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Impact of Human Capital Index on Economic Growth in Africa

Yohana Maiga

Tanzania Institute of Accountancy (TIA), Dar es Salaam, Tanzania

E-mail: yohanamaiga2016@gmail.com

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Abstract

This study investigates the impact of the Human Capital Index (HCI) on economic growth (EG) in Ghana, Kenya, and Tanzania using various statistical techniques. The results indicate that the relationship between HCI and EG is complex and varies by country. The coefficient for TZA is positive, while GHA and KE are negative. However, these coefficients are not statistically significant, and the overall coefficient for all countries is negative and not statistically significant. This suggests that other factors such as investment in infrastructure, education, and innovation may contribute to EG. Policymakers should consider a range of factors beyond HCI when formulating policies to promote EG in these countries. Further research is necessary to identify potential predictors of EG and explore the relationships among these factors in more detail.

Keywords: *Human Capital Index; Economic Growth; Quantile Regression; Breusch-Pagan Test; Kendall; And Spearman Correlation*

1. Introduction

Human capital has been identified as a key driver of economic growth and development, and is increasingly becoming an important policy priority in many countries. In Africa, where human capital development is still a major challenge, the impact of human capital on economic growth is a subject of great interest and relevance.

The Human Capital Index (HCI) is a tool used to measure the potential of human capital and productivity of children in each country, assuming that optimal health and education conditions are present (Kraay, 2018). In other words, it is an assessment of how well countries are developing and investing in their human capital, which is considered a critical component of economic growth and sustainable development.

The HCI was developed by the World Bank in 2018 as a response to the increasing recognition that traditional measures of economic growth, such as gross domestic product (GDP), do not fully capture the overall well-being of a country's population. The HCI takes a more comprehensive approach to measuring a country's economic potential by focusing on the development and education of its citizens, particularly its youth.

For instance, if a country's current conditions are steady, children in this country born today with an HCI of 0.62 would only realize 62% of their maximum productivity. This means the prevailing standards of health and education would cost such a country 38% of its national income (Shukla, 2018).

The motive behind human capital is that, paying attention to human capital is essential to ending extreme poverty and creating more inclusive societies. It is well-established that investing in human capital, particularly in children, has a significant impact on a country's economic development and potential for sustainable growth. However, policymakers may not prioritize such investments due to the lack of immediate benefits and competing demands for resources.

Therefore, this study focuses on Ghana, Kenya and Tanzania, which are among the fastest-growing economies in Africa. These countries have made significant investments in education and health in recent years, but there is still a significant gap in human capital development compared to other regions in the world. This study aims to examine the relationship between the Human Capital Index and Economic Growth in these countries, and to provide insights for policymakers to design effective policies for human capital development.

To attain the objective, the research employed Ordinary Least Squares Regression and Quantile Regression (Median Regression) to evaluate the effect of HCI on Economic Growth in Ghana, Kenya, and Tanzania. Additionally, the study examined whether the data had fixed or random effects and heteroscedasticity.

2.Literature Review

Previous studies have highlighted the positive relationship between human capital development and economic growth (Barro, 1991; Mankiw, Romer, and Weil, 1992; Lucas, 1988). The Human Capital Index (HCI) is a tool used to measure the development of human capital in a country, which includes indicators such as education, health, and skills development. Several studies have examined the relationship between HCI and economic growth in different countries. For example, Ssekibaala and Jjuuko (2021) found a positive and significant relationship between HCI and economic growth in Uganda.

Similarly, Salleh et al. (2022) examined the impact of HCI on economic growth in Malaysia using data from 2006 to 2019. The study found a positive and significant relationship between HCI and economic growth in Malaysia, suggesting that investments in human capital development are critical for sustained economic growth. The authors recommended that policymakers should prioritize investments in education, health, and skills development to enhance human capital and promote economic growth in Malaysia.

Several studies have investigated the impact of human capital on economic growth in Africa. For instance, a study by Wamalwa and Ndung'u (2018) on Kenya found a significant positive relationship between education and economic growth. The authors argued that investment in education is a key driver of economic growth, and that policymakers should prioritize education in their development agenda. Similarly, a study by Owusu-Addo and Smith-Greenaway (2018) on Ghana found that maternal education has a positive impact on child health and survival.

The Human Capital Index (HCI) has been used as a measure of human capital quality and quantity in several studies. For instance, a study by Koenker and Bassett (2018) on Africa found a positive relationship between the HCI and economic growth. The authors argued that the HCI captures the quality of human capital, which is an important driver of economic growth. Similarly, a study by Yuan et al. (2018) on Tanzania found that investment in human capital, as measured by the HCI, has a positive impact on economic growth.

However, there are also studies that have found no significant relationship between human capital and economic growth in Africa. For instance, a study by Ahortor et al. (2018) on Ghana found no significant relationship between education and economic growth. The authors argued that investment in education alone is not sufficient to drive economic growth, and that other factors such as infrastructure and institutions are also important.

In conclusion, the existing literature suggests that there is a positive relationship between the Human Capital Index and Economic Growth in Africa, but the strength and significance of the relationship varies depending on the country and context. Our study aims to contribute to this literature by examining the relationship between the HCI and Economic Growth in Ghana, Kenya and Tanzania.

3.Materials and Methods

3.1 Research Design

This study will adopt a quantitative research design that aims to investigate the relationship between Human Capital Index and Economic Growth in Ghana, Kenya, and Tanzania. The research design will be based on the Phillips-Perron Test and Augmented Dickey-Fuller Test, Hausman Test for Fixed and Random Effects, Breusch-Pagan test, Ordinary Least Squares Regression (OLS), Quantile Regression (Median Regression), Kendall and Spearman Correlation.

3.2 Data and Source

Two secondary data sets were used in this study. The Index of Human Capital

(HCI) data were obtained from FRED economic database.

The Economic Growth (EG) computed based on the % changes of Gross

Domestic Product (Current US dollar) from World Bank database. The data for economic growth covered a period of 20 years from 2000 to 2021.

3.3 Data Analysis

In this study, various statistical techniques were used to analyze the collected data and identify relationships between the variables. The Phillips-Perron Test and Augmented Dickey-Fuller Test were used to test for stationarity of the variables. The Hausman Test for Fixed and Random Effects was employed to determine the appropriate regression model to be used. The Lagrange Multiplier Test was used to test for heteroscedasticity in a regression analysis. Ordinary Least Squares Regression (OLS) was used to estimate the impact of Human Capital Index on Economic Growth. Quantile Regression (Median Regression) was used to test for different impacts of HCI on economic growth at different quantiles of the dependent variable. Finally, Kendall and Spearman Correlation were used to determine the correlation between the variables.

4.Results and Discussion

4.1 Motivation: EG and HCI by Countries

GHA has a higher HCI compared to KE and TZA, though, KE has a higher EG compared to GHA and TZA. In general, countries have a higher HCI compared to EG. This may indicate EG is still in an early stage and can follow later as the benefits of human capital investment. Alternatively, this indicates the country has made progress in improving factors that contribute to human capital (HC), like health, and education, but there may be other obstacles to EG, such as limited access to capital or poor infrastructures (Figure 1).

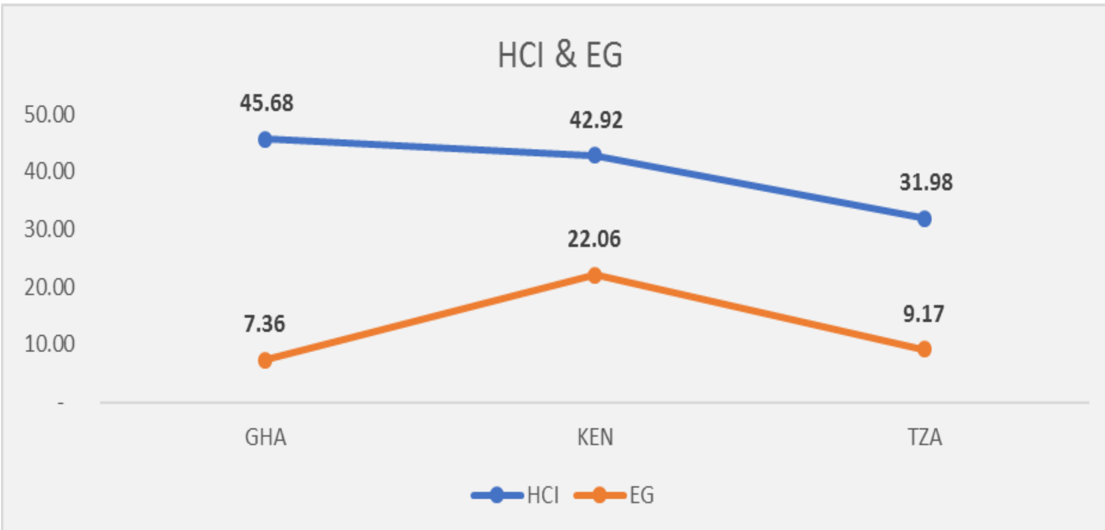

Figure 1: EG and HCI for by Countries

The IQR is a robust measure of dispersion since it is less sensitive to outliers than the mean or standard deviation. The IQR represents the range of the middle 50% of the data, the difference between the 75th percentile and the 25th percentile of the data. GHA and KE have high median and IQR in HCI unlike TZA. GHA and TZA has <1 median but slightly high for KE with 1. This means the EG in countries almost is similar (Table 1).

Table 1: Summary statistics of EG and HCI

	HCI		**EG**	
Country	**Mean (Min-Max)**	**Median (IQR)**	**Mean (Min-Max)**	**Median (IQR)**
GHA	2.28(2.12-2.53)	2.25(2.17-2.39)	0.33(-1.00-4.27)	0.13(-0.07-0.59)
KEN	2.15(1.94-2.35)	2.15(2.04-2.25)	1.00(-0.99-17.12)	0.07(-0.35-0.69)
TZA	1.59(1.49-1.72)	1.59(1.54-1.66)	0.42(-0.92-6.32)	0.13(-0.24-0.34)

HCI=Human Capital Index; EG= human capital; IQR=Interquartile Range

4.2 Distribution of EG and HCI by Country: Violin Plots

A violin plot visualization combines the features of a box plot and a kernel density plot indicating the distribution of EG and HCI probability density. The distribution of EG is small in some countries but has high HCI in GHA, KE, and TZA. Also, there is small a density/frequency of EG, unlike HCI which means the majority have small EG compared to the HCI. The range of EG is high in KE, unlike GHA and TZA compared to the HCI. The median value of EG is high for GHA and KE followed by TZA with high quartiles and the range of the EG as well as HCI respectively (Figure 2 and Figure 3).

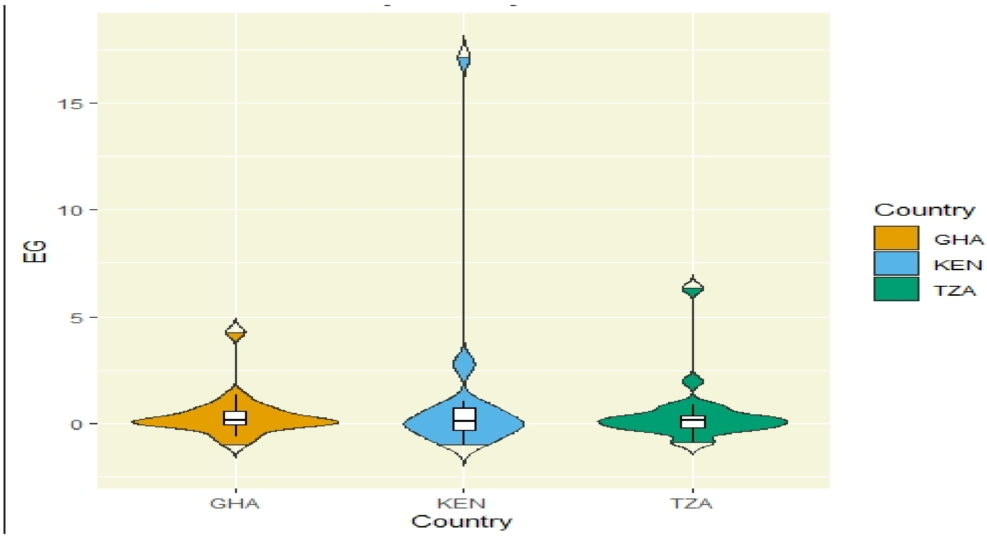

Figure 2: Violin Plot for EG by Country

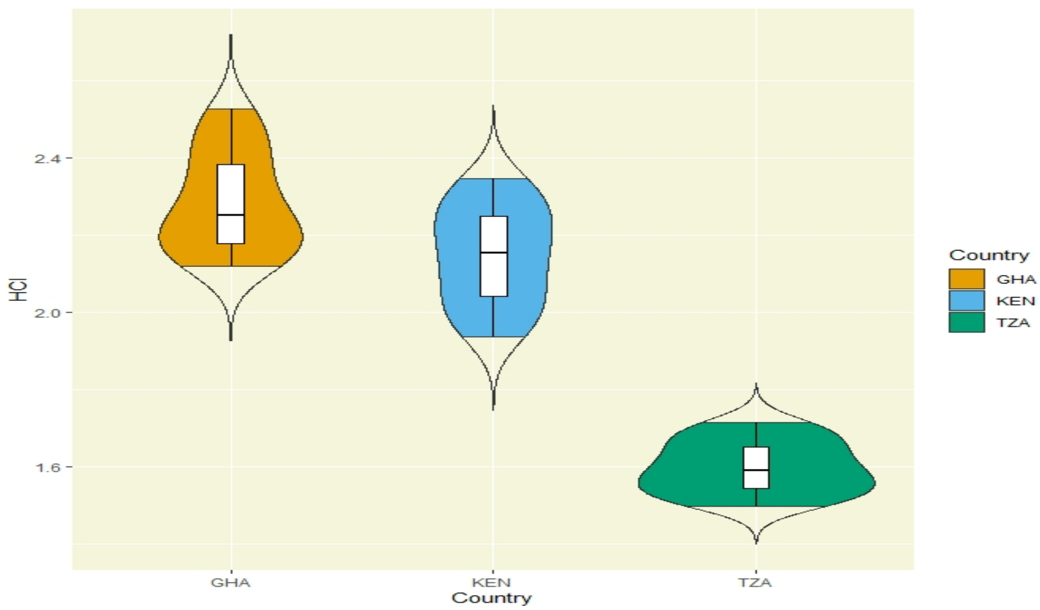

Figure 3: Violin Plots for HCI by Country

Due to HCI and EG growth differences in countries, Kendall's tau is favoured for the data that contains ties, while Spearman's rho is robust to outliers for the data that are not normally distributed.

Table 2: Kendall's(tau) and Spearman's(rho) Correlation

Country	Kendall's(tau)	Spearman's(rho)
GHA	**0.13**	**0.19**
KE	**0.07**	**0.06**
TZA	**0.35**	**0.48**

4.3 Coplots for EG Given Country

There are patterns or relationships that exist between the EG in years across countries. GHA had high EG from 2005 to 2008 while KE from 2008 to 2009 and TZA around 2017. This implies there is different identifying potential factors that result in the existence of outliers or influential points in EG. The study identified an increase of HCI above 2 from GHA while KE is above 1.75 and TZA above or equal 1.5 (Figure 4 and Figure 5).

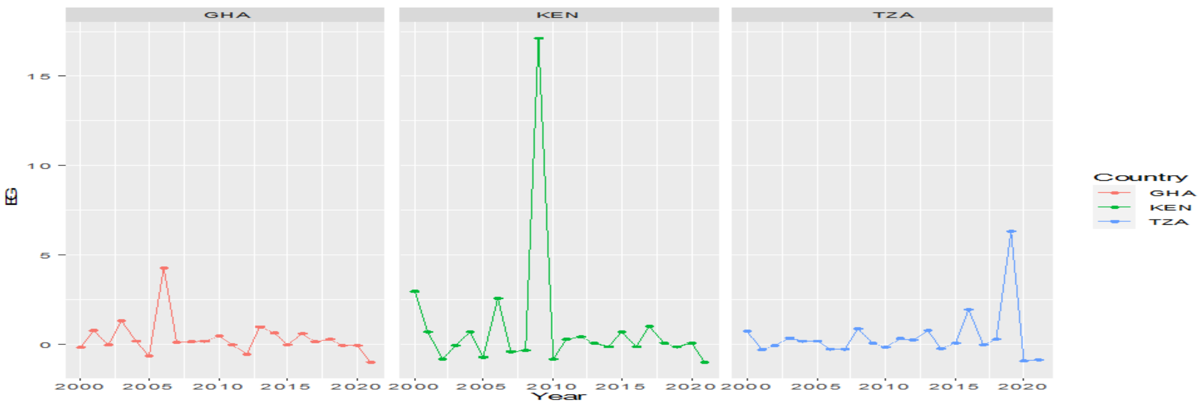

Figure 4: Coplots for EG by Country and Year

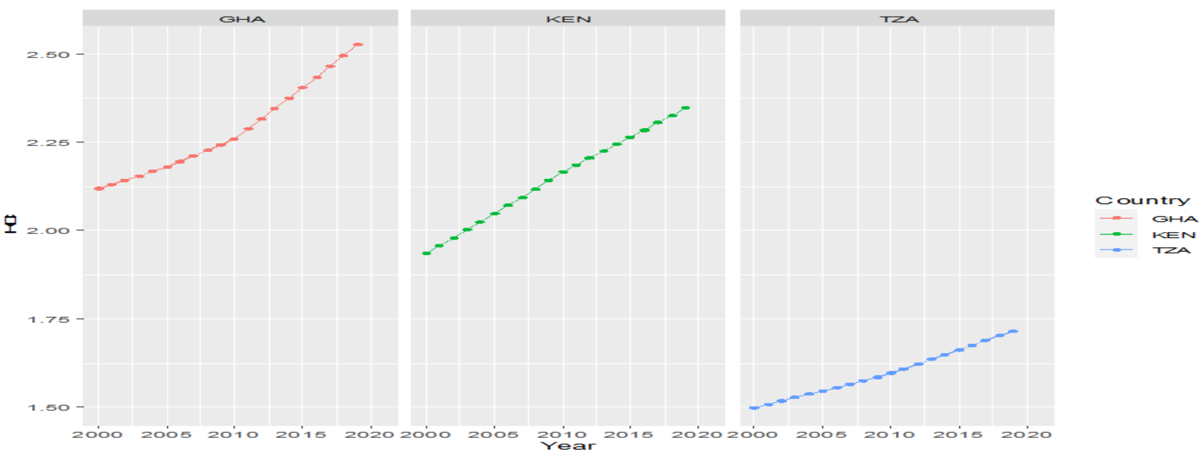

Figure 5: Coplots for EG by Country and Year

4.4 Phillips-Perron and Augmented Dickey-Fuller Tests

The ADF and Phillips-Perron test both tests for unit roots, but the PP test is more robust to serial correlation.

Ho: The series has a unit root or has a stochastic trend that is non-stationary

H1: The series has no unit root.

Table 3: Phillips-Perron and Augmented Dickey-Fuller Tests

	Phillips-Perron		Augmented Dickey-Fuller	
Country	**Test Statistics**	**ρ-value**	**Test Statistics**	**ρ-value**
GHA	-24.60	<0.001	-58.80	<0.001
KEN	-23.47	<0.0002	-49.89	<0.0002
TZA	-21.83	<0.001	-54.27	<0.001

Since the p-value is <0.05, we have evidence to reject Ho and conclude that the time series has no unit root that is stationary.

4.5 Hausman Test

Fixed effects (FE): The individual-specific effects are fixed and unrelated to the other explanatory variables. **The random effects (RE):** The individual-specific effects are random and correlate with the other explanatory variables. If there is a significant difference between the coefficients of the FE and RE models, then the FE model is preferred otherwise RE is preferred.

Ho: Hausman test is that the random effects model is consistent and efficient

H1: The fixed effects model is consistent and efficient.

Table 4: Hausman Test

Test Statistic	ρ-value
0.02	0.8980

4.6 Lagrange Multiplier Test (LM)

Ho: $\sigma^2 i = \sigma^2$ for all i; error variance is constant (residuals are homoscedastic) across all

Ha: $\sigma^2 i \neq \sigma^2$ for at least one I; Residual are heteroscedasticity

Table 5: Breusch-Pagan Test

Test Statistic	ρ-value
0.00	1.00

Since the p-value is >0.05, conversely, we fail to reject the null hypothesis, indicating that the model satisfies the assumption of homoscedasticity. In this model, the error variance is constant.

4.7 OLS Regression

Regarding the assumption of the Breusch-Pagan test, it suggests that there is no evidence of heteroscedasticity in the model. However, since the Breusch-Pagan test did not find significant evidence of heteroscedasticity, the OLS method is appropriate.

Table 6: Estimated Model Parameters for the Countries

Country	Parameter	Estimates	Std.Error	ρ-value
GHA	Intercept	3.1302	4.2234	0.468
	HCI	-1.1859	1.8463	0.529
KEN	Intercept	5.5522	15.2848	0.721
	HCI	-2.0518	7.1096	0.776
TZA	Intercept	-15.1956	7.2117	0.049
	HCI	9.8451	4.5061	0.042
Overall	Intercept	0.4396	2.0554	0.831
	HCI	0.1325	1.0103	0.896

OLS=Ordinary Least Squares
R^2: Overall =0.003; GHA=0.0224; KE=0.0046; TZA=0.2096

Based on the results, it can be observed that the relationship between the HCI and EG varies across different countries. Specifically, for GHA and KE, the coefficients are negative and not statistically significant, suggesting that there is no significant relationship between HCI and EG in these countries.

On the other hand, TZA, the coefficient is positive and statistically significant, indicating that there is a significant positive relationship between HCI and EG. However, it is important to note that the overall coefficient for all countries is positive but not statistically significant, suggesting that the relationship between HCI and EG is weak or non-existent when countries are considered together.

The R^2 values provide information about the goodness of fit of the model. The R^2 is quite low (0.3%), indicating that the model explains only a small amount of the variation in EG. For individual countries, R^2 are slightly higher, 20.9% with TZA, indicating that the model explains a higher proportion of the variation in EG than in other countries, 2.2% for GHA and 0.4% for KE.

4.8 Median Regression Analysis/ Quantile Regression

Unlike OLS regression, which estimates the conditional mean of the EG given the HCI variables, median regression estimates the conditional median of the EG (Table 7).

Table 7: Median Regression Analysis/ quantile regression

Country	Parameter	Estimates	Std.Error	ρ-value
GHA	Intercept	0.3786	3.1726	0.906
	HCI	-0.1009	1.3870	0.943
KEN	Intercept	4.9375	6.3326	0.446
	HCI	-2.1594	2.9455	0.473
TZA	Intercept	-0.9034	5.0418	0.860
	HCI	0.7004	3.1502	0.827
Overall	Intercept	0.2642	0.6641	0.692
	HCI	-0.0545	0.3264	0.868

For GHA and KE, the coefficients of HCI are negative and not significant. This suggests there is no significant relationship between HCI and EG. However, for TZA, the coefficient of HCI is positive, although not significant. This suggests that there may be a positive relationship between HCI and EG, but further research is needed to confirm.

Overall, all countries HCI coefficient is negative and not significant implying there is no significant relationship between HCI and EG across all the countries. It's worth noting, that the coefficient for TZA is positive although not significant there may be some variation across countries in the relationship between HCI and EG.

It's important to remember that the relationship between HCI and EG may be influenced by other factors.

5.Conclusion and Recommendations

Conclusion

The magnitude of association between EG and HCI for GHA and KE are also quite low, indicating that the model does not explain a large portion of the variation in EG unlike for TZA. Also, HCI is positive for TZA and negative for GHA and KE. There may be some relationship between HCI and EG, but it is not strong and may vary by country.

The median regression analysis showed that the coefficient for TZA is positive but not statistically significant, while GHA and KE are negative and not statistically significant. Additionally, the overall coefficient for all countries is negative and not statistically significant.

Overall, these findings suggest that the relationship between HCI and EG is complex and vary by country. The OLS and median regression analyses produced different results, but both suggest that the relationship is not strong or consistent across all countries. Further research may be needed to explore the factors that influence this relationship and why it may vary across countries.

Recommendation

It appears that the relationship between the HCI and EG is not strong, as evidenced by the low R^2values across all countries. Therefore, policymakers may need to consider other factors that contribute to EG, such as investment in infrastructure, education, and innovation.

While the OLS analysis suggests a positive relationship between HCI and EG in TZA, it is important to note that the intercept is negative so attaining EG will require large value of coefficient. This suggests that the relationship may be weak. Therefore, caution should be exercised when drawing conclusions based on this result.

The median regression analysis, which is more robust to outliers and non-normality, suggests that the coefficients for GHA and KE are negative but not statistically significant, while for TZA is positive but not statistically significant. This suggests that HCI may not be a significant predictor of EG in these countries or it is weak predictor.

Overall, it is recommended that policymakers consider a range of factors beyond HCI when formulating policies to promote EG in these countries. Additionally, further research may be necessary to identify other potential predictors of EG and to explore the relationships among these factors in more detail.

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References

Ahortor, C. R. K., Adade, J. K., & Fiagbe, M. S. (2018). Education, economic growth and poverty reduction in Ghana. African Journal of Economic and Management Studies, 9(1), 93-106.

Barro, R. J. (1991). Economic growth in a cross-section of countries. The Quarterly Journal of Economics, 106(2), 407-443.

GDP per Capita (Current US dollar). Available online: https://data.worldbank.org/indicator/NY.GDP.CD?locations=MY (accessed on 10th November, 2022).

Koenker, R., & Bassett, G. (2018). Regression-based quasi-experimental estimation of the impacts of interventions: The human capital example. Econometrics, 6(1), 8.

Kraay, A. (2018). Methodology for a World Bank Human Capital Index.

Lucas, R. E. (1988). On the mechanics of economic development. Journal of Monetary Economics, 22(1), 3-42.

Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. The Quarterly Journal of Economics, 107(2), 407-437.

Owusu-Addo, E., & Smith-Greenaway, E. (2018). Maternal education and child health: A comparison of Ghana and Kenya. Social Science & Medicine, 211, 93-101.

Policy Res. Work. Pap. (2018). Available online: https://openknowledge. worldbank.org/handle/10986/30466 (accessed on 1st November, 2022).

Shukla, G. (2018). Human capital index: A step towards economic growth. International Journal of Scientific Research and Management, 6(6), 13-17.

Wamalwa, F. M., & Ndung'u, S. K. (2018). The impact of education on economic growth in Kenya. International Journal of Social Science and Humanities Research, 6(2), 49-57.

World Bank. (2018). Human Capital Project. Retrieved from https://www.worldbank.org/en/publication/human-capital.

World Bank. (2021). Human Capital Index. Retrieved from https://data.worldbank.org/indicator/hc.hci.

Yuan, J., Xu, Z., & Xu, R. (2018). The impact of human capital investment on economic growth in Tanzania. Economic Research-Ekonomska Istraživanja, 31(1), 489-501.