



## **Skill-Biased Technological Change and Its Impacts on Labour Market Polarisation**

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### **Abstract**

*Gender inequality continues to be a significant issue in the global labour market, with women frequently encountering wage disparities, occupational segregation, and restricted access to skills training, as well as informality and workplace discrimination. These challenges reduce women's participation in high-paying sectors and confine many to low-wage, insecure and informal employment. This paper underscores the importance of labour market interventions as essential instruments for tackling gender disparities and fostering inclusive economic growth. Key interventions encompass the enforcement of anti-discrimination laws, the bridging of wage gaps, and the promotion of equal opportunities in hiring and promotion. The paper examines how expanding access to skills development particularly in science, technology, engineering, and mathematics (STEM) empowers women to compete in high-demand sectors such as ICT and engineering. It also explores additional interventions that support work-life balance, including parental leave, flexible work arrangements, and childcare services, which enable women to reconcile family responsibilities with professional growth. Furthermore, the paper addresses the challenges of extending social protection to informal workers, with a focus on ensuring that women in vulnerable employment have access to healthcare, pensions,*

*and maternity benefits. The paper explains policies that prevent workplace harassment and promote female entrepreneurship, which further strengthen women's labour market positions. The method applied is by contacting relevant texts and journals for information. The research concludes that addressing gender issues through comprehensive labour market policies is not only a matter of equality but also an economic necessity, as empowering women in the workplace contributes to productivity, innovation, and sustainable development.*

**Keywords:** *Gender Inequality, Labour Market Intervention, Wage Gap, Occupational Segregation, Social Protection, Skill Development, Inclusive Growth.*

## **Introduction**

Skill-biased technological change refers to technological progress that favours skilled workers over unskilled or low-skilled workers. In other words, new technologies increase the productivity and demand for high-skilled labour (e.g., workers with advanced education, technical expertise or problem-solving abilities) while they replace or reduce demand for low- and middle-skilled workers who mostly perform routine or manual tasks.

This process widens wage gaps and contributes to labour market inequality and polarisation. However, skilled-biased technological change (SBTC) refers to how technological progress increases demand for skilled labour while reducing demand for less-skilled workers. This effect is particularly evident in industries where technology complements complex cognitive tasks, thereby enhancing productivity in decision-making and problem-solving roles (Acemoglu, 2011).

Skill-biased technological change has been a major contributor to wage inequality, as workers with higher levels of education and specialised skills benefit the most from technological progress. For instance, advancements in computerisation and information technology have significantly increased demand for workers skilled in fields like programming, data science, and engineering. As a result, these workers enjoy higher wages and better job opportunities. Conversely, workers engaged in routine, low-skill jobs, such as clerical or manual labour, are more susceptible to job displacement and stagnant wages.

The demand for workers in STEM fields, as well as in creative industries requiring innovation, problem-solving, and critical thinking, continues to rise. To bridge the skills gap, policymakers need to prioritise investments in education and vocational training programmes tailored to the evolving requirements of a technology-driven economy.

Technology reshapes labour demand by substituting routine tasking, complementing high-skilled workers, creating new job categories and polarising opportunities into high-skill and low-skill roles. While it raises productivity and fosters innovations, it also risks deepening inequality if workers are unable to adapt through reskilling and education.

Technological advancements have fundamentally transformed the global economy, significantly affecting labour markets. From automation to intelligence (AI), technological innovations have altered the demanded new skill sets from the workforce. While these innovations drive productivity and economic growth, they simultaneously present challenges such as job displacement, labour market polarisation, and the proliferation of non-standard work arrangements.

The advent of advanced technologies has deeply influenced labour demand, though the effects vary across different industries, job types, and skill levels (Autor, 2013).

Technological evolution necessitates new labour types as certain jobs become obsolete while others emerge. The impact of technological change on labour demand can be broadly categorised into two areas: - automation and skill-biased technological change (Kats, 1992).

Automation in Nigeria is a double-edged sword; while it enhances productivity and efficiency, it also poses serious risks of job displacement, especially for low- and middle-skill workers in both the formal and informal sectors. Without adequate preparation, through education reforms, reskilling programmes, and stronger social safety nets, the benefits of automation could deepen unemployment, inequality, and social unrest.

Automation refers to the use of machines, robotics, and artificial intelligence (AI) to perform tasks previously carried out by humans. In Nigeria, where the economy is highly dependent on labour-intensive sectors such as manufacturing, agriculture, oil and gas, services, and informal trade, the growing use of automation presents both opportunities and challenges. The most pressing concern is job displacement, which occurs when workers are replaced by machines or digital systems, leaving them unemployed or underemployed.

It also refers to the use of machines and technology to perform tasks that were previously carried out by human labour. This encompasses everything from robotics and AI to digital systems that replace cognitive and manual tasks. While automation enhances efficiency and drives productivity, it raises concerns regarding job displacement.

Historically, automation has been responsible for the reduction of human labour in sectors reliant on routine tasks. For example, manufacturing industries have experienced significant reductions in manual labour due to the introduction of automated machinery in assembly lines.

Similarly, retail sectors have seen a decrease in demand for human cashiers due to self-checkout systems and digital payment platforms. However, while automation leads to job displacement, it simultaneously creates new roles, particularly in fields related to technology maintenance, AI development, data analysis, and cybersecurity (Berman, 1998).

The main challenge lies in how quickly displaced workers can transition into these emerging jobs. Therefore, retaining and reskilling programmes are crucial for ensuring that the workforce can adapt to technological shifts in the labour market.

Automation in Nigeria poses significant risks of job displacement but also offers transformative opportunities if well-managed. The key lies in aligning technological adoption with inclusive policies, robust education, and labour market reforms.

In this situation, skill-biased technological change refers to how technological progress increases demand for skilled labour while reducing demand for less-skilled workers. This effect is particularly evident in industries where technology complements complex cognitive tasks, thereby enhancing productivity in decision-making and problem-solving roles.

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The demand for workers in STEM (science, technology, engineering, and mathematics fields) as well as in creative industries requiring innovation, problem-solving, and critical thinking, continues to rise. To bridge the skill gap, policymakers need to prioritise investments in education and vocational training programmes tailored to the evolving requirements of a technology-driven economy.

Skill-biased technological change is when technology replaces routine, low-skilled labour while boosting the productivity and demand for skilled labour. An example in Nigeria is banking sector digitalisation: fewer clerks and more IT specialists (Egbekokun, 2019).

### **Labour Market Polarisation**

In this context, labour market polarisation refers to the process where employment opportunities increase at both the high-skill, high-wage end and the low-skill, low-wage end of the job spectrum. Meanwhile, jobs in the middle-skill, middle-wage segment are shrinking. It is often described as the “hollowing out of the middle classes”, for instance:

- i. High-skill Jobs: In patterns of measure, knowledge-intensive, analytical, creative and managerial roles, for instance, I.T. specialists, engineers, consultants and medical professionals are required.
- ii. Low-skill Jobs: In this particular sector, manual and personal service roles that are difficult to automate but often poorly paid are unevenly exercised; for instance, jobs of cleaners, security guards, delivery workers, and care assistants, etc. (Balakrishman 2017).
- iii. Middle-skill jobs: This is in dealing with roles, routines, and clerical and production roles that are increasingly automated or outsourced, for example, those of bank clerks, data entry workers, and assembly line operators, among others.

However, labour market polarisation emerges from structural changes in the economy, driven by skill-biased technological change. Technology complements skilled workers while replacing routine workers. Globalisation, offshoring and outsourcing reduce demand for middle-skill manufacturing and clerical jobs. Also, changing consumer demand, by growing demand for personalised low-cost services, for instance, care and hospitality, sustains low-wage jobs, while demand for innovation sustains high-wage jobs. Institutional weakness, which includes labour laws, education systems, and weak social protection, can deepen polarisation. Thus, polarisation is not only about job availability but also about income inequality, social stratification and workforce adaptation.

In this respect, positions in the international labour market polarisation have become a global phenomenon, though their intensity varies across regions. For example, in advanced economies like the United States of America, Europe and Japan, strong evidence of polarisation since the 1980s has been manifested. Also there is growth of technologically driven jobs, for example, artificial intelligence specialists, finance professionals and expansion of low-wage services like hospitality, care work, etc. (Foster, 2008).

However, in emerging economies like Nigeria, India, Brazil and South Africa. Polarisation is gradually unfolding but takes a different form. Middle-skill industrial jobs are being threatened by automation and global outsourcing. Here, rapid urbanisation increases the demand for low-wage service jobs; for instance, transport delivery, retail business, etc. are required.

As such, countries with weak education and vocational training systems face greater risks of exclusion from high-skill jobs. Example:- In Nigeria, Fintech and ICT sectors create high-skill jobs, but many middle-skill clerical jobs in banking have declined, while informal low-wage service skills dominate.

In low-income developing economic regions in Africa and parts of Asia, labour markets are still heavily informal. Polarisation appears as dual economics: a small high-skill elite in oil, mining, and ICT and a large low-skill, low-wage workforce in agriculture and informal trade. In this case, middle-skill “formal” jobs are scarce, and automation threatens to prevent their growth. A new trend as regards global implications is inequality; this shows how polarisation increases the gap between skilled and unskilled workers. Social stratifications: Here the middle class shrinks, threatening social cohesion. In policy challenges, governments face pressure to redesign education, social protection, and industrial policies. As for labour migration, skilled workers move to countries with high demand, while unskilled workers migrate to fill low-wage jobs abroad, reinforcing global inequalities.

Therefore labour market polarisation is the structural shift where middle-skill jobs decline, while high-skill and low-skill jobs grow. Internationally, it's a defining trend in the 21st-century labour market. Advanced economics show strong polarisation, emerging economies and economic risk skipping the “middle-skill industrialisation phase” altogether due to automation (International Labour, 2019).

### **Policy responses to technological change**

As technology continues to evolve, fundamentally altering the labour landscape, policymakers face the critical task of ensuring that the advantages of these changes are equally distributed while minimising their adverse effects. A multifaceted approach is essential to address the challenges brought about by automation, skill-biased technological change, labour market polarisation, and the emergence of the gig economy.

Technological change is inevitable, but its impact on the labour market is not predetermined; with forward-looking policies in education, labour regulation, social protection, and innovation, governments can mitigate job displacement, reduce inequality, and harness technology for inclusive economic growth.

Technological change, especially automation, artificial intelligence, robotics and digital platforms, reshapes how work is done. It increases productivity but also disrupts employment structures by reducing demand for routine jobs and increasing demand for high-skilled labour. This raises challenges such as job displacement, inequality, and polarisation (Frey, 2017).

Policy responses are therefore needed to ensure that technological change leads to inclusive growth rather than widespread unemployment and inequality. However, policy responses to technological change are through:

- i. Education and skills development: these are curricular reforms. Embed digital literacy, coding, problem-solving and critical thinking in schools and universities.
- ii. Expand STEM and TVET, which strengthen science, technology, engineering, mathematics and technical vocational education and training (TVET). Lifelong learning creates frameworks for workers to continually reskill as technologies evolve. For example, Finland and Singapore have strong national lifelong learning systems that prepare workers for Industry 4.0 (Auor, 2010).
- iii. Acting Labour Market Policies (ALMP): in this manner, reskilling and retraining, public-private partnerships to reskill workers displaced by automation, for example, training factory workers to become digital technicians. Job placement services; improve labour market information systems to match skills with new opportunities. Wage subsidies: temporary subsidies for firms that retain and retrain workers rather than replacing them with machines.

- iv. Social protection and safety Nets, unemployment benefits, provide income support for displaced workers. Universal Basic Income (UBI): some countries are experimenting with UBI to cushion technological job losses. Portable Benefits: Allow gig and platform workers to access pensions, health care, and insurance regardless of employer. For example, California's AB5 law attempted to extend protections to gig workers, though implementation remains contested.
- v. Labour Market Regulation: Regulate the gig economy and ensure fair wages, working conditions, and rights for platform workers (Uber drivers, delivery riders, freelancers, etc.). Working Time and Contracts: update labour laws to cover flexible, remote, and hybrid work models created by digital technologies. Collective Bargaining: Encourage new forms of worker representation in platform and digital sectors.
- vi. Industrial and Innovation Policies:- Inclusive Innovation: support small and medium enterprises (SMEs) in adopting technology without massive job losses. Tax incentives: Reward firms that invest in worker training when they introduce automation. Local content policies encourage domestic job creation in technology sectors rather than over-reliance on foreign platforms (Goos, 2014).
- vii. Reducing Inequality: through progressive taxation; use taxes on capital-intensive tech sectors to fund social programmes: redistribution mechanisms: channel productivity gains into healthcare, education, and infrastructure for broad-based benefits Regional development policies that support lagging regions where technological disruption is more damaging.
- viii. Fostering Job Creation in New Sectors: Green economy: invest in renewable energy, waste management, and climate-smart agriculture. Digital economy that supports start-ups in Infinitect, e-commerce, health tech, and creative industries. Human-Centric Sectors: encourage employment in care services, education, and health, which are less prone to automation (Subskind, 2015).

However, in advanced economics, it focuses on retraining, innovation policies, and social protection, for example, Germany's dual education and training system. While emerging economies, like Nigeria, India, and Brazil, face the dual challenges of automation displacing jobs while digital skills remain scarce. Here, policies should prioritise digital inclusion, infrastructure, and upskilling. In developing economies, risk premature deindustrialisation due to automation. They need to behave with technology adoption policies that safeguard job creation in agriculture, manufacturing and services.

Therefore, policy responses to technological change must strike a balance between promoting innovation and protecting workers. Without proactive measures, technology risks deepening labour market inequality, but with the right policies, it can become a driver of shared prosperity (Destetand, 2016).

Labour market interventions are policies and programmes designed to improve employment outcomes, protect workers, and promote fairness in the workplace. When viewed through a gender lens, such interventions must address the unique barriers that women (and sometimes men) face in accessing, retraining, and advancing in employment.

The protection of workers' rights is essential for fostering fair and safe working conditions. Governments must enforce labour laws that establish minimum wage and uphold the right to unionise and collectively bargain. Addressing violations of labour standards is crucial to reducing exploitation and ensuring that all workers, regardless of their status, enjoy fair treatment (Sahm, 2003).

The paper is addressing issues on promoting decent work for all and gender disparities in labour markets: The International Labour Organisation's (ILO) decent work agenda, which seeks to secure rights, employment, social protection, and dialogue for workers, provides a framework for fostering inclusive labour markets, and trade unions are essential to implementing policies that promote dignity and productive work environments for all.

In this case, eliminating gender-based inequalities is key to fostering a more inclusive and dynamic social development.

Women in developing countries face significant barriers to entering the workforce, ranging from cultural norms to limited access to education and financial resources. Policies that focus on empowering women by providing access to skills, training, education, and entrepreneurship opportunities can drastically improve their labour market participation. Women's economic empowerment is a powerful tool for reducing poverty and driving development, as it unlocks untapped economic potential. (Seguono, 2010).

Reducing gender-based discrimination helps to achieve gender parity in the workforce. Governments and employers must strengthen anti-discrimination legislation and actively promote gender-sensitive hiring practices. By addressing biases in recruitment, promotions, and pay, gender disparities in the workplace can be reduced. Encouraging

companies to adopt inclusive practices that embrace diversity will not only improve fairness but also foster innovation and growth (Blinder, 2013).

Women's participation in the workforce can be greatly enhanced through policies that promote supporting work-life balance. Implementing family-friendly policies, such as paid parental leave and flexible working hours, ensures that both men and women can effectively balance their professional and personal responsibilities. This fosters a more inclusive workplace culture and can improve overall labour market participation.

Labour markets in developing countries are characterised by a complex set of challenges, including high levels of informal employment, migration, and persistent issues such as child labour and widespread poverty.

Addressing these problems requires a holistic approach that encompasses improving education and skills, enforcing labour standards, and promoting gender equality. By focusing on human capital development, enhancing social protection systems and creating inclusive policies, developing nations can build more equitable, sustainable labour markets that offer opportunities to all workers (Deming, 2017).

Through these efforts, labour markets can evolve into engines of economic growth that not only reduce poverty but also foster social cohesion and shared prosperity. Labour markets in developing countries are characterised by several unique features, including high levels of informal employment, wage disparities, and labour market segmentation. Informal employment, which includes street vendors, domestic workers, and other unstructured roles, accounts for up to 60% of the workforce in low-income regions. While this sector provides livelihoods for many, workers face significant challenges such as low wages, job insecurity, lack of social protection, and limited opportunities for upward mobility. These conditions contribute to economic inefficiencies, low productivity, and persistent poverty (Boseh, 2012).

A related issue is underemployment, where individuals work in jobs that do not fully utilise their skills or provide sufficient hours. This situation is particularly prevalent in the informal sector and exacerbates poverty and economic instability. Developing countries' labour markets are also marked by a split between agriculture and non-agriculture sectors. (Batcherman, 2004).

Agriculture, which remains the primary source of employment for many, is often low productivity and vulnerable to income volatility and climate change and often offers higher wages and more stability but remains constrained by informality and barriers to

transitioning from agriculture. These barriers include limited access to education, skill training, and financial resources. Addressing these challenges is essential for promoting inclusive economic growth and improving labour market outcomes' (Andernto, 2019).

Rural-urban migration is a significant trend in developing countries, driven by the search for better job opportunities in cities. While migration can stimulate economic growth, it also places pressure on urban infrastructure, contributes to higher unemployment rates, and exacerbates underemployment. This highlights the need for balanced labour development policies that promote both rural and urban opportunities.

Okojoic (2016) also highlighted additional labour market challenges in developing countries, which include child labour, migration, remittances and the pervasive effects of poverty. Child labour, especially in agriculture, deprives children of education and perpetuates the cycle of poverty. The lack of education and weak enforcement of labour laws contribute to this issue.

Migration, particularly international migration, can offer economic opportunities, but it also exposes migrant workers to exploitation, unsafe working conditions, and family separation. While remittances sent by migrant workers play a crucial role in supporting households, they can also make families vulnerable to external economic shocks. These interconnected issues required comprehensive and multi-faceted policy interventions to create inclusive and sustainable labour market development.

Poverty remains one of the most significant barriers to improving labour market outcomes in developing countries. It limits access to education, job opportunities, and overall economic resilience. The poverty trap keeps individuals in low-wage or informal jobs, especially in marginalised communities. Economic vulnerability compounds this, as those living in poverty are more susceptible to economic shocks, such as job losses, health crises, and natural disasters. To break the cycle of poverty, targeted interventions are needed. There include social protection programmes, expanded access to education, and economic diversification that creates stable and higher-paying jobs (Onibon, 2020).

Above all, labour market development strategies must focus on improving education, skills training, and social protection. Access to quality education is essential for upward mobility and economic growth. Vocational training programmes aligned with local economic needs can help address skills mismatches and ensure that workers are prepared for available job opportunities.

Additionally, promoting lifelong learning and reskilling initiatives is crucial to help workers adapt to evolving industries and new technologies. Strengthening social safety nets, such as unemployment insurance, healthcare benefits, and income support programmes, is vital for protecting workers, particularly in the informal sector, from economic hardship.

Enforcing labour standards, including fair wages and workplace safety, will improve job security and ensure that workers' rights are upheld. Gender equality policies, including anti-discrimination laws, work-life balance initiatives, and targeted support for women, can enhance workforce participation and reduce gender disparities (Awosu, 2023).

### **Conclusion**

The development of an equitable and sustainable labour market in developing countries requires a comprehensive policy approach. This should focus on enhancing education and skills development, ensuring social protection, and fostering gender equality. By addressing the root causes of informal employment, underemployment, and poverty, developing nations can create more inclusive, resilient, and productive labour markets that drive long-term economic growth and social welfare.

The technological change is inevitable, but its impact on labour markets is not predetermined. With forward-looking policies in education, labour regulation, social protection, and innovation, governments can mitigate job displacement, reduce inequality, and harness technology for inclusive economic growth.

### **Recommendation**

Policy responses to skill-biased technological change must strike a balance between promoting innovation and protecting workers. It has the undermentioned recommendations.

Invest massively in digital skills and lifelong learning. Strengthen social protection systems for displaced workers; update labour laws for gig and platform workers. Encourage public-private partnerships for reskilling and use industrial policy to align technology adoption with job creation. Without proactive measures, technology risks deepening labour market inequality, but with the right policies, it can become a driver of shared prosperity.

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