

ORIGINAL ARTICLE

Nexus between being landlocked and living standards in Sub-Saharan African countries: A two-step System GMM analysis

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ABSTRACT

The ultimate objective of the study was to investigate the effects of being landlocked on the living standards in Sub-Saharan African (SSA) countries from 1991 to 2019. Adopting the two-step estimation technique of System GMM (generalized method of moments), the study found that being landlocked has a negative and significant effect on the living standards in SSA countries when using GDP per capita as the living standard measure. Moreover, the historical living standard experiences of SSA countries have a positive and significant influence on the current living standard level. In addition, the population growth rate has a positive and significant effect on the living standards in SSA countries. On the other hand, the official exchange rate, broad money as a percentage of GDP, and inflation have a negative and significant effect on the living standards in SSA countries. Generally, the estimated result reveals the existence of a significant variation in the living standards in landlocked and coastal SSA countries. This study suggests that regional integration between landlocked and transit countries should be improved to minimize entry costs and increase access to global markets for landlocked countries. We argue that this study is of interest to landlocked and coastal countries to increase trade integration and promote the development of both groups, and it will contribute to the scarce empirical evidence.

Keywords: GDP per capita; landlocked; living standard; Sub-Sahara Africa; System GMM

1. Introduction

Economic growth helps communities to raise their living conditions, including those at the very bottom (Rodrik, 2007). Thus, economic growth is one of the major objectives of all nations and an important issue in the world political economy to improve living standards and bring economic development (Batu, 2016; Timsina, 2014). In addition, the economic development process encourages the growth and restructuring of an economy to advance the economic well-being of the community to advance the quality of life (*International Economic Development Council*, 2000) and contribute to the improvement of the medical condition, school system, income distribution, and living standards (Haller, 2012).

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The subject of economic growth has received growing interest in various studies over the last few decades, and one of the most fundamental economic issues that have gained focus has been to pinpoint the determinants of economic growth (Batu, 2016). However, a new focus has been given to the economic effect of geographical positions recently, mainly on the cost of being landlocked. Thus, recognizing the cost of being landlocked and its economic effects is vital from a development viewpoint, because 20% of the world and 33% of Sub-Saharan African (SSA) countries are landlocked (United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLLS), 2019; Arvis et al., 2007).

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Landlocked developing countries (LLDCs) suffer from long distances to global markets, inefficient transit processes, and inadequate logistics to carry goods to their destinations without significant delays, which in turn, leads to high transport costs and other market transaction costs and limited foreign trade. LLDCs are distinguished by lower per capita income, since they are generally dependent on their transit neighbors' markets, infrastructures, and institutions for transporting goods to ports, which dramatically affects the poverty reduction and economic integration goals of the countries (UN-OHRLLS, 2014). Combining all these facts, it can be inferred that LLDCs face more difficulties in economic development, and geographical variables have put them at a major disadvantage in the development phase relative to coastal countries (International Telecommunication Union (ITU) and UN-OHRLLS, 2013).

There are 44 landlocked countries and 5 partially recognized landlocked states located on four continents of our world (UN-OHRLLS, 2019). Based on the World Bank Classification, the United Nations lists 32 of them as LLDCs that are low and middle-income countries, where Sub-Saharan Africa has the largest number of landlocked countries in the world, having 16 out of 32 LLDCs (see **Figure 1**) and most of them are extremely poor and have the lowest GDP per capita in the world (Gorigledhzhan, 2014). Thus, this study mainly aimed to investigate the nexus between being landlocked and living standards in SSA countries, as the well-being of over 1.04 billion inhabitants of the world's 16 LLDCs is at stake.

2. Literature review

2.1. Being landlocked and living standards

Due to the fact that 20% of the world's countries and 33% of SSA nations are landlocked, recent studies have placed a greater emphasis on



Figure 1. Landlocked countries in Africa

the costs of being landlocked, as well as its economic ramifications, from the development aspect (UN-OHRLLS, 2019; Arvis et al., 2007). Geographic isolation, lack of direct access to the open sea, and high transportation and transit costs put landlocked countries at a significant economic disadvantage compared with the rest of the world. A country that is landlocked is more likely to be impoverished. Most countries without access to the coast are among the poorest in the world, and their citizens are among the poorest billion of the population (Goldberg, 2017). Because landlocked countries rely on the markets, infrastructures, and institutions of their transit neighbors to get their commodities to port, these countries have lower per capita incomes and are categorized as least developed (UN-OHRLLS, 2014).

The lack of access to the open sea is one of the most prevalent geographical factors blamed for a country's poor growth and development, and Collier (2008) identified being landlocked as one of the primary factors driving poverty in such nations. Landlocked countries are more prone to poverty and have lower socioeconomic conditions than those of poor developing coastal countries due to their lack of direct access to seaborne trade (ITU and UN-OHRLLS, 2013; Chowdhury and Erdenebileg, 2006). Furthermore, many transit countries levy fees and road tolls, which raises costs even further (Faye et al., 2004).

It is widely acknowledged that landlocked countries confront greater economic development challenges compared with those of coastal countries and that their economies are especially vulnerable to external economic shocks (Taglioni et al., 2016). The average value of GDP per capita in landlocked developing countries is 43% lower than in coastal countries (Taglioni et al., 2016; Gorigledzhzhan, 2014); on average, they trade 30% less than do coastal countries, and being landlocked reduces average growth by about 1.5% to 2% compared with those of coastal countries

(Arvis et al., 2007), which necessitates investigating the nexus between being landlocked and living standards in the study area.

2.2. Factors affecting GDP per capita

A United Nations study highlighted that Sub-Saharan Africa is the only developing region in the world where the number of people living in severe poverty has risen since 1990 (Gorigledhzhan, 2014). It is generally admitted that LLDCs face more difficulties in economic development than countries with access to the coastline (UN-OHRLLS, 2019).

Landlocked countries exported just 61% of the trade volume of a comparable coastal economy in 2010 and the cost of trade and transportation services in these countries has escalated over time (UN-OHRLLS, 2014). Landlocked economies bear a cost penalty ranging from 8% to 250%, as well as a time penalty ranging from 9% to 130%, for using coastal neighbors as transit route, and landlocked countries have a 20% lower level of development than coastal countries due to being landlocked (Arvis et al., 2007). Bosker and Garretsen (2009), Bloom, Canning, and Sevilla (2003), and Masters and Sachs (2001) have all documented the negative impact of being landlocked on income/growth (2001).

Being landlocked often coincides with other factors that affect economic development (UN-OHRLLS, 2019). Sultana (2018) and Phibian (2010) found that inflation rate and money supply are significantly responsible for sustainable economic growth, thereby creating employment opportunities, decreasing poverty, and increasing per capita income and living standard. Acharya and Basnet (2019) found a significant and positive relationship between GDP and macroeconomic indicators, such as the consumer price index, flow of money, and foreign assistance.

Based on economic theories, the exchange rate as a monetary variable that affects long-run growth is seen as a bit puzzling, especially the negative effects (Miles, 2006). Morina et al. (2020), Ping (2011), Aghion et al. (2009), and El-Ramly and Abdel-Haleim (2008) found a negative impact of real exchange rates' volatility on economic growth, contributing to a low GDP per capita. However, Kogid et al. (2012), Chen (2012), and Tarawalie (2010) showed a positive and significant long-run co-integration between both nominal and real exchange rates and economic growth.

Inflation as a macroeconomic variable influences the living standard in a country (Gagarawa and Mehrotra, 2017), and can lead to social and political instability and disorder and hinder economic growth (Wang and Zou, 2011). Studies conducted by Sare, Ibrahim, and Musah (2019), Hossin (2015), Kasidi and Mwakanemela (2013), Ahmad, Ahmad, and Ali (2013), and Quartey (2010) established the negative impact of inflation on economic growth. However, Behera (2014), Osuala, Osuala, and Onyeike (2013), and Ahmad and Luqman (2012) found a significant positive relationship between inflation and economic growth.

The total volume of currency in circulation and demand deposits play a crucial role in attaining economic growth (Mahara, 2020). Mahara (2020) and Hussain and Haque (2017) revealed that money supply has a significant influence on the long-term growth rate of GDP. Gnawali (2019), Sultana (2018), and Gatawa, Abdulgafar, and Olarinde (2017) documented the positive effect of the variable on GDP. However, Odumusor (2019), Sulaiman and Migiro (2014), and Ogunmuyiwa and Ekone (2010) found that it has a negative relationship with economic growth.

Peterson (2017) made the contentious claim that if the growth rates of population and GDP per capita are genuinely independent, a higher population growth rate will lead to a higher economic growth rate. He also showed that low population growth in high-income nations is likely to cause social and economic problems, whereas a larger population increase in low-income countries may postpone development. Bucci (2015), Sethy and Sahoo (2015), Tumwebaze and Ijjo (2015), and Mierau and Turnovsky (2014) all found that population growth has a favorable impact on per capita economic growth. Huang and Xie (2013), Yao, Kinugasa, and Hamori (2013), and Furuoka and Munir (2011), on the other hand, revealed that population growth and GDP per capita have a negative association.

The studies analyzed so far have shown that numerous experiments have been undertaken to recognize factors influencing economic growth. However, to the best of the researchers' knowledge, no analysis has yet been undertaken to investigate the relationship between being landlocked and living standards in combination with other factors, such as population growth, official exchange rate, inflation, and money supply, as control variables for Sub-Saharan Africa. Thus, this research aimed to add evidence to the existing limited literature in the context of Sub-Saharan African countries by examining the nexus between being landlocked and living standards using the two-step estimation of System GMM (generalized method of moments).

3. Methodology of study

3.1. Data source and research design

This study investigated the nexus between being landlocked and living standards in SSA countries over the period from 1991 to 2019. The panel data used in this study were obtained from the World Bank data collection of the World Development Metrics (World Bank, 2020) for 33 Sub-Saharan African countries having balanced panel data for the study period out of 46 Sub-Saharan African countries classified based on the United Nations Development Programme. Based on the research objective and the quantitative nature of the data, this study employed a quantitative approach and an explanatory research design to examine the impact of being landlocked on living standards. To have accurate estimates of the impact of being landlocked on living standards, we used control variables, which were official exchange rate, inflation, broad money supply, and population growth.

3.2. Methods of data analysis

The study used both descriptive statistics and econometric tools to analyze the data. The study substantiated the descriptive analysis by manipulating econometric models to examine the causation between explanatory and dependent variables, with special emphasis on the relationship between being landlocked and living standards.

The dynamic nature of such a model disallows the use of standard Ordinary Least Squares (OLS) estimators, which might be biased and inconsistent due to the correlation between unobserved panel-level effects and the lagged dependent variable (Hasanović and Latić, 2017). Thus, the use of panel data with fixed or random effects does not solve econometric problems inherent in dynamic models. To overcome the problem of endogeneity that produces biased results and unobserved heterogeneity that cannot be accurately measured, Arellano and Bond (1991) proposed a new GMM estimator for

dynamic panel models.

GMM controls for endogeneity, unobserved panel heterogeneity, autocorrelation, omitted variable bias, and measurement errors (Ullah et al., 2018). According to Bond (2002), the unit root property makes the Difference GMM estimator biased and affects the estimated result to some extent, whereas System GMM produces more precise results. The System GMM approach corrects endogeneity by introducing more instruments for the lagged dependent variable and any other endogenous variable to dramatically improve efficiency, and it transforms the instruments to make them uncorrelated (exogenous) with fixed effects. Thus, this study employed the two-step System GMM estimation to examine the effect of being landlocked on living standards and identify control variables that significantly affect the living standards in SSA countries.

3.3. GDP per capita as a measure of living standard

The level of welfare that an individual or group of people can access is referred to as their standard of living. It covers the resources that people can access as well as the commodities and services they can consume (Cvrlje and Ćorić, 2010). The generally accepted measure of the standard of living is GDP per capita (Federal Reserve Bank of Boston, 2020). Since real GDP measures the quantity of goods and services produced, it is common to use GDP per capita, which is real GDP divided by population, as a measure of economic welfare or standard of living in a nation. GDP per capita shows the approximate amount of goods and services that each person in a country is able to buy in a year if incomes are divided equally. That is why the measure is also often called “per capita income” (Soubbotina, 2004). A country that produces a lot will be able to pay higher wages. That means its residents can afford to buy more of its plentiful production.

3.4. Specification of model

To investigate the impact of being landlocked on living standards, this study developed the following model based on the selected variables and theoretical frameworks:

$$GDPPC_{it} = \alpha + \theta GDPPC_{it-1} + \beta LLD_i + \gamma Z_{it} + \varepsilon_{it} \quad (1)$$

where $GDPPC$ is the gross domestic product per capita as a measure of living standard, and LLD is being landlocked as a dummy variable (1 landlocked, 0 otherwise), while Z_{it} included other explanatory variables, which were inflation rate, broad money supply as a percentage of gross domestic product, and the population growth rate for country i at time t . Parameter α is the expected value when other variables are zero. Coefficient θ is the coefficient of the lagged dependent variable, β is the coefficient of being landlocked, γ is the coefficient for other explanatory variables in the model, and ε_{it} is the error term.

4. Result and discussion

4.1. Descriptive analysis

This study considered 33 SSA countries, 12 of which are landlocked. Out of the total SSA countries, 48% of them are low-income countries, 37.5% of them are lower-middle-income countries, 10.5% of them are upper-middle-income countries, and the remaining two countries (Mauritius and Seychelles) are categorized as higher-income countries. Of the sampled 33 SSA

Table 1. Income category of sampled SSA countries

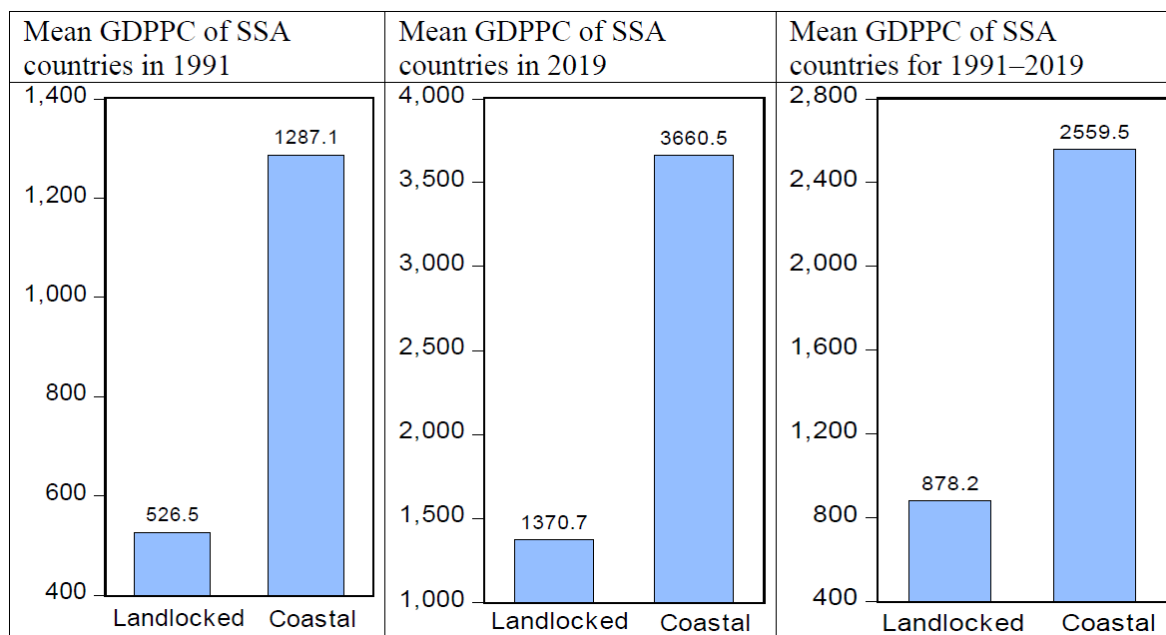
Income group as of 2019	Coastal	Landlocked	Total
Low income	5 (23.8%)	9 (75%)	14 (42.42%)
Lower-middle income	11 (52.3%)	2 (16.6%)	13 (39.39%)
Upper-middle income	4 (19.04%)	1 (8.3%)	5 (15.15%)
High income	1 (4.7%)	0 (0%)	1 (3.03%)
Total	21	12	33

Source: Authors' computation

countries, 42.42% are low-income countries, out of which 64.28% are landlocked, followed by 39.39% of lower-middle-income countries, as shown in **Table 1**.

There is a major difference between the growth of GDP per capita of the sampled landlocked and coastal SSA countries. As presented in **Figure 2**, the average GDP per capita in 1,991 was \$526 and \$1,287 for the landlocked and coastal countries, respectively, and this amount rose to \$1,370 for the landlocked and \$3,660 for the coastal SSA countries in 2019, which shows that coastal countries' GDPPC increased by 184% during the period, which is 24% greater than the GDPPC growth of landlocked countries.

The mean value of gross domestic product per capita for the sampled landlocked SSA countries during the study period is \$878.19, with a minimum value of \$11.93 and a maximum value of \$8,279.60. However, during the same period, the mean value for the coastal SSA countries is \$2,559.58, with the minimum and maximum values of \$102.59 and \$22,942.58, respectively, as shown in Figure 2.



Source: Authors' computation

Figure 2. Mean GDPPC of SSA countries

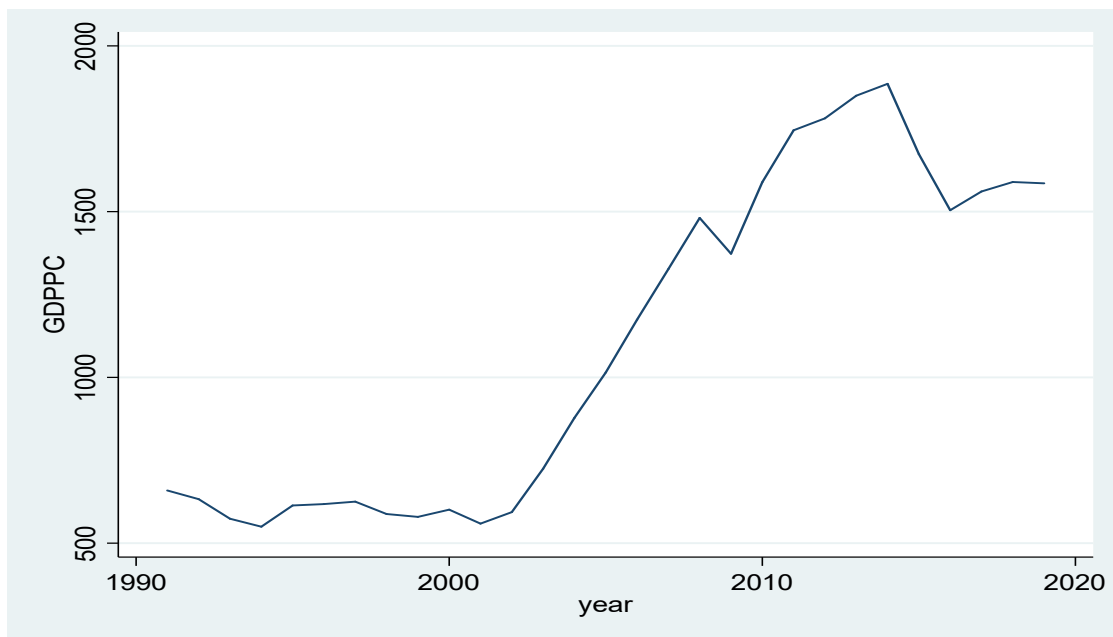
The World Bank’s development indicators show that the economic growth of the sampled SSA countries differed considerably in recent years, with countries such as Ethiopia, Rwanda, Benin, Côte d’Ivoire, Ghana, Lesotho, Senegal, and Cabo Verde experiencing an average annual growth of GDP per capita of more than 4% from 2016 to 2019. On the other hand, SSA countries such as Equatorial Guinea, Chad, Congo Republic, Burundi, and Nigeria experienced negative growth of GDP per capita on average during the same period. Even though there is a significant variation in the growth of GDP per capita among Sub-Saharan African countries, there is an overall cyclical movement in the mean value of GDP per capita.

As **Figure 3** depicted, there was a sustainable rise in the growth of GDP per capita from 2003 to 2008. In 2008, with the global financial crisis, the average GDP per capita of Sub-Saharan Africa started to move backward, and it later returned to growth in 2010. There was also a cyclic pattern between 2010–2019.

4.2. Two-step System GMM estimation result

The model’s findings are reported in **Table 2** to highlight the influence of the regressors on the living standards in SSA nations, with an emphasis on the association between being landlocked and living standards. Based on the study, the F -test statistic of $\text{Prob} > F = 0.0000$ supports the model’s goodness of fit. The Hansen test result (0.381) exhibits that the instrumental variables were legitimate. The Sargan test result (0.565) indicates that the over-identifying limits in System GMM’s estimates were valid for all parameters, and the AR(2) test (0.660) indicates that second-order autocorrelation did not exist.

The coefficient of the lagged living standard, which was estimated via GDP per capita (L.GDPPC), indicates that the living standards in SSA countries were relatively consistent. As a result, the current year’s living standard was estimated based on the prior year’s level. This parameter also aided in



Source: Authors’ computation

Figure 3. Time trend of GDPPC of African countries

Table 2. Two-step System GMM estimation result

Explanatory variable	Coefficient	Std. Err.
L.GDPPC	0.912***	0.0024
LLD	-332.4**	147.1
OER	-2.008***	0.169
INF	-2.106***	0.318
BMGDP	-14.27***	0.467
PGR	269.9***	16.17
Year	38.47***	1.380
Constant	-75,966***	2,749
Number of observations	875	
F-statistic	942,999.38***	
Groups/Instruments	33/33	
A-Bond AR(1) test	0.265	
A-Bond AR(2) test	0.660	
Sargan test	0.565	
Hansen test	0.381	

Note: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$ show statistically significant at 1%, 5%, and 10% levels, respectively. Standard errors are in parentheses. P-values were reported for A-Bond AR(2), Sargan, and Hansen test statistics. Source: Authors' computation

the estimation of explanatory variables' long-term effects. The lagged GDP per capita had a positive impact on the current living standard and appeared to be a useful instrument for determining living standards in the short run. This is in line with expectations because it is believed that countries will continue to maintain higher levels of GDP per capita in the future.

The model's result shows that being landlocked (LLD) had a negative and statistically significant effect on the living standards in SSA countries (-332.4), which indicates that the GDP per capita of landlocked countries was lower than that of coastal countries by 332.4 in the short run at 5% significant level on average, *ceteris paribus*. In the long run, the living standards in SSA countries reduced by 3,771.78. Thus, given the short-run effects, being landlocked decreased living standards to reach long-run equilibrium, all other things remaining the same. Sub-Saharan African countries, with the highest number of landlocked countries, are among the most disadvantaged and have the lowest economic performance; most of them are extremely poor and have the lowest GDP per capita in the world. The result is consistent with prior expectations and the findings of Bosker and Garretsen (2009), Bloom, Canning, and Sevilla (2003), Masters and Sachs (2001), and Bloom et al. (1998), who reported a negative effect of being landlocked on living standards measured by GDP per capita.

The official exchange rate (OER) had a negative and statistically significant effect on Sub-Saharan African countries' living standards (-2.008), implying that a unit change in the official exchange rate was associated with a 2.008 decrease in GDP per capita of landlocked countries in the short run and 22.79 in the long run on average, *ceteris paribus*, at a 1% significant level. Morina et

al. (2020), Ping (2011), Aghion et al. (2009), and El-Ramly and Abdel-Haleim (2008) all concluded that real exchange rates' volatility has a negative effect on economic growth and contributes to low GDP per capita. The finding contradicts those of Kogid et al. (2012), Chen (2012), and Tarawalie (2010), who found a positive relationship between real exchange rate and economic growth.

Inflation (INF) had a negative and statistically significant effect on the living standards in SSA countries (-2.106), which indicates that a unit increase in the overall price level was associated with a 2.106 decrease in GDP per capita of landlocked countries in the short run and 23.905 in the long run at 1% significant level on average, *ceteris paribus*. Logically, inflation as a macroeconomic variable influences the living standard in a country (Gagarawa and Mehrotra, 2017), may lead to social and political instability and disorder and does not create economic growth (Wang and Zou, 2011). The result is consistent with the findings of Sare, Ibrahim, and Musah (2019), Hossin (2015), Kasidi and Mwanemela (2013), and Quartey (2010), who established a statistically significant negative relationship between inflation and economic growth, but the result is against the findings of Behera (2014), Osuala, Osuala, and Onyeike (2013), and Ahmad and Luqman (2012), who found a positive and significant relationship between inflation and economic growth.

Broad money supply as a percentage of gross domestic product (BMGDP) had a negative and statistically significant effect on the living standards in SSA countries (-14.27), which indicates that a unit change in the broad money supply was associated with a 14.27 decrease in GDP per capita of landlocked countries in the short run and 161.9192 in the long run at 1% significant level on average, *ceteris paribus*. To achieve economic growth, money supply plays a vital role (Mahara, 2020). The result is in line with the findings of Odumusor (2019), Sulaiman and Migiro (2014), and Ogunmuyiwa and Ekone (2010), who found that money supply has a significant negative impact on the growth of the gross domestic product. But the result is against the findings of Mahara (2020), Gnawali (2019), Marshal (2016), Aslam (2016), and Ogunmuyiwa and Ekone (2010), who found that money supply has a significant and positive effect on economic growth.

The rate of population growth (PGR) had a positive and statistically significant impact on the living standards in Sub-Saharan countries (269.9), which indicates that a unit growth in the population was associated with a 269.9 increase in GDP per capita of landlocked countries in the short run and 3,063.109 in the long run at 1% significant level on average, *ceteris paribus*. Logically, population growth could have both positive and negative impacts on economic development; the outcome would depend on the relative contribution of the population and human capital to the economy. The result is in line with the findings of Bucci (2015), Sethy and Sahoo (2015), Tumwebaze and Ijjo (2015), and Mierau and Turnovsky (2014), who found that population growth has a positive effect on economic growth per capita, but the result is against the findings of Huang and Xie (2013), Yao, Kinugasa, and Hamori (2013), and Furuoka and Munir (2011), who observed a negative and significant relationship between population growth and GDP per capita.

5. Conclusion and implications

This study investigated the nexus between being landlocked and living standards in SSA countries over 29 years from 1991 to 2019. Based on the findings of the study, on average, the GDP per capita of landlocked SSA countries is lower than coastal SSA countries' GDP per capita by \$946.5564. Besides that, the findings show that there was a negative and statistically significant

association between being landlocked and GDPPC during the study period. As a result, it can be inferred that being landlocked has a negative influence on the living conditions of Sub-Saharan African countries in the short and long run.

Moreover, the model's result shows that the lagged GDP per capita and population growth had a positive and statistically significant effect on the living conditions in Sub-Saharan African countries. On the other hand, due to the countries being landlocked, the official exchange rate, inflation, and broad money supply as percentage of GDP had a statistically significant negative effect on the living standards in Sub-Saharan African countries.

The study suggests that LLDCs and transit nations should work together to lower access costs and improve access to LLDCs' foreign markets. Landlocked countries should give special attention to the development of roads, railways, pipelines, air transport, and information technologies that best connect them with coastal neighbors and boost trade competitiveness.

Similar to LLDCs, transit countries also ought to undertake a set of reforms, particularly concerning the efficiency and cost of their customs procedures and the effective reception of their national legislations on international conventions or agreements.

Finally, international organizations, such as the United Nations (UN), the African Union (AU), the World Trade Organization (WTO), the World Bank (WB), the International Monetary Fund (IMF), and others, should give great attention on the promotion of technical assistance or investment projects and on regional integration to improve the connectivity and development of regional policies to protect landlocked countries against unfair exploitation by their coastal neighbors.

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