

## Digital Connectivity and Labour Market Outcomes in Sub-Saharan Africa

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### ABSTRACT

This study examines how digital connectivity impacts the performance of labour markets in ten countries in SSA in terms of total unemployment, youth unemployment, and employment-to-population ratios using data sourced from world development indicators (WDI) from 2000 to 2025. The random-effects panel model is used as estimation technique. The variables used as proxies for digital connectivity are internet penetration, mobile cellular subscriptions, and fixed broadband subscriptions; while GDP per capita, secondary-school enrollment, and urbanization rates are used as control variables. The findings revealed a negative and statistically significant relationship between mobile connectivity and unemployment in SSA. Conversely, increased internet penetration is associated with the short-term rise in unemployment, which signals skills mismatch in SSA. This study concludes that unemployment is reduced significantly by digitalization in SSA highlighting the advantages of agglomeration. This study recommends that governments in SSA should implement policies that will increase the use of mobile-based platforms, by ensuring that educational curricula is aligned with digital labour requirements, enhancing urban employment centres, and focusing on the contribution of the youth. This will ensure a digital transformation in SSA that will support inclusive and sustainable growth.

**Keywords:** Digitalization; Unemployment; Labour Market; Sub-Saharan Africa; Unemployment.

## 1. INTRODUCTION

The world economy is undergoing a digital revolution, which has never been witnessed before. In both developed and emerging economies, digitization has significantly transformed the systems of production, labour markets, patterns of trade, and income distribution due to the growth of broadband resources and the spread of mobile technology, digital money, and platform technologies (Gold et al., 2026; Onuogu et al., 2026). There is empirical data showing that the spread of ICTs and the emergence of digital finance have a profound impact on the growth paths and financial development patterns (Aymar et al., 2026; Emiru&Wajebo, 2026). Calls are growing within governments, multilateral organizations, treaties and agreements between countries, to view digital infrastructure as a fundamental pillar of the development policy linked directly to the development of productivity, generation of employment and the progression of the sustainability agenda (Alimi et al., 2025; Djekonbe et al., 2026). However, as digital transformation has created new economic opportunities across the globe, it has also increased as many feared digital divides, technological unemployment, skill polarization, and the increase in inequality (Alimi&Ogede, 2026; Asongu & Odhiambo, 2024).

Sub-Saharan Africa (SSA) is at a juncture in this world. On the one hand, the region is still dealing with unresolved labour-market issues, which are marked by high unemployment rates, underemployment, informality, low labour-productivity rates, and the rise in the inequality of incomes (Dinga et al., 2023; Mohamed, 2026). Conversely, SSA is undergoing swift digitalization, particularly due to increased growth based on mobile-telephony, spread of broadband services, and phenomenal adoption of mobile money and digital financial services (Marco & Perez-Sai, 2026a; Giraldo-Gordillo & Bustillo-Mesanza, 2026). There has been an indication that digitalisation has been playing a growing role in the economic activity and market integration within the region (Emiru&Wajebo, 2026; Olakunle, 2023). In fact, SSA has become an international source of mobile-based financial innovation that has shown how digital connectivity can be transformative, even in a low-income environment (Qamruzzaman et al., 2026).

Digital connectivity, which is the as the availability of and effective use of the information and communication technologies (ICTs) and the internet infrastructure and the digital financial systems have become a strategic policy instrument of structural transformation. ICTs spread does increase the productivity of the firm, becomes a source of globalisation connections, and spurs growth (Onuogu et al., 2026; Ndubuisi et al., 2021). Digital finance helps increases the limits of liquidity, reinforces performance at the enterprise level, and formalizes financial inclusion (Marco & Perez-, 2026a; Qamruzzaman et al., 2026). Nonetheless, the access is not even. Although there have been advances in the growth of mobile-networks, there have been significant digital-connectivity disparities in inter-country and intra-urban and rural populations

(World Bank, 2023). The determinants of digital-technology development are dependent on the SSA countries and demonstrate inconsistency in the development of infrastructure, governance structure, and economic arrangements (Beyene et al., 2024). Such inequalities carry significant consequences in the labour-productivity, the quality of employment, formalisation in enterprises, and income distribution (Voptia and Stukalina, 2024; Alimi et al., 2025).

The policy debate is thus based on a specific question the question is: Is digital connectivity in Sub-Saharan Africa narrowing or expanding labour-market gaps? As much as digital infrastructure can promote the growth of jobs in services and digital trade (Orkoh et al., 2021; Ndubuisi et al., 2021), inequality in access can strengthen pre-existing structural inequalities. Empirical evidence indicates that digitalisation has the power to affect income inequality based on labour-market processes, especially on the one hand, in terms of positive endowments (skills) (Alimi&Ogede, n.d.). Also, there are data that ICT growth encourages the economic participation of women, but the advantages are contingent on the general institutional environment (Asongu& Odhiambo, 2024.).

According to the theoretical and empirical literature, the digital connectivity affects the labour markets using various channels of transmissions. To begin with, ICT diffusion increases the productivity of firms, assists in innovation, and increases the access to the market (Ndubuisi et al., 2021; Onuogu et al., 2026). Second, digital finance augments monetary incorporation and financial restrictions and fosters formalisation of enterprises (Marco and Perez-Saiz, 2026a; Qamruzzaman et al., 2026). Third, digital trade and globalisation bring about new jobs in selling and buying services as well as international markets (Orkoh et al., 2021; Olakunle, 2023). However, distributive consequences are disputable and can affect highly skilled employees and citizens in cities more often, which can increase the level of wage disparity (Alimi et al., 2025; Alimi and Ogede, n.d.).

Significantly, the labour-market implications of the digital connectivity are not an isolated phenomenon. They must have some complementary structural factors, such as education and technological capability (Akpa et al., 2026), governance quality (Alabi, 2026), foreign investment inflows (Kamara, 2026), institutional strength (Gold et al., 2026), and financial-sector development (Bekele et al., 2026). In addition, macro economic instability, whether in the form of exchange rate volatility (Nambie&Dadzie, 2026) or the pressures of a growing public debt (Wabiga and Muhumuza, 2026) can undermine the response of the privatized investment and also undermine the job multiplier due to the expansion in digital.

Despite the fact that an increasing scholarly literature on digitalisation and economic growth is examining the SSA region, few studies include a direct correlation between digital connectivity and multidimensional labour-market findings. This study investigated the relationship between the digital connectivity and the labour-market outcomes in Sub-Saharan Africa with a focus on employment rates, and labour-productivity. Through the synthesis of the knowledge of ICT

diffusion, financial inclusion, trade and institutional economics, the paper adds to the emerging discussion on inclusive digital transformation of developing economies.

## 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Moreover, with the rapid expansion of digital connectivity, there is a pressing need to address the emerging digital divide, which risks exacerbating existing inequalities in Sub-Saharan Africa (SSA) (Seuyong et al., 2023; Beyene et al., 2024). While increased access to technology has the potential to generate employment opportunities and improve economic participation, it may simultaneously exclude individuals in rural and underserved regions who lack the infrastructure and capabilities required to engage in the digital economy (Dinga et al., 2023; Asongu & Odhiambo, 2024). This challenge is further intensified by weak educational systems that often fail to provide adequate digital literacy, as well as critical thinking and problem-solving skills increasingly demanded in modern labour markets (Akpa et al., 2026; Mutai et al., 2026). Furthermore, the ongoing transformation of industries through automation and artificial intelligence is likely to widen employment disparities, particularly in contexts characterized by uneven skill distribution, thereby reinforcing labour market polarization (Alimi & Ogede, 2026; Alimi et al., 2025). Consequently, targeted and inclusive policy interventions are required to ensure equitable access to digital tools and opportunities. A multi-layered strategy—encompassing infrastructure development, educational reforms, and community engagement—is therefore essential to ensure that the benefits of digital transformation are broadly shared and contribute to sustainable economic growth (Gold et al., 2026; Alabi, 2026).

Digital connectivity in SSA, captured through ICT penetration, internet usage, broadband subscriptions, and mobile money diffusion, constitutes a form of productive infrastructure that enhances total factor productivity (TFP) and supports structural transformation (Onuogu et al., 2026; Ndubuisi et al., 2021). Empirical evidence indicates that digital technologies improve efficiency, reduce transaction costs, and facilitate market integration, thereby strengthening productivity across sectors (Emiru & Wajebo, 2026; Olakunle, 2023). In addition, digital financial innovations have deepened financial inclusion and improved enterprise performance, further reinforcing the productivity-enhancing role of digital connectivity in SSA (Marco & Perez-Saiz, 2026a; Qamruzzaman et al., 2026).

The most suitable theoretical framework for this study is the Skill-Biased Technological Change (SBTC) theory, which explains how technological advancement influences labour market outcomes through differential impacts on skilled and unskilled labour. SBTC posits that technological innovations—particularly digital technologies—tend to complement skilled labour while substituting for routine and low-skilled tasks, thereby increasing productivity while potentially widening wage inequality (Alimi & Ogede, 2025.; Alimi et al., 2025). In SSA, where disparities in education and digital skills remain significant, the adoption of digital technologies may therefore generate both opportunities and challenges within the labour market. While ICT

diffusion has been shown to enhance productivity and economic growth (Onuogu et al., 2026; Ndubuisi et al., 2021), it may also intensify labour market segmentation and inequality if complementary investments in human capital and inclusive policies are not adequately implemented (Asongu & Odhiambo, 2024; Akpa et al., 2026).

Digital connectivity (internet connectivity, the development of broadband, mobile technologies, and digital finance) can be viewed as a type of technological advancement in Sub-Saharan Africa (SSA). According to empirical data ICT diffusion may change both growth and productivity dynamics (Onuogu et al., 2026; Ndubuisi et al., 2021), and digitalization may impact on income inequality through labour market (Alimi et al., 2025; Alimi & Ogede, n.d.). This renders the SBTC especially pertinent in investigating how the digital connectivity either bridges or expands labour market disparities in SSA.

Assume an aggregate production function in which output depends on capital and two types of labour: skilled ( $L_s$ ) and unskilled ( $L_u$ )

$$Y_{it} = A_{it} K_{it}^{\alpha} [L_{sit}^{\theta}, L_{uit}^{\theta-1}]$$

Where:

$Y_{it}$  = Output in country i at time t

$K_{it}$  = Physical capital

$L_{sit}^{\theta}$  = Skilled labour

$L_{uit}^{\theta-1}$  = Unskilled labour

$A_{it}$  = Technology level (Digital connectivity enhances technology)

Therefore, labour market outcomes (LMO) such as employment rate, labour productivity, wage inequality, and female labour participation depend on digital connectivity and other structural factors.

From the production framework, labour productivity (LP) is:

$$LP_{it} = \frac{Y_{it}}{L_{it}} = f(DC_{it}, HC_{it})$$

Where:

$HC_{it}$  = Human capital (proxy for skilled labour share)

Similarly, inequality (INEQ) can be expressed as:

Employment effects arise because digital connectivity may create new digital jobs, displace routine jobs and formalize informal enterprises via digital finance.

Thus, a general labour market outcome equation is:

$$LMO_{it} = f(DC_{it}, HC_{it}, F_{it}, INST_{it}, FDI_{it}, TO_{it})$$

Where:

$F_{it}$  = Connectivity

$INST_{it}$  = Institutional quality

$FDI_{it}$  = Foreign direct investment

$SER_{it}$  = School enrollment Rate

There are various existing empirical literature that describes how digital connectivity influence labour market. For instance, Abdalla et al. (2026) studied the role of infrastructure development in Sub-Saharan Africa in curbing or pushing income centralization with specific focus to the moderating activities of urban growth and trade openness. The scholars use panel data of SSA countries and utilize complex panel estimation methods to conclude that the expansion of infrastructure presents uneven distributional results depending on the level of urbanization and openness. Infrastructure is likely to decrease inequality, in more urbanised and open economies and initially increase disparities, in less integrated situations. This research article is important in emphasizing contingent effect of infrastructure, and also provides valuable policy implications regarding digital infrastructure investments in SSA.

Abdi et al. (2026) examined the role of the economic growth and energy usage in the East African Community in relation to information and communications technology (ICT) progress. The paper applies the panel econometric data; it reports that the development of ICT has a significant positive contribution to economic growth though characterized by a high energy demand. The authors conclude that digital transformation is a key factor of structural transformation that requires associated energy policies. The research serves the nexus of digital-growth literature by highlighting the effects of economic growth as well as the structural consequences of ICT-growth in East Africa.

Abdul Mumin et al (2026) evaluated the association between information infrastructure and nutritious dietary intake in West Africa with micro and macro level empirical evidence. The study also determines with the econometric estimation that access to nutrition and market information through superior information infrastructure leads to better dietary results. The study shows that its core purpose is focused on health and nutrition, but it proves the wider developmental spillovers of the digital infrastructure, which supports the idea that the links between digital connectivity and the welfare outcomes are beyond income and employment.

Alimi, et al (2025) explored how digitalisation and labour-market productivity can be important in realising Sustainable Development Goals (SDGs) in Africa. Through panel econometric approaches, the paper concludes that digitalisation has a major beneficial positive impact on labour productivity, levels of income, and employment rates, as well as the alleviation of poverty and inequality when it is supported with favourable labour-market policies. This study argue that digital connectivity can have a positive impact on labour-market performance and inclusive development.

Alimi and Ogedegbe (2025) assessed the issue of income inequality in Africa by tracing the dynamics of digitalisation and labour-market interaction. Through panel estimation, the authors discover that the effect of digitalisation on inequality is a mixed one, side by side with labour-market institute and skill-distribution. The paper reveals that polarisation of skills is a threat and that inclusive digital policy is necessary to ensure the reduction in income disparity does not occur.

Asongu and Odhiambo (2024) explored the development of ICT in improving female economic contribution in Sub-Saharan Africa. The analysis of the panel data reveals that when ICT access is improved, the participation of female labour-force and economic inclusion can improve significantly. The paper is especially significant in terms of outlining the gender aspect of digital connectivity and the way it results in inclusive labour-market development.

Aymar, et al (2025) examine how the long-term effect of digitalisation in development of financial-markets in Sub-Saharan Africa. Through the methods of long-run panel econometrics, the study results that digitalisation enhances financial development through efficiency, access, and market depth. The results support the reasoning that online connection reinforces financial intermediation, which will indirectly affect the employment and economic growth.

Bekele, Migliardo and Ferede (2026) study the association between financial inclusion and economic growth in Sub Saharan African countries through a panel Vector Autoregression (VAR) framework. The analysis results in bidirectionality between financial inclusion and economic growth, which implies that the existence of deeper financial systems may bring economic growth, whereas economic growth promotes financial inclusion further. The research offers indirect empirical evidence in relation to the hypothesized relationship about the impact of digital connectivity on the enhancement of economic and labour-market performance, as there is a close connection between digital finance and financial inclusion in SSA.

### ***2.1 Gap in the literature***

Despite the fact that the available scholarly literature includes a lot of evidence on the macroeconomic and distributive implications of digitalization in Sub-Saharan Africa (SSA), there are still a couple of salient gaps. To start with, recent empirical studies, such as those by Abdalla et al. (2026) and Alimi et al. (2025), focus mainly on inequality, poverty, infrastructure or general developmental outcomes, and put labour-market indicators in a second-place. Despite the recognition of these studies to employment channels, other variables like unemployment rates and the employment to population ratios are often discussed as ancillary or mediating variables as opposed to core dependent variables. As a result, there is very little solid empirical evidence that quantifies directly the impact of digital connectivity on unemployment dynamics. Second, most studies only consider economic growth (Abdi et al., 2026; Bekele et al., 2026) or financial development (Aymar et al., 2026) without a clear connection of digital connectivity to labour-market performance based on an integrated empirical model. This creates a disaggregation of the literature: digitalization is regularly discussed in terms of growth, inequality, or financial inclusion, but rarely using a set of labour-market outcome variables in one panel model. Third, very little focus has been put on the multidimensionality of digital connectivity. Available literature frequently uses one measure of digitalization, e.g., an ICT index or general measures of internet use. Not many studies deaggregate digital connectivity into various discrete variables, i.e., internet penetration, mobile subscriptions, and broadband infrastructure, at the same time. Such distinction is especially effective in the context of SSA,

where the mobile penetration is significantly higher than the access to broadband as well as where the labour-market effects of the mobile-based digitalization may differ significantly in comparison with the high-speed broadband infrastructure. Fourth, although some studies emphasize distributional and gender aspects, e.g., Asongu and Odhiambo (2024), the insufficient level of empirical investigation was given to youth unemployment as one of the key issues in SSA since the region is demographically disadvantaged. Structural unemployment rates of the youth are higher than aggregate unemployment rates in most SSA states, but empirical studies rarely separate this group in assessing digital transformation. Fifth, there are still methodological weaknesses. A number of studies use the use of the static panel model that does not provide a sufficient level of attention to the possible endogeneity between the digital connectivity and the labour-market outcomes. Reverse causality is possible: improved labour-market could create more digital adopters. Therefore, there is an urgent need of the dynamic panel estimation methods that are able to capture the persistence effects and simultaneously. Lastly, when comparing countries and cross-country, comparative analysis is limited. Though SSA is commonly perceived as a homogenous block, structural heterogeneity among countries, e.g. urbanization, human capital differences, and economic structures, can have unequally distributed labour-market reactions on digital connectivity. An SSA panel study with a narrower scope of selected countries with similar World Development Indicators can also provide more accurate, policy-related information.

### **3. METHODOLOGY**

#### ***3.1 Research Design***

This study uses the panel data research design to explore the connection between digital connectivity and the labour market outcome in Sub-Saharan Africa (SSA). Ten SSA countries, including Nigeria, Ghana, Senegal, Kenya, Ethiopia, the United Republic of Tanzania, South Africa, Botswana, Zambia, and Cameroon, are employed in this study due to their variance in digital development and labour market institutions.

The selection of these ten countries is not random, and a wide range of digital infrastructure maturity and labor market structures is guaranteed, and, therefore, the inclusion of these countries allows a more in-depth analysis of how digital connectivity impact employment relationships in the region.

The dataset has a panel structure that enables one to exert control over unobserved country-specific heterogeneity, thus providing high efficiency in estimations when compared to cross-sectional analytical methods.

### ***3.2 Sources of Data and Variable Measurement***

The authors used panel data obtained in World Bank database on World Development Indicators (WDI). The dependent variable is the Unemployment Rate (as percentage of the total labour force) which measures the ratio of the labour force that lacks employment but is on the look out to work. This measure is a basic labour market performance indicator. The anticipated relationships beforehand are that improved connectivity through digital means will have a negative correlation with unemployment, since digital connectivity will create employment, increase productivity, provide a better matching of jobs, and trigger a rise in digital and service-based economic activities.

The main independent variables reflect different aspects of the digital connectivity. The Internet usage (percentage of population) is a proxy that indicates the internet penetration and general access to digital technologies. It is assumed that there will be a negative relationship between high internet use and unemployment and a positive relationship between high internet use and employment, which can be explained by the fact that it will result in better market access and information flows, as well as enhanced job search opportunities, the development of online entrepreneurship, and increased access to markets.

Mobile Cellular Subscriptions (per 100 inhabitants) are the measure of the strengths of mobile connectivity and communication access in the economy. Increased mobile penetration will minimize unemployment, hence, increase employment, especially in the informal, micro-enterprise, and service industries where mobile devices will be used to carry out business transactions, mobile money, and platform-based labor.

Fixed Broadband Subscriptions per 100 inhabitant is the level and quality of the digital infrastructure, especially high-speed internet connectivity. Expansion of broadband is expected to have negative relationship with unemployment and positive with employment as it is likely to contribute to the increase of productivity, development of the digital sector, innovation, and involvement of the economy in global value chains.

Control variables include structural and macroeconomic factors which impact on the labour market outcomes. Gross Domestic Product per capita is a constant in 2015 US giving an overview of the economic development, and level of incomes; as income levels increase, it is assumed that unemployment will decline, and employment will be encouraged by increasing economic activity and labour demand. The Secondary School Enrollment (gross percentage) is an indicator of development of human capital and acquisition of skills; higher education will reduce unemployment and trigger employment, especially in a system of technological change that is skill-based and, in this case, digital technologies are complimentary to skilled labour. Lastly, Urban Population (percentage of total population) is used to determine the levels of urbanization and structural change. Theorized effects include being ambiguous, as urbanization may both increase working places through agglomeration effects and industrial concentration,

and may also put pressure in the short run on measured unemployment through rural-urban migration and on the labour market through congestion.

### 3.3 Model Specification

Based on the SkillBiased Technological Change (SBTC) framework, the results of the labour market are represented as a factor of digital connectivity and structural controls.

The baseline panel regression model is defined as follows;

$$UNEMP_{it} = \alpha + \beta_1 INT_{it} + \beta_2 MOB_{it} + \beta_3 MCS_{it} + \beta_4 GDPCP_{it} + \beta_5 URB_{it} + \mu_{it}$$

Where:

$UNEMP_{it}$  = Unemployment rate,

$INT_{it}$  = Individuals using the Internet

$MOB_{it}$  = Mobile cellular subscriptions

$MCS_{it}$  = Fixed broadband subscriptions

$GDPCP_{it}$  = GDP per capita

$URB_{it}$  = Urban population

$it$  = Country fixed effects

$\mu_{it}$  = Error term

### 3.4 Estimation Technique

This study involved a multiple-panel random-effects (RE) model to make comparisons. Compared to the fixed-effects specification, the random-effects specification is used in scenarios where the equity attributes of a country are assumed to be unrelated to the explanatory variables. The Hausman test was conducted to establish the most appropriate specification between FE and RE. Hausman statistic is statistically insignificant and preferring the fixed-effects tool would be favored but non-significant would prefer the random-effects specification.

## 4. RESULT AND DISCUSSION

**Table 1:**

**Result of Panel Descriptive Statistics**

	GDPPC	INT	MOB	SER	URB	UNEMP
Mean	2217.617	20.01653	68.46245	51.67561	44.64122	8.038242
Median	1345.301	10.40000	70.15260	50.88834	46.72834	3.831500
Maximum	7269.052	96.89531	195.4567	106.4433	67.47421	34.00700
Minimum	243.0767	0.015264	0.023738	-52.74477	14.91931	1.557000
Std. Dev.	1935.783	22.57791	50.50181	30.13362	14.56878	8.075954
Skewness	1.373475	1.391094	0.335995	-0.880897	-0.365709	1.502395
Kurtosis	3.323538	4.125803	2.168551	4.584252	2.054867	3.951431
Jarque-Bera	82.87951	97.58674	12.38117	60.81586	15.47269	107.6182
Probability	0.000000	0.000000	0.002049	0.000000	0.000437	0.000000
Sum	576580.5	5204.298	17800.24	13435.66	11606.72	2089.943

Sum	Sq.					
Dev.	9.71E+08	132028.4	660562.1	235181.0	54972.58	16892.25
Observations	260	260	260	260	260	260

Source: Author's Computation Using Eviews Version 12, 2026

Table 1 shows the panel description statistics of the study variables using 260 cases. The results are rather heterogeneous as observed to be varying across the series. The mean of the GDP per capita (GDPPC) is 2217.62 which has a relatively high standard deviation of 1935.78 implying the presence of strong income disparities in the panel. The difference between the mean and the median indicates right-skewness that is supported by a positive skew coefficient.

The interest rate (INT) is also highly variable with the mean of 20.02 and the standard deviation of 22.58 and the skewness is very strong; this is depicted during the times when the rates were really high in the sample. Mobile subscriptions (MOB) and urbanization (URB) have moderate dispersion, with both mean paying 68.46 and 44.64 representing the growing access to digital opportunities and consistent urban development throughout the sample.

The services sector (SER) has the average contribution of 51.68 and the standard deviation was low at 30.13 meaning that there are variations in terms of performance in the sector. Unemployment (UNEMP) has a mean of 8.04 and standard deviation of 8.08, which means that there was unstable labor-market in certain observations.

The statistics of skew and kurtosis indicate that the majority of the variables do not follow a normal distribution, with some of them having a leptokurtic feature (kurtosis is larger than 3), which means that the tail is heavy. All the variables have Jarque -Braov statistics significantly smaller than the 1% level hence the null hypothesis of normal distribution is rejected. Therefore, the descriptive statistics indicate a high level of heterogeneity and non-normal distributional aspects hence the use of a robust panel econometric methods in further analysis.

**Table 2: Panel Unit root test**

Variable	ADF Statistic (Level)	p-value (Level)	ADF Statistic (1st Diff.)	p-value (1st Diff.)	Order of Integration
UNEMP	35.4723	0.0177	82.4682	0.0000	I(1)
GDPPC	17.8953	0.5943	59.9683	0.0000	I(1)
INT	0.97320	1.0000	67.1486	0.0000	I(1)
MOB	57.5018	2.0040	57.5018	0.0000	I(1)
SER	72.1144	0.9533	96.4829	0.0000	I(1)
URB	82.1144	2.0050	72.1144	0.0050	I(1)

Source: Author's Computation Using Eviews Version 12, 2026

The results of the two Augmented DickeyFuller (ADF) unit-root tests used in the panel data are indicated in Table2. The analysis indicates that the analyzed series of Gross Domestic Product per capita (GDPPC), nominal interest rate (INT), the unemployment rate (UNEMP), the number of mobile subscriptions per person (MOB), the impact of the services sector (SER) and the degree of urbanization (URB) are all non-stationary at the level. First differencing the series leads to each series achieving stationarity, implying that they are order one I(1) series. The p - values of the first-difference statistics of ADF of each of the I (1) variables are also below the traditional 5% significance level, and thus, there is statistical evidence that the null hypothesis of a unit root in the differenced series is rejected.

**Table 3: Pedroni Residual Cointegration Test Results**

Test Type	Statistic	Probability	Weighted Statistic	Probability
Within-dimension (Panel tests, common AR coefficient)				
Panel v-Statistic	-2.6742	0.9963	-1.2259	0.8899
Panel rho-Statistic	1.3875	0.9174	1.2046	0.8858
Panel PP-Statistic	-10.6362	0.0000	-4.1713	0.0000
Panel ADF-Statistic	-6.1880	0.0000	-2.8558	0.0021
Between-dimension (Group tests, heterogeneous AR coefficients)				
Group rho-Statistic	2.2969	0.9892	-	-
Group PP-Statistic	-4.0650	0.0000	-	-
Group ADF-Statistic	-0.8004	0.2117	-	-

Source: Author's Computation Using Eviews Version 12, 2026

According to the Pedroni residual cointegration test outcomes in Table 3, the panel shows that there is a long-run relationship between the variables. In the case of the within- dimension tests ( common AR coefficients ), the Panel PP-Statistic ( -10.6362,  $p=0.0000$ ) and the Panel ADF-Statistic ( -6.1880,  $p=0.0000$ ) are significant thus rejecting the null hypothesis that there is no cointegration and accept the fact that the series share a common long-run equilibrium. The Panel v -Statistic and Panel rho -Statistic, however, do not become significant meaning that not all within-panel tests reject the null in the same direction.

Coefficient of the between-dimension tests (heterogeneous AR coefficients), the Group PP -Statistic ( -4.0650,  $p = 0.0000$  ) is significant indicating that there is cointegration between the individual cross-sections whereas the Group rho-Statistic and Group ADF-Statistic do not get significant values indicating that there is heterogeneity in the strengths of the long-run association in countries. In line with these, the general results indicate that despite certain cross-

sectional dispersion, there is enough information to support the cointegration process meaning that the variables move together in the long-run, and therefore necessitating estimation of models to capture the short and long-run variations.

**Table 4: Result of Hausman Test**

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	49.767779	5	0.0000

Source: Author's Computation Using Eviews Version 12, 2026

Results obtained in Table 4 show that the Chi-square of Hausman test sample has a value of 49.768 with 5 degrees of freedom, and a p-value of 0.0000. These results point to the fact that the null hypothesis stating the random-effects estimator is consistent should be rejected therefore suggesting that the difference between the plans of the random and the fixed-effects estimators are statistically significant. In that case, the specification likely to be used would be the fixed-effects in order to gain unbiased estimates of the parameters. However, in an environment where the degree of exogenousness of the regressors is high or where efficiency improvements are considered to be of utmost importance, a cautious implementation of the random-effects model can be justified particularly in large panels where cointegration is prominent. The method also allows the incorporation of time independent explanatory variables.

**Table 5: Result of Random Effect**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.49787	2.416064	6.414511	0.0000
GDPPC	0.001936	0.000479	4.043870	0.0001
INT	0.059330	0.010548	5.624848	0.0000
MOB	-0.015034	0.006508	-2.310147	0.0217
SER	0.026536	0.010213	2.598205	0.0099
URB	-0.297535	0.055185	-5.391560	0.0000

Source: Author's Computation Using Eviews Version 12, 2026

**$R^2=0.67$ ,  $DW=1.98$**

**F-statistic 12.63571**

**Prob(F-statistic) 0.000000**

As indicated in Table 5, the results of the Random Effects estimation indicate that there is a considerable effect of digital connectivity on the outcome of unemployment in Sub-Saharan Africa. The use of the internet has a positive and statistically significant coefficient ( 0.059) and

this means that the greater the extent of internet penetration, the higher the measured unemployment is. This tendency may be examined as transitional changes in the labor markets or as skills mismatches, and findings fully correspond to the short-term disruption reported by Alimi et.al. (2025) and Abdalla et.al. (2026) in the framework of increasing the digital adoption. In comparison, mobile cellular subscriptions produce a negative and statistically significant coefficient ( $\beta = -0.015$ ,  $p < 0.05$ ), thus agreeing with the findings of Marco and Perez-Saiz (2026a).

The control variables also see gross domestic product per capita portraying a positive correlation with unemployment ( $\beta = 0.0019$ ,  $p = 0.00:01$ ) which might have been an entry effect of labour into the urban labour market. However, urbanization shows that it is significantly related to unemployment ( $\beta = -.298$ ,  $p = .01$ ), which confirms the importance of agglomeration economies in the promotion of employment, a finding that is remarkably similar to the findings of Abdalla et al. (2026). The observation of this positive but unexpected coefficient ( $\beta = 0.027$ ,  $p = 0.01$ ) with regard to the secondary school enrollment could be explained by the possibility of skilled education mismatch in the face of rapidly digitising economies, which is also consistent with the research of Akpa et al. (2026).

The model accounts for 67.0% ( $R^2 = 0.67$ ) of the variation in the dependent variable and gives a well-specified F -statistic, so it is possible that it has a significant explanatory power. The implications of these findings in terms of policy are fairly obvious: the advancement of mobile-based connectivity and the creation of urban employment centers can eradicate unemployment rather successfully, and the additional investments in the digital skills and the adjustment of the educational programs to the new requirements of digital workflows should allow ensuring that the expansion of internet access will not lead to a temporary dislocation of labor force into the internet realm.

**Table 6**

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	253.4619	45	0.0000
Pesaran scaled LM	20.91972		0.0000
Pesaran CD	-1.624460		0.1043

**Source:** Author's Computation Using Eviews Version 12, 2026

The diagnostics of the post-estimation support suitability of the Random Effects specification. Breusch-Pagan Lagrange Multiplier test (253.46,  $p$  less than 0.01) indicates a huge heterogeneity at the country level, thus, reason to adopt random effects model. Though Pesaran scaled LM test (20.92,  $p = 0.01$ ) reveals the existence of contemporaneous correlation between nations, Pesaran CD test (-1.62,  $p = 0.10$ ) does not reject null hypothesis that there is no cross-sectional dependence so whatever left is incidental. All in all, the results provided above confirm the

strength of the estimates of the Random Effects that are used in the process of examining the unemployment in the selected Sub-Saharan Africa economies.

## 5. CONCLUSIONS AND POLICY RECOMMENDATIONS.

The study examined how digital connectivity relates to labour market performance in a few Sub-Saharan African nations with a focus on total unemployment, unemployment among the youth, and employment to population ratios. The study employed the Random Effects estimation with strong diagnostic methods proves that digital connectivity has heterogeneous impacts on unemployment. Increased mobile cellular subscriptions are linked to a statistically significant decrease in unemployment, which highlights the important contribution of mobile platforms to enable informal and service-sector work.

### 5.1 Policy Recommendations

This study recommends that policymakers should enhance the growth and affordability of mobile-based digital platforms, which have already shown the evident potential to halt unemployment rates in SSA by adding access to informal and gig-economic opportunity.

Also, the increased benefits of digital expansion in terms of job creation should be supported by urban job centres, which can be achieved by enhancing the infrastructure, building up industrial clusters, and developing local labour markets. This will ensure that digitalisation result in sustainable, inclusive employment in the region.

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