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IS THERE EVIDENCE OF CONVERGENCE IN SUB-SAHARAN AFRICA?

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ABSTRACT

This study sheds new light on the possibility of absolute beta-convergence among countries in sub-Saharan Africa (SSA). This convergence has been defined as the closing of the income gap between the poorest and richest countries in sub-Saharan Africa. In addition to testing for evidence of absolute beta-convergence among 43 countries in SSA, it also tests for convergence for different income groups – the middle and low-income economies respectively. Annual cross-country data from 43 SSA countries were employed between 1996 and 2020. The panel least square method was employed in the analysis. The dependent variable was the GDP growth rate while the independent variable was the initial GDP per capita. The result revealed that there is weak evidence of absolute beta-convergence among all the countries in SSA. This evidence was more pronounced among the middle-income economies, unlike the low-income economies of SSA. This implies that the inequality in the middle-income economies of SSA has reduced within this period of study but inequality has not reduced among the low-income economies. Hence, there is a need for the low-income economies of SSA to double their GDP growth rate in order to catch up with the rich countries.

KEYWORDS: institution, economic growth, sub-Saharan Africa, panel study

1. INTRODUCTION

Solow (1956) introduced the idea of convergence theory which is also known as the catch-up effect. The convergence hypothesis states that poor countries tend to grow faster than rich countries so that over time, income levels converge across countries. Economists have long debated whether different countries and regions are converging over time in terms of per capita income. The interest in convergence has led many researchers to study whether poorer economies are incipiently catching up with the richer ones. This is relevant for sub-Saharan Africa (SSA) region that is characterized with underdeveloped and developing economies. It is also a basic question; and of considerable interest for welfare. It addresses the concern of policy makers in analyzing inequality and brings to the analysis, ideas and insights into the economics of income distribution and redistributive policy.

In the study of cross-country growth, researchers have come up with many different interpretations of convergence. The following often encountered dichotomies indicate some of the different ways in which convergence has been understood; Convergence within an economy and convergence across economies; Convergence in terms of growth rate versus convergence in terms of income level; beta-convergence versus sigma convergence; unconditional (absolute) convergence versus conditional convergence; global convergence versus local or club-convergence; income convergence versus total factor productivity (TFP) convergence and; deterministic convergence versus stochastic convergence.

In the course of this study, we are going to pay attention on two classifications of convergence which are β -convergence (beta convergence) and σ -convergence (sigma convergence); and unconditional (absolute) convergence versus conditional convergence.

Overtime, there have been different hypotheses related to convergence, with specific emphasis to β -convergence (beta convergence) and σ -convergence (sigma convergence). Beta convergence occurs if a poor country tends towards catching up with the rich country in terms of levels of per capita income or per capita product. The sigma-convergence occurs if the cross-sectional income dispersion measured by the standard deviation of the logarithm of per capita income or per capita product across a group of countries or regions declines over time. Both the σ -convergence and the β -convergence are related because the β -convergence cannot occur except there is σ -convergence. The β -convergence is therefore adopted in this study. There are two different types of β -convergence - unconditional (absolute) β -convergence and conditional β -convergence

Unconditional β -convergence was predicted by Solow in his economic growth theory under certain characteristics. They predicted that the poor countries (economies) will catch-up with the rich countries (economies) if the fundamental characteristics of these countries are equal, irrespective of the differences in the initial capital-labour ratio and living standards.

Conditional β -convergence argues that economies would converge to different steady states with different capital-labour ratio and different fundamental characteristics. The economies that have less capital per worker tend to have higher rate. The fundamental characteristics are saving rate, population growth rate and access to technology. It is expected that higher saving rate will lead to higher living standards in the long run. An increased saving rate leads to higher output, consumption and capital per worker. For this study, the unconditional β -convergence will be adopted and analyzed for sub-Saharan Africa countries.

This study is relevant for two reasons; first, to test for the relevance of the neoclassical theory in SSA. Secondly, many economists and policy makers had predicted that SSA would have grown above its current level. In fact, some predicted that it had the potential to achieve convergence before some south-east Asian countries (Acemoglu, 2009). Unfortunately, this has not been the case.

Instead, those south-east Asian countries have actually developed better than SSA. Therefore, considering the growth in the last two decades in SSA, there is need to test for the convergence.

Unconditional β -convergence would be adopted in this study because the steady-state level of capital and output per worker depends on the fundamental characteristics of the nations. These fundamental characteristics – saving rate, population growth rate and access to technology, may vary across countries but countries in SSA have much similarity based on their geographical location, levels of economic and institutional development (Kumo, 2011). Therefore, this study would consider them as countries with much similarity, hence, the theory of absolute convergence would hold. Therefore, this study sets out to examine if there is possibility of absolute beta convergence among the countries in SSA.

2. REVIEW OF RELATED LITERATURE

Empirical Literature Review

Miller and Upadhyay (2002) studied the existence of convergence in total factor productivity (TFP) and GDP per worker across a pooled sample of 83 developing and developed countries using panel data that covers from 1960 to 1989. While testing for both absolute beta and sigma convergence with fixed effects, they found that there is both beta and sigma convergence in TFP.

Barro (2003) studied the determinants of growth in a panel of countries using a cross-country data for 71 countries from 1965 to 1995. They checked if there is evidence of convergence in their study by employing lagged value of GDP. Their findings revealed that there is evidence of conditional convergence.

Leonida and Petraglia (2004) in their paper, investigated the regional convergence of the Italian economy. They argued that the idea of convergence of world economies can be extended to study regional economies within the same country. This line of argument is premised on the idea that convergence is possible because the different regions share similar economic fundamentals. This implies that there will be no need to control for the estimates of growth determinants within a regional framework. They used Malmquist productivity indices method of decompose the growth equation. They concluded that there is slow divergence among Italian regions.

Kumo (2011) investigates convergence in real per capita GDP and macroeconomic policy and stability indicator within the Southern African Development Community (SADC) between 1992 and 2009. The results show no evidence of absolute beta and sigma convergence in real per capita GDP among the SADC economies.

Anyanwu (2014) examined the factors that affect economic growth in Africa and compared the findings from Africa to that of China. For African countries, cross-sectional panel data from 1996 to 2010 with three-year averaging were employed. They used pooled OLS regression while controlling

for the fixed effect for the sub-regions. They included the initial real per capita income as an independent variable. Their result revealed that the coefficient of the initial real per capita income was positive and insignificant. This means that there is no evidence of conditional convergence during the period of study.

3. RESEARCH METHODS

To test for absolute β -convergence, this study will adopt the model specified by Sala-i-Martin (1995) and used by McCoskey (2002), Barro (2005), Arbache and Page (2007) and Kumo 2011. The data exhibits absolute β -convergence if $\beta > 0$ and this can be shown graphically. If the regression line between economic growth and the initial GDP per capita slopes downwards from left to right, then, there is absolute β -convergence but if it does not slope downwards, then, there is no absolute β -convergence. The model is stated as follows:

$$G_{i,t:t+T} = \alpha - \beta \log(Y_{i,t}) + U_{i,t} \quad 3.25$$

Where $G_{i,t:t+T}$ is the annual average real GDP growth rate of economy i , between t and $t+T$. $\log(Y_{i,t})$ is the logarithm of economy i 's real GDP per capita at time t . $U_{i,t}$ is an error term for country i at time t .

In other words, $G_{i,t:t+T}$ represents annual average real GDP growth rate using five year interval between 1996 and 2020 for each country and $\log(Y_{i,t})$ represents log of per capita income in 1996, 2001, 2006, 2011 and 2016.

To check if the rate of convergence is increasing over time, the square of the log of per capita GDP will be measured to see whether the rate of convergence depends on the level of per capita GDP in line with Barro (2003). If the coefficient on the squared variable was negative, then, the rate of convergence would be increasing with per capita GDP.

Research Hypothesis

H₀: There is no evidence of absolute convergence among the countries in SSA.

H₁: There is evidence of absolute convergence among the countries in SSA.

Nature and Sources of Data

This study employed panel data for the analysis. The data were sourced online from the World Development Indicator (WDI) and Worldwide Governance Indicator (WGI). They are retrieved individually for the 42 countries used in the analysis. Therefore, it is panel data covering 25 years from 1996 to 2020 across 42 countries.

4. ANALYSIS AND DISCUSSION OF FINDINGS

Testing for Absolute β -Convergence

The absolute β -convergence was tested using regression analysis stated as follows. The dependent variable is the annual non-overlapping five-year averages of GDP growth from 43 SSA countries between 1996 and 2020. The independent variable is the natural log of initial GDP per capita from 1996 to 2020 (using five years average).

Table 4.12: Testing for Absolute β -Convergence

Dependent Variable: Real GDP growth rate				
Variable	Coefficient	Standard Error	t-statistics	Probability
C	8.1035	2.2035	3.6774	0.0003
LGDPpc	-1.2835	0.7347	-1.7470	0.0821

Source: Researchers computation using WDI data 2021

The findings, as shown in Table 4.12, revealed that there is evidence of absolute β -convergence though only at 10 percent significance level. The coefficient of -1.2835 is negative as expected and the p-value of 0.082 is less than 10%. This means that there is little evidence of absolute β -convergence in SSA between 1996 and 2020. This evidence is supported by the graph – Figure 4.1.

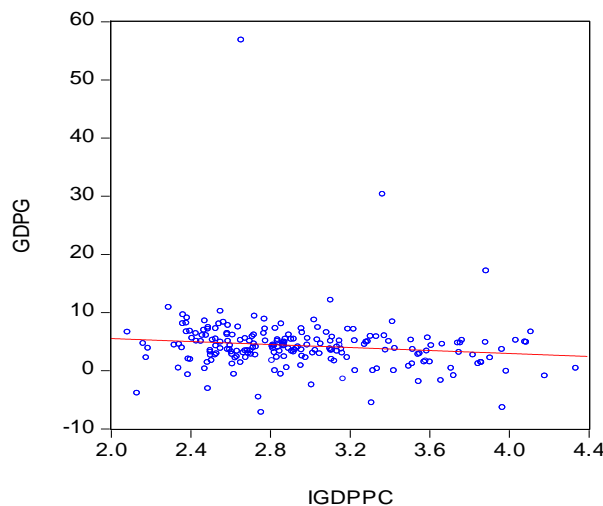


Figure 4.1: Growth rate versus natural log of GDP per capita
Source: Researchers computation using WDI data 2021

Figure 4.1 shows that there is slight negative relationship between the GDP growth rate and natural log of GDP per capita. The log of per capita GDP for 1996, 2001, 2006, 2011 and 2016 is shown on the horizontal axis. The vertical axis plots the corresponding average growth rate of real GDP from 1996 to 2000, 2001 to 2005, 2006 to 2010, 2011 to 2015 and 2016 to 2020.

Table 1: Convergence for the 42 economies in SSA

Method: Panel Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIGDPPC	-1.283581	0.734705	-1.747070	0.0821
C	8.103568	2.203587	3.677444	0.0003

Source: *Researchers Computation using data from WDI 2022*

Furthermore, the researchers attempted to determine if the rate of convergence is increasing over time by including the square of the log of per capita GDP. The result of the squared GDP per capita turned out negative but it was not significant. Therefore, it revealed that the increase in the GDP per capita could lead to increase in the convergence. Further test also revealed that there is evidence of convergence in the middle income economies but not in the low income economies of SSA.

Table 2: Test for convergence using the squared value of the GDP per capita. Dependent Variable GDPG

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIGDPPC	2.773127	8.492557	0.326536	0.7444
LIGDPPCSQ	-0.648775	1.353073	-0.479482	0.6321
C	1.928324	13.06683	0.147574	0.8828

Source: *Researchers Computation using data from WDI 2022*

Table 2 presents the result of the test for convergence including the squared GDP per capita. The coefficient of the squared GDP per capita turned out negative but it was not significant. Therefore, it negative coefficient support that the increase in the GDP per capita could lead to increase in the convergence.

More tests were carried out on 23 middle income economies as well as 20 low income economies. The results for the middle and low income economies were presented in Table 3 and four respectively.

Table 3: Convergence for middle income countries

Dependent Variable: GDPG

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIGDPPC	-2.812149	1.322983	-2.125613	0.0358
C	13.42666	4.228981	3.174915	0.0020

Source: Researchers Computation using data from WDI 2022

The result from the middle income economies revealed that there is evidence of convergence for the middle income economies as shown in Table 3. the coefficient of the GDP per capita is negative which reveals that there is evidence of convergence in the middle income economies. This can be substantiated by the t-statistic value which is greater than 1.96. Hence, it is significant at 5 percent level.

Table 4.13d: Convergence for Low income economies

Dependent Variable: GDPG

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIGDPPC	-0.649672	0.792864	-0.819399	0.4146
C	6.063466	2.178096	2.783838	0.0065

Source: *Researchers Computation using data from WDI 2022*

Table 4 revealed that there is no evidence of absolute convergence in the low-income economies of SSA. This can be deduced from the coefficient of GDP per capita which is positive. The t-statistics is also less than 1.96 meaning that it is not significant. Hence, there is no evidence of absolute convergence in the low-income economies of SSA. This implies that the inequalities in the per capita income levels did not shrink among the member states. Therefore, the low-income economies need to double up their current economic growth to catch up with the more developed economies in the region.

DISCUSSION OF FINDINGS

The result from the absolute convergence test using the 42 countries in SSA revealed that the sign of the coefficient of GDP per capita conforms to a priori expectation. For the convergence hypothesis to hold, it is expected that the value of the coefficient of the GDP per capita will be negative. The coefficient there was -1.28 which denotes that increase in the GDP per capita by 1 percent leads to 1.3 percent decrease in the economic growth. The result is also significant although, it is only at 10 percent

level. This is supported by the graphical illustration which is slightly downward sloping showing that increase in GDP per capita leads to a decrease in the GDP growth rate.

There is also evidence of absolute B-convergence in the middle income economies. This means that among the middle income economies in SSA that the inequality in the per capita income has reduced within the period of this study. It can be observed that it was the convergence in the middle income economies that drives the convergence seen in the SSA region as a whole. There is no evidence of absolute convergence in the low income economies as shown in Table 4.

5. CONCLUSION AND POLICY IMPLICATION

This study sets out to determine if there is possibility of absolute B-convergence in SSA from 42 countries using non-overlapping five years data between 1996 and 2020. The result revealed that there exists slight evidence of absolute convergence in the SSA region as a whole. Specifically, it shows evidence of absolute convergence among middle income economies of SSA but not among the low-income economies of SSA.

This study, therefore, contributes to the theory of convergence by finding that there is slightly absolute convergence in the SSA countries which is significant at 10 percent. This has opened a new perspective in the study of theory of convergence in SSA because previous studies have not been able to establish such relationship such as Kumo, (2011) and Anyanwu, (2014).

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