa, gender gap in the use of mobile internet-based services and Internet, in general, remains substantial.

The Government of South Africa has introduced programmes to specifically target women to facilitate their participation in the mainstream economy. As part of the National Fund, the Women's Empowerment Fund was established in 2014 for funds disbursement to businesses that are owned and managed by black women (Department of Women, Youth and Persons with Disabilities, SA, 2020). In addition, South Africa was the first country in sub-Saharan Africa to embrace gender budgeting in 2019, which directs the use of fiscal policy to advance women's development. Although Gender Responsive Fiscal Evaluation framework seeks to ensure that planning instruments at the national, sub-national and institutional levels are gender responsive and sufficient resources are allocated to interventions, these initiatives waned following two rounds of budgeting (Stotsky et al., 2016).

With the recognition of digital skills being a vital component of South Africa's human resource capacity growth path, National Digital and Future Skills strategy was introduced in 2020 that provides a structured series of initiatives intended to meet the challenges arising from increasing deployment and adoption of digital technologies in the economy. The policy sets out layers and mechanisms for advancing digital skills, where the focus lies in key targeted directions of priority skill areas and convergence of digital skills with subject matter knowledge (Government Gazette, 2020). While the program document identifies the emphasis on building digital literacy and skills among women and girls by enabling universal access design to address the marginalization of a large proportion of its population, it must be noted from the experience of developing economies that women's rate of Internet access and usage do not increase in tandem with increases in national deployment of digital technologies in the economy, unless specific gender-oriented data on ICT access is collected and complementary targets are designed.

3 The Policy Problem

Services-led growth experience of IKS indicates that their structural transformation processes are not gender neutral since they have taken place against a background of persistent gender segregation in sector-wise employment over the past decades. Low levels of FLFP and occupational segregation of women's employment in these countries may not reverse by itself with high rates of growth in the business services sector since the key driver in the growth of these ICT-intensive services requires skills that a majority of women do not possess. This draws attention to the fact that as these

economies are leapfrogging towards the high-productive modern services sector, it is not sufficient for raising women's ability to gain access to decent employment opportunities, which is unlike the U-shape theory of evolution of female employment, where the upward swing in FLFP at later stages of economic development completes the U-shape on account of increased education and growth of the services sector. With a significant proportion of women being secluded from the high-paying ICT-intensive services sector that is on a high growth trajectory, there is a need to revisit the issue in terms of human capital formation and how the acquisition of ICT skills by women can change this troubling dynamics. A rise in economic participation of women is instrumental at a macroeconomic level not only for the realization of their full economic potential, but also to advance the growth rate in these economies, while also making the structural change process more inclusive.

As digital technologies have fostered the growth of ICT-intensive services, they have restructured the labor markets by making it more flexible through changes in the structure of labor demand and supply, which may constitute an important factor for enhancement of female workforce participation. In this context, reducing the gender gaps in digital access, usage and literacy can be transformative for low-income countries to leverage the full benefits of digital economy that bypasses traditional technologies. New forms of work that have emerged in the digital economy with the Covid-19 pandemic offer advantages either through flexibility in the number of hours or the ability to work from remote locations, where jobs involving online engagements hold the potential of overcoming gendered mobility constraints and longstanding occupational segregation faced by women in these countries. Mobility constraints often include greater domestic responsibilities that make travel farther from home more difficult, safety concerns (harassment or rape), unequal access to cars or bicycles, and cultural disapproval of girls' movements (Porter et al., 2011).

Since the feminization of vulnerability is a result of lacking professional skills and competence that bring relatively low returns to women and hinders their participation in formal economic activities, digital channels provide an alternative route of improved access to knowledge and general information that benefit women and girls by not only providing access to additional income and employment opportunities, but also paving a path to narrow gender gaps observed in skills, labour market participation and wages. As digital platforms reduce the entry barriers and transaction costs confronted by women from working in the formal sector, they also facilitate in labour market matching by increasing the transparency of information flows.

In addition, with the profound transformation in the content of jobs in the ICT-intensive sector and the skills needed to perform them, addressing the digital gender divide can potentially impact the labour market outcomes for women. The nature of flexible work can foster greater female participation in formal jobs by making it easier for women to balance work and family duties considering that women's unequal shouldering of unpaid care work is a key barrier to entering the labour force. Directing policy efforts towards gender-oriented actions to target Internet access, digital skilling, digital finances and ICT platforms would not only enable women in finding better job opportunities and fight economic vulnerability, but also provide access and control over financial resources through the use of mobile money that accelerates the financial inclusion of women and facilitates in their empowerment.

Considering that a disproportionate number of women in IKS experience distinct barriers to mobile ownership and use, the Mobile Gender Gap Report (GSMA, 2019) highlights that affordability is the top barrier to mobile ownership, followed by literacy and digital skills. For instance, 46 percent of mobile-owning women in Kenya do not use the Internet because of affordability issue, while this figure is 51 percent in South Africa and 20 percent in India. This indicates that for specific Internet-based mobile use cases such as downloading apps, the gender gap widens even further in these

economies. In this regard, the role of concerted policy efforts to drive digital inclusion for women becomes significant, but ensuring digital access alone is not sufficient because barriers such as harassment in public spaces also limit the opportunities for women to access ICTs. This implies that women need a gender-inclusive safe space where they are allowed to train in digital skills that supports their transition from basic digital literacy to advanced digital skills, where they are encouraged to use these skills to access public information and governance services. This becomes essential since most women lack unrestricted access to connectivity at the household level and support to learn how to navigate online (Gurumurthy and Chami, 2018).

Moreover, besides widespread access to and use of ICTs, a subsequent policy challenge is to convert the digital training of women into their sustained workforce participation by integrating such interventions with ICT mentorship, monitoring job quality, fostering peer networks that can help in combining labour market participation-related actions with actions shaping investment for targeted life-long training. This would not only help in increasing the FLFP, but it also has the potential to create a cascading effect at the household level because research indicates that women with greater earning power invest more in the health and education of their children, thus playing a key role in the inter-generational transmission of human capital formulation (Choudhuri, 2021).

4 Implications for Development Strategies and Directions for Research

In this section, we identify and analyze the key areas of policy interventions. Given the evidence and existing policy context in IKS, the underlying causes of digital gender gap are found to be both diverse and interrelated that demand coordinated action. Since large-scale nationwide digital programs and ICT plans have already been launched across IKS in recent years that are still underway, it indicates the existence of substantial political will from policymakers to address the marginalization of a large proportion of its population as a significant proportion of resources has been directed at implementing the digital skilling of women and girls. But these initiatives have not been able to translate into higher FLFP in high-paying service sector jobs in these economies because not only are these programs lacking in making provisions for gender-disaggregated training targets, but they also fail to recognize that women's rate of Internet usage may not increase in tandem with increases in national deployment of digital technologies in the economy, unless specific gender-oriented data on ICT access is collected and complementary targets are designed. This is especially because the gender gap in the use of mobile internet-based services and Internet, in general, remains substantial in IKS and other low-income economies. Considering a common policy gap across the three countries, the potential solutions in the following sections highlight crucial links through which digital access and training affect the FLFP, where these channels are directed at data collection, digital literacy, digital finance and labour market opportunities for women. Building on our core characterizations under each channel, we accordingly suggest areas that merit additional investigation.

4.1 Collect data on gender-disaggregated ICT access

A major limiting factor observed in IKS is the lack of gender disaggregated, nationally representative dataset on ICT access and usage that identifies and documents variations in the application of ICTs at an individual level by men and women. Since aggregate data collections at the household level do not guarantee that women in the household have equal access to ICTs, this implies that women-specific indicators go unrecorded, both in statistics as well as in policy, which consequently underlies the push for gender-based statistics so as to unmask the gender differences (UNCTAD, 2014). As the

role of ICT becomes increasingly vital that permeates across fields, the first step to address the digital gender divide begins with defining, collecting and analyzing the gender-related statistics on ICT, which is a necessary prerequisite to inform national policy, develop gender-specific indicators of ICT and evaluate the magnitude of current policy effects.

Considering the enormous gender-based disparities in access and use of ICTs that leads to further divides in the job opportunities for women in these countries, collection of gender-specific data on ICT statistics and indicators provides the basis for developing the evidence needed for policy formulation that addresses gender issues in digital policies, plans and strategies. A convenient starting point could be to collect the individual-level ICT statistics through existing surveys such as population censuses or labour force survey that allow for disaggregation by sex, where the variables on ICT questions such as awareness, access options, utilization and skill can be included and measured, without the need for allocating additional resources (Hafkin and Huyer, 2007). Moreover, monitoring and evaluating the results obtained from this data collection, followed by researching women's access to and use of the Internet that is disseminated through publication in government reports is critical to track the implementation of policy reforms and interventions over time.

These efforts can further be supplemented with e-Government initiatives, where digital technological innovations can potentially support better access to public service delivery and quality of provision through online portals. Accessibility to e-governance can be strengthened by the increase in electronic registration methods for services like, banking, healthcare, education and government dissemination of information. These services can be scaled up to design women-directed e-services by defining the needs and modalities for increasing the access of women to e-Government. In India, for instance, digitally-enabled public information outreach efforts have been undertaken by the Government of India such as Maternal health information services and m-learning for frontline health workers (Banga et al., 2020), but there is no coherent strategy with respect to e-services for women since the approach is fragmented based on a one-time solution rather than employing an embedded strategy through digital solutions.

Also, more research is needed to understand how the government policy of providing healthcare facility through digital mediums affects the ICT access and usage by women particularly in rural areas. Moreover, the delivery of e-government services can further be channelized to track and monitor the data on ICT access and use by women, which can enable greater transparency and decision-making through efficient policy responsiveness. Finally, for better targeting of women, a deliberate gender bias in e-government programs is crucial for mainstreaming gender dimensions in e-governance, but it is also critical to recognize the causal chain linking women-oriented digital interventions on their ability to navigate these e-programs and to explore how such interventions through health and education systems facilitate in bridging the digital gender divide.

4.2 Prioritize women-targeted digital literacy and skilling

Women remain disproportionally disadvantaged in terms of ownership and usage of smartphones, where women in India are 56 percent less likely to own a smartphone that can connect to mobile Internet, while this gender gap is 39 percent in Kenya and 15 percent in South Africa (GSMA, 2019). However, this gender gap deepens even after the access is granted because going beyond access, the issue of lack of digital literacy and skills to capitalize on the benefits from participating in the information economy further widens the existing divide that consequently spills over to low levels of women's participation in ICT-intensive services sector. This implies that access is a necessary, but not sufficient condition to close up the digital gender divide. It is not merely access to digital technologies but about the capacity to draw on its meaningful use that is especially needed as the

digital transformation unfolds. The fact that women are much less endowed with such skills is also likely to contribute to the already existing gender wage gap considering that ICT-intensive services are a high-paying sector.

Even as large-scale digital literacy training programs have been initiated in recent years in IKS, they lack gender responsive monitoring and evaluation aimed at women and girls. Not only are the gender-oriented training targets missing from such initiatives that can be tailored to the high-paying ICT services sector, but programs such as Skill India also struggle to recruit women and keep them in jobs after they have been placed. Moreover, women in these countries experience mobility constraints and have reported difficulties in gaining access to the Internet through public facilities and cafes where ICT resources are located on account of safety reasons and cultural norms that prevent them from seeking training and support services, thereby confining their benefits from Internet use.

In this regard, the role of self-help groups (SHGs) of women who come together to address their common problems through mutual support can serve as an effective strategy for skills development, social empowerment and income-generating activities. These collaborative and group-based methods can provide a platform for administering various levels of digital and financial literacy programs that hold the potential of encouraging women to join training camps, take up productive work and act as a bridge for women entrepreneurs who are willing to begin an enterprise, but lack resources needed for it. The underlying idea of bottom-up approach to skilling through SHGs can employ a range of digital strategies to support its grassroots women's collectives and strengthen program activities by recognizing the access and use of the Internet amongst the group members, setting up ICT-enabled gender help-desks, disseminating relevant information for advancing digital literacy and creating an interface with local government representatives for evaluating women-targeted e-services. This not only facilitates in overcoming regional imbalances and information asymmetry with respect to ICT access and usage by women at the local level, but it also fosters a safe gender-inclusive internal learning space for women that can be channelized to experiment with a range of digital tools through e-learning and knowledge interventions deployed using a blended learning model combining ICT and face-to-face methodologies.

Some of the successful digital skilling interventions through the SHG linkage include *Kudumbashree Mission* that reaches out to over 43 lakh women across Gram Panchayats and municipalities in the Indian state of Kerala, which has resulted in computerization of village-level offices, setting up of a web portal *Sreesakthi* to facilitate dialogue between women's collectives from different geographies, introduction of digital accounting system to increase transparency of group finances and deploying of e-learning for grassroots women through digital efforts in the use of technology for information and public services (Gurumurthy and Chami, 2018). A few programs with public-private partnerships and industry sponsorships are also underway in India that provide digital skilling to rural women in underserved areas. For instance, *Internet Saathi* initiative, the collaboration between Google and Tata Trusts, creates a cadre of digitally trained women who train other women in rural areas through community networks and group activities, which encourages these women to serve as agents for change by taking the lead in promoting digital literacy within their rural communities. So far, the strong network of 60,000 trainers under this program has imparted digital literacy to more than 20 million women across 200,000 villages[f]. But more research is needed to investigate the efficacy of these skilling interventions on women's market work that sheds light on how female market participation is evolving over time with such initiatives. Randomized controlled trials (RCTs) can be designed to identify if the digital literacy programs for women can incentivize placement and

[f] Source: Tatatrusts https://www.tatatrusts.org/our-work/digital-transformation/digital-literacy/internet-saathi

retention in ICT-intensive jobs after training that can provide crucial linkages for connecting women to ICT-intensive work.

Also, since national ICT plans in IKS lack a coherent strategy to integrate and mobilize skilling interventions through existing SHGs, it provides room for complementing current digital literacy initiatives though SHG linkages in these economies that offer a medium to impart targeted ICT training to women by leveraging on dynamic peer effects and overcoming barriers such as harassment in public spaces that limit the opportunities for women to access ICTs. Through innovative digital solutions, women can be made to connect with each other across SHG institutions, which not only addresses the issues of mobility, safety, affordability and literacy barriers, but also provides a channel of fostering peer networks among women through SHG linkages.

However, it is imperative to classify and isolate how such local networks among women enable communication, digital learning and mobility that opens prospects for women to access work-related opportunities and information. Experimental evidence is needed to investigate the effects of SHG skilling of women on their decisions to participate in ICT training and to identify whether women can carry out financial transactions through online platforms or whether they can apply digital tools that could relate to expenditure and saving patterns in households or what kind of investments to make, and whether or not to work. Understanding these causal linkages could be significant to analyze if digital training empowers women to exercise agency and effect changes in household decisions or circumvent social and cultural norms.

4.3 Advance digital financial inclusion for women

Research indicates that being financially included can have meaningful effects on women because when women are given control over a stream of resources through access to bank accounts, saving mechanisms and other financial services, they are able to better manage risk, smooth consumption in the face of economic shocks and increase household welfare by funding education, child nutrition and health (Duflo, 2012; Hendriks, 2019). A growing body of rigorous RCTs shows consistently positive economic outcomes for women from interventions to increase personal savings (Klapper and Dutt, 2015). With the right financial tools that allows women to send and receive transactions or remittances, it gives them autonomy to gain control over their earnings, undertake productive expenditures and make more choices about how they use their time, be it for employment, leisure, education or income-generating activities (Arnold and Gammage, 2019; Bandiera et al., 2013). In a large-scale RCT by Field et al. (2017) conducted in the Indian state of Madhya Pradesh, women working in India's rural workfare programme are provided with their own bank accounts, where their earned wages are directly transferred and basic financial literacy training is imparted to them to be able to operate these accounts, which is found to precipitate a behavior change through improved intra-household bargaining positions, increased female participation in the program and in the private sector labor market.

In IKS, the Global Findex Report (2021) shows that the percentage of female population (aged above 15 years) who own an account at a financial institution or with a mobile-money-service provider is respectively 78, 75 and 86 percent. This implies that even as the gender gap in financial inclusion appears to decline in these economies, disparities in the use of financial services remain stark since women remain constrained by issues such as, low rates of mobile ownership, dependence on cash transactions and lack of financial literacy. However, women's access to conventional financial products by means of visiting the local bank branches becomes limited by long travel distances, social norms, and family responsibilities, which is why, digital financial services offer innovative platforms to address gendered financial exclusion. Not only do digital platforms reduce the

transaction costs and overcome restrictions brought on by geography, but they also have the potential to enhance transparency, facilitate links to government-sponsored financial support and provide women with greater financial autonomy through confidentiality and control over their finances (Arnold and Gammage, 2019; Klapper and Dutt, 2015; Suri, 2017). For instance, data from a randomized experiment of a mobile money cash transfer program in Niger indicates the benefits of electronic transfers through improved household diet diversity and additional meals for children among households who received mobile transfers, which is attributed to time-savings and shifts in intra-household bargaining power for women (Aker et al., 2016). But more research is needed to test whether access to mobile money affects gender inequality in mobile ownership and Internet usage by women in low-income countries and to derive pathways through which digital technologies can be leveraged to accelerate financial inclusion and financial control among women considering that women in these economies continue to face gaps in digital learning, where it is crucial to study the role of higher degree of digital literacy on financial inclusion of women.

While mobile money through M-Pesa showed pronounced effects on female-headed households in Kenya that covered 83 percent of its population, its reach in South Africa was only 8 percent in 2018, which is attributed to low demand for M-Pesa's services since nearly 85 percent of South African population already own a bank account (World Bank Data; Mothobi and Gillwald, 2018; Jack and Suri, 2014). But it would be interesting to study how improvements in digital financial inclusion among South African women, given their high rates of penetration through traditional bank accounts, would propagate the use of digital technologies and services that may have effects on female entrepreneurship and labour market participation of women.

In India, the government initiative of *Jan Dhan Yojana* started in 2015 aims at improving the financial inclusion of women at the national level by ensuring that at least one member of every household, preferably a woman, has a zero balance bank account together with the promotion of mobile wallets based on mobile transactions. But there is no evidence if women are independently managing their finances particularly in view of their limited functional literacy and lack of digital capabilities. Despite investments in mobile platforms, and digitization of payments and transfers, women tend to face barriers in accessing and using digital financial services, which arise on account of gaps in women's mobile ownership and usage of online applications, low levels of financial literacy and lacking digital skills. Although digital village initiatives have been implemented in India and Kenya under their respective nationwide digital programs, experimental evidence is needed to better understand the effects of these multiple interventions in rural areas on digital usage, skilling and financial literacy of women at the grassroots level that can be used to evaluate if such interventions strengthen women's bargaining power by driving changes in their financial behavior.

4.4 Tailor and facilitate labour market participation of women in ICT services

The U-shaped relationship between women's involvement in market work and economic development has been documented over time for the US and other developed economies (Sinha, 1965; Goldin and Schultz, 1995; Boserup et al., 2013; Olivetti, 2014). In the initial stages of development, FLFP declines as jobs move away from home to factories that are deemed inappropriate for women. With higher incomes and more financial resources at the household level, the income effect induces female employment to decline considering that child-care responsibilities typically lie with women. However, at later stages of development, as structural transformation of the economy shifts towards the growth of services, female employment swings up again because now, not only are women better educated, but with the movement towards 'brain-based' work in

services, female workers gain a comparative advantage in mentally intensive service jobs compared to the physically intensive jobs of previous stages, which raises the opportunity cost of staying at home and thereby, leads to increased FLFP along the rising part of the 'U' (Heath and Jayachandran, 2016). As economic activity shifts away from the 'brawn-based' industrial work towards 'brain-based' service work, the rise in comparative advantage for women is observed from changes in the occupational mix in favor of jobs that are skill-intensive, which augments both the schooling investments and earnings of women relative to men (Pitt et al., 2012).

Although there exist extensive literature on women's progress in the labor market that includes a number of supply-side explanations for gender trends, be it medical advances, availability of child-care services, human capital investment or improvements in home technology, few research papers have investigated the role of structural transformation in determining the rise in FLFP, that is, devising multi-sector frameworks to model the interplay between the rise of the service economy and the growth in female hours of work. Work by Rendall (2017) considers the evolution in employment and average wages by gender in the post-War US economy that is explained by labor reallocation from brawn-intensive to brain-intensive jobs in a one-sector model, where skill-biased technical change favors women's comparative advantage in brain over brawn that results in shrinking of gender gaps in both employment and wages over this period. The impact of sector-specific shocks on gender outcomes is illustrated in Lee and Wolpin (2010), where skill-biased technological change accounts for narrowing of the gender wage gap and the increased feminization of the workforce. Along these lines, papers by Rendall (2018) and Buera, Kaboski and Zhao (2019) apply multi-sector models with home production to show that women have a comparative advantage in producing services, where marketization of home services contributes to the rise in both female labour supply and services share. Olivetti and Petrongolo (2014, 2016) document the interaction between the service share and variation in female hours in an international perspective that relates the pattern of variation in gender gaps to the process of structural transformation across countries. In Ngai and Petrongolo (2017), faster labor productivity growth in goods sector reallocates labour towards services that results in structural transformation in the US economy, where women's comparative advantage in services, rise in service share and marketization not only raise women's relative market hours and wages, but turn a seemingly gender-neutral shock of service sector growth into a de facto gender-biased shock.

While these papers calibrate the model economy to US or European labor markets in order to predict the trends in female market participation in developed countries, the literature in this area is, however, scant for developing or low-income economies. Although the trends in FLFP and rise in service share in developing economies have been independently examined in detail, it is important to jointly explore the inter-relationship between the sector-specific structural change and gender outcomes in these countries in order to quantitatively investigate the role of sector- and skill-biased technical change in the growth of service sector and to simultaneously account for how the rise in services quantitatively contributes to the observed trends in female labor supply in terms of relative demand for female work, relative wages and women's market hours.

Considering that IKS have leapfrogged certain stages of industrialization with services-led growth occurring earlier in their development trajectory, the FLFP rates in these economies may not follow historical patterns since their manufacturing sectors have prematurely stagnated at lower levels of per capita GDP when compared to developed countries. With speedier movement from agriculture into services, women's employment in IKS has mostly become concentrated in sectors that are low paying and have high rates of turnover. This indicates that as IKS advance towards the high-productive ICT service sector during the process of structural transformation, women face mobility barriers to move to and persist in high-paying jobs. This suggests that even though modern services

have grown rapidly, the specific friction arising through digital gender divide in the form of lack of digital access and skills not only leads to misallocation of female labour, but also prevents them from moving towards stable high-wage work. Since upward movement in FLFP along the U-shape is not automatic in these economies, policy interventions are needed to address this gap for improvements in female labour market outcomes. This can be channelized through the existing nationwide ICT plans in IKS that provide a platform to integrate and mobilize gender-oriented skilling interventions by imparting digital skills training to women that is tailored to the skills requirements of the rapidly growing business services. This may include coding bootcamps and other digital jobs programs that can equip women with advanced digital skills and soft skills necessary to enter ICT-intensive jobs, which in conjunction with job-matching platforms through select organizations and institutions can target women in online job-matching services that also hold the possibility of identifying female mentors and developing professional networks (Robinson et al., 2018). As statistics point to significant supply-demand mismatches leading women to search for jobs with less intensity than men (Fletcher et al., 2017), digital technologies can be leveraged to facilitate job search and job matching that benefit women and girls by increasing information availability about jobs and potentially lowering search costs.

However, an important question for future research is whether remedying the friction of lack of digital literacy enables women to move towards high-paying business services considering that the rise of services is also associated with a faster marketization of home production activities, which, as shown by Bridgman et al. (2018), is mostly due to decrease in women's household hours on account of changes in housework (cleaning, cooking etc.). Accordingly, this can be used to evaluate whether addressing these frictions results in the patterns of female work observed in developed economies being replicated in IKS and whether it allows these countries to either move onto the increasing part of the U-shape curve or shift the curve itself as ICT services expand further with structural transformation. Gaining insights on how female labour market frictions with respect to digital divide impact gender wage gaps and employment outcomes for women in IKS and other low-income countries can provide profitable avenues for future research, where connecting these particular frictions in labour markets with the structural transformation literature of developing economies can shed light on important policy implications for bridging this gap.

In order to measure the participation of men and women in paid and unpaid activities at household level, time use survey (TUS) describes a framework for measuring time dispositions by the population on different activities that are grouped into specific categories, which provide useful data points for building a picture about the activities performed by an individual and the time duration for which such activities are performed. While a survey of time use has been conducted twice in South Africa during the years 2000 and 2010, this exercise was first performed in India and Kenya, respectively in 2019 and 2020. Time use data for IKS illustrates that women do the vast majority of unpaid work as they spend an average of nearly 5-7 hours each day on unpaid domestic services that cover unpaid care, housework, household management and childrearing duties, where women's primary role in home production is also cited as key constraint to their participation in the labor force in these economies. Using the officially published statistics for the year 2015 to capture the share of home-substitutable female market jobs in select African countries, Dinkelman and Ngai (2022) show that women's market jobs in home-substitutable sectors make up the vast majority of service sector work among women in Kenya and South Africa, which indicates that the marketization of some types of home production is underway in these economies. However, in order to track how the share of marketized home production substitute jobs has changed over time, multiple time-use surveys are required to be conducted within a country so as to observe how the location of time required for producing household services shifts out of the household and into the market.

Since growing marketization results in potentially large time-saving for women, their ability to shift hours away from home production towards market work is also affected by social norms across IKS that require women to be primary housekeepers and unpaid caregivers. As a consequence, this imposes a constraint on women's mobility and time allocation that restrict their choice across occupations and firms and may induce them to choose jobs with more flexible or shorter working hours. Accordingly, the policy challenge in IKS is to facilitate the labour market participation of women towards regular part-time work or work with flexible arrangements since these employment opportunities are relatively compatible with continuing demands from home production as compared to full-time jobs with rigid systems in the formal sector. For instance, in India, 73 percent of women willing to take a job prefer regular part-time work, while 22 percent prefer regular full-time jobs, which reflect the demands of household responsibilities in the context of marriage and childbearing (Fletcher et al., 2017). Here, ICT services jobs hold the potential of generating new opportunities in online work, which is likely to benefit women in a shift towards non-routine occupations by allowing them to work remotely, including from home or with greater geographical mobility. Interventions could be designed to identify whether ICT jobs that provide flexible work arrangements with access from a home base facilitate market work for women, which can be combined with interventions that ease the time constraints on home production at the household level. Time-use survey can be deployed to measure and evaluate the dual impact of labour market interventions in ICT sector and of marketised home production services on time allocations for women.

Few studies have evaluated the effects of ICT on labor market outcomes of women. In Sub-Saharan Africa, Ngoa and Song (2021) show that a 1 percentage point increase in internet use is associated with a 0.223 percentage point increase in FLFP, while a 1 percentage point increase in mobile phone use is associated with a 0.046 percentage point increase in FLFP, where ICT diffusion is found to enhance work-life balance for women and reduce informational inefficiency in the labor market by lowering the matching time for labor skills and job expectations. Findings by Efobi et al. (2018) and Asongu and Odhiambo (2019) indicate that since high-speed Internet availability and broadband access are imperatives for female economic participation in Sub-Saharan Africa, ICT penetration needs to be enhanced in order to effectively mitigate inequality for the enhancement of the participation of women in the formal economic sector. Das et al. (2015) revisit the determinants of FLFP in India that illustrates how labor market rigidities lead to low female market participation, where increased labor market flexibility tends to be associated with higher FLFP and a greater likelihood of being employed, including in the formal sector. But more evidence is needed to look into how the digital training programs in IKS can successfully place women in ICT service jobs that not only support their employment aspirations, but also match female preferences and household roles, where systematic analysis for improving job retention rates among women is a promising area for further investigation. This can be further used to analyze whether the expansion of ICT services in low-income countries increases the relative demand for female work considering that women have a comparative advantage in service sector jobs and whether the rise in services generates gender convergence in labor market outcomes both in terms of employment and wages. Recognizing these causal linkages could be significant to analyze if the increase in potential ICT job opportunities for women influence their bargaining power within households either through changes in household decisions or shaping of marriage and fertility decisions or circumventing of social norms.

5 Conclusion

In an expanding economy, the transition to modern economic growth requires a structural transformation of the economy among sectors, which enables the movement of workers and jobs from less productive to more productive sectors during this process. However, like economic growth itself, structural change is not an automatic process, as it needs a nudge in the appropriate direction. This is particularly when a country experiences labour market frictions that interfere with this process by impeding the incentive and ability of workers to take advantage of these opportunities, which not only traps workers in low-wage work, but also slows down the speed of structural transformation and thereby, the growth of the entire economy. As the emerging economies of IKS make a transition towards business services sector, they face a critical obstacle of lack of adequately qualified individuals to fill these high-skilled jobs, a shortage that is severely exacerbated by the low representation of women with the necessary technical skills in these industries. This poses a grave challenge in the ability of these three countries to spearhead the growth-enhancing structural change driven by this subsector. Since the unconventional structural transformation path in these countries have taken place against a background of persistent gender segregation in sectoral employment, it provides scope for supply-side policy intervention that increases the participation of women in the high-skilled and high-wage business services, which would not only help bridge the skills gap, but also enable women to take full advantage of this growing sector.

In this paper, we have demonstrated the existence of digital gender gap in the three economies of IKS that act as a constraint to the mobility of female labour force towards the high-productive high-paying business services sector. Accordingly, we identify and draw relevance to the suitable channels of policy intervention that address the issue of skill gaps and mismatches amongst the marginalized women workforce, which facilitate in targeting not only the falling FLFP and the skilling paradox in ICT-intensive sectors, but also enable the inclusivity in structural transformation process towards the services-led growth in these countries. While reviewing the evidence under each channel, we show that in the economic transformation towards ICT-intensive services in IKS, the opportunities for women become restricted due to the existence of digital gender divide, which amounts to a persistent gender gap in access and use of digital technologies, digital skills and labour markets. Accordingly, we have also noted and identified several avenues for further research under each channel, where the evidence is either preliminary or lacking. Considering that digital technologies represent a potential opportunity to overturn the many challenges of gender inequalities, this specific friction can be integrated into the existing theories of FLFP and structural transformation that offers the potential for serious policy analysis and evaluation of gains at the aggregate level.

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