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ABSTRACT

The role of human capital in accumulating national wealth and sustaining long-term economic growth and development is a strategic human resource and management approach that can be advantageous to society if financed well. The term and value of “human capital” can also be used as a competitive advantage for a country to maximize the labor force and conversely increase productivity and output. In this study, we investigate the role of human capital and its impact on economic growth and development. Based on the result obtained using the Ordinary Least Square (OLS) methods and technique, our result indicates that the index on Health care expenditure, LIFE Expectancy, and Foreign AID is negatively associated with Liberia’s Economic Growth and development. Theoretically, it was proven that Population (POPg) growth is positive and significant and also serves as a positive and contributing factor to Gross National Income accumulation in Liberia which also serves as a fraction of the labor force in the economy. Consequently, low expenditure (Investment) on Health care could place the total workforce at risk and causing a reduction in the human resource of the country. The data used in the study is Time-Series data which was generated from the World Bank Development Indicators to test the hypothesis and variables from 2000 to 2019. We used the EViews-7 statistical tool for data analysis.

Keywords: HUMAN CAPITAL, ECONOMIC GROWTH, EDUCATION, HEALTH, LIBERIA, DEVELOPMENT

1. Introduction

Human Capital has been a perceptible concentration towards the development and accumulation of national wealth. This is because the growth of physical capital for any nation of that matter depends on human capital resource and development. Without adequate support and investment in people at all level and developing the human resource capital which is the process of increasing individuals’ knowledge, skills and their capacities within a country, the possibility for economic growth might be lacking or in adequality. Past evidence proved that developing countries have
relied on education as their foundation for economic visibility, such as those of Japan, China, the United States, India, Germany, and Russia. There are growth evidence and significant progress of human capital resource and output between their economic growth and the kinds of education provided to their work-forces that we can point to (1). Also, the author highlighted the significance of education and what it does in acquiring capital stock (national wealth) and improving social development. Moreover, health and education are human capital components which serve as a contributing factor to economic growth and development.

In the current literature on human capital and its relationship to economic growth, there is empirical evidence and hypothesis tested in investigating the association to account for economic growth. Therefore it can serve as a pathway to sustainable and long-term economic growth and development. For example, there is a large body of empirical literature that has revealed that one of the most effective means that drive economic growth for countries is the inclusion of human capital resources (1), (2), (3), (4) argued about the advantage and (so-called level effect) and its influence on production through labor productivity.

Also, according to (5), the rate of effect through the means of increased competitive advantage due to innovation factors, and the spread of technology has a return on economic growth (6), (7) and, (8). Economists have used theories and empirical research to explain the causal relationship and factors that account for economic growth among countries. Among these are people like Professor Robert Solow (Solow-Swan model) providing theoretical backings and arguments to support these growth theories and hypotheses. These empirical studies specifically look into factors that determine growth in developing economies which are our best tools to help us understand the basics.

When considering human capital, we can argue that the success of individuals depends on their higher level of education and competency in society. Accordingly, people are becoming even more and more educated and likewise becoming valuable assets in society. From an economic viewpoint, capital refers to the factors of production used to create goods or services. While the human component is the subject to take charge of those economic activities such as production factors, consumption, and transaction among people.

Human capital resource plays a key role in rebuilding a nation and is one of the drivers and success behind every economy while the topic remains predominant in major research fields. According to (9), human capital is the most valuable asset in both developed and developing countries. For example, South Korea has given top priority to education and it invested more than 8% of its GDP on education (11). These countries and their success stories show that investment in human capital and policy changes and education reforms can lead to positive economic growth and developments.

As poverty drives the lives of millions in Sub-Sahara African countries, and also other parts of the globe, many countries are still a reliance on foreign aid and remittances as a major source of revenue generation rather than investment and focusing on their human capital resource. Moreover, it can also be advantageous especially to those of the least developed countries of Sub-Saharan African countries to aim at maximizing their capacity in spending on the component of human capital to boost their economy as the continent population continues to swell yearly.
The low contribution of government spending on citizens in Liberia through human capital investment has contributed to numerous challenges ranging from low living standard, poor quality of educational delivery in formal and informal intuitions of acquiring knowledge and skills consequently results in deprived and unequipped graduates that results to weak institutions. Liberia as one of the poorest countries on the coast of West Africa, the low level of human capital development continues to hinder the productivity level of individuals conversely results in a range of socio-economic challenges faced by both government and people ranging from poverty and unemployment in the society. Nevertheless, to achieve steady or cutting-edge economic growth, a nation should have a well-educated and diversified workforce of gender-sensitive trained to take over the day-to-day affairs of the economy. One way to achieve this by a government is to ensure that adequate investment is made to create a productive workforce of citizens at all levels.

People's value and their knowledge in society can turn out to be very rewarding when it starts to show up in their productivity and output, therefore, this component of the economy cannot be overlooked. The wealth of a nation does not only lie in its produced capital, natural resources, but in its people; their skills, their health, and their resilience that give back to society. People, and their human capital capability, are fundamental long-run and sustainable economic growth tools for transformation. Over the last few decays, many prominent international organizations have placed more focus on human development, especially in Sub-Saharan African countries, and among them is the World Bank Development Group.

The World Bank’s Africa Human Capital Plan identifies several game-changers in other to accelerate Africa’s human development capacity. Not only that but also, the proposed European Union’s 2020 Strategy is centered around the building of human capital for economic growth and the same for the World Bank Development Group. The EU’s global goals set in 2015 aim at ending poverty, protect the planet and ensure prosperity for everyone by 2030. In other to meet these deadlines and set criteria, for transformative and economic sustainability particularly for the least developed and third world countries in Africa and elsewhere, human capital resources or the knowledge and value of people cannot be overlooked in no time.

Empowering women and young girls is also an essential tool for an inclusive society. This helps to directly improve the human resource capacity and create a demographic change that can significantly impact poverty and human development and as well as fragility, climate, and broad-based economic growth for all. Second, preventing the loss of life in fragile and conflict settings, and also supporting displaced communities to increase one’s human capacity must be a major focus. Third, developing human capital requires multi-sectorial solutions that focus on transportation, affordable energy supply, good governance, and as well as interventions across other sectors like safe drinking water, agriculture, and food security.

Social protection systems must be put into place to help provide safety for the most vulnerable in society. Fourth, harnessing the opportunities that technology and innovation offer can improve the human capital outcomes and productivity in many other sectors. In general, Africa has growth potential at all levels that lie mainly in the continent's youthful population which gives it the edge among others for future growth.
opportunities but to achieve that, the continent must invest in human capital resource and development at all levels. Our proposed hypothesis to be tested is that low investment in education, health care (population) signals high risks of fatality (employee health) which results in worker's low productivity and risking the overall labor force in the economy. Countries with a higher initial investment in regions with higher initial health care (education) are certain to have higher economic growth rates. So, can Liberia attain social expansion through human capital accumulation? The answer is “Yes”. Investing and making use of the youthful population that the nation has, could be advantageous.

This analysis provides a test at the macro-economic level of the correlation between investments in the health care delivery system and the impact of population growth in the economy. To achieve the study goal, the author employed a theoretical framework that is based on a Neo- Classical economic growth model and approach using endogenous variables that affect national income. The role of human capital resource through (education and health care) can be used as a pathway to sustainable economic growth and development for Liberia. Mean why the study used a time series analysis on data general from the World Bank Development Indicators from the period 2000 to 2019 to test the hypothesis.

2. Literature review (Economic Growth Theories and Human Capital Development Regime)

The ideal concepts of economic growth and development are associated with economic output and economic progress for countries. From a microeconomics standpoint, the human capital theory suggests that education is an asset/investment that increases once productivity and income level (10). The link between foreign aid and economic growth has been presented theoretically, and empirically in previous literature. There are channels through which foreign aid affects economic growth and these channels are accumulation; direct Growth; and Conditional theoretical models argued by (11). The Accumulation model projected that the impacts of foreign aid are on either savings or investment, and showed that aid has an indistinct effect on the accumulation of capital/wealth. On the other hand, the direct Growth model framework used the reduced model of the effect of foreign aid on growth set considerably, and also combined to a positive, but do not have significant effects on growth itself (11).

The empirical analysis of (12) used dynamic growth equations on a panel data approach for a set of nine Asian countries over the period 1972 to 2012. The overall evidence shows that foreign trade improves the accumulation of human capital and contributes to economic growth positively. (13), argued that there are several channels through which human capital may affect technological progress. In their argument, they stress that individuals with the highest talents may in some way contribute to the technological component and progress by the use of their human capital skills if they have the necessary access to education amenities. In that way, these individuals can have the utmost significant impact on technological progress.

Apart from that, the workforce, in general, could affect technology, that is, due to the externalities derived from human capital and, also, because human capital alters and increases the incentives for people to invest more in technological advancement. For instance, the inclusion of the technological component of human
capital is likely only advantageous and more profitable if there are enough and skilled workers who know how to use those pieces of machinery and tools to maximize output.

The pioneering work of (14), (15), and including Mankiw and (16) demonstrated that the cross-country data can be read as consistent with either income non-convergence of convergence; and the extensive research over the intervening years has not produced a consensus (17), and (18). Economists have long started the importance of human capital in the process of growth. One might assume that neglecting human capital would lead to incorrect outcomes. Including human capital can potentially alter either theoretical modeling or the empirical analysis of economic growth which can be overlooked. (19) for example, believes that although there are diminishing returns to physical-capital accumulation when human capital is held fixed, the returns to all reproducible capital (human plus physical) are constant. (20) examined coefficients of variation for education variables for a sample of countries from 1960 to 1983. Since the coefficient of variation in the sample declined for enrollment rates at the three different levels of education contracted, therefore she concluded by saying that these indicators were converging. The research found the highest convergence at the primary level.

These individuals possess perhaps the most significant influence on technological advancement. Also, the workforce in more general terms may affect technology, that is, due to the externalities derived from human capital and, also, because human capital alters and increases the incentives to invest more in technological progress. Notwithstanding, technology may be only sufficiently profitable if there are enough skilled workers who know how to perform well on the job.

Long ago, the importance of human capital development was already considered in the early works of Adam Smith and Alfred Marshall see (21) and (22). However, it took a considerable length of time for human capital to emerge as a key factor for economic growth and is now being discussed among economic technicians. The most important contributions were developed from the mid-20th century and onwards (23), and to be specific, we can refer to (24) who also acknowledged and as a founder of human capital theory, underlining that human capital increases productivity of workers. Likewise, (25) highlights the effect of experience on technical change. In this vein, (26) emphasize that human capital is also important for implementing and adopting new technologies which (27) argues that workers are better off in coping with changes in the economic structure and flexible to handle new technologies if they have more human capital available.

In another development right about the beginning of the 1990s emerged new advancement in economics theory. An extension of Robert Solow's original growth model (i.e., the human-capital augmented Solow Growth model) was presented by Mankiw, Romer, and (28). The model explicitly includes human capital as a factor in the Cobb-Douglas production function. Also, the endogenous growth model, another kind of growth model, was introduced by (29) and, (19).

Historically, Robert Solow’s pioneering work on economic growth in the 1950s led to the formulation of growth accounting and the discovery of the “residual” (30). The residual is certainly that portion of economic growth that the researcher cannot easily explain due to the increase in physical productive factors such as the capital stock, the number of workers, and their hours and weeks of work (30).
The magnitude of the residual during much of the twentieth century relative to economic growth in per capita income or per worker terms demonstrated that physical capital accumulation did not explain much of growth phenomena and that something is responsible. That something else can be considered as knowledge import and the augmentation of the labor input through education and training of people. In other words, much of the residual was due to the increase in human capital formation. Some researchers have developed methods to close up or tighten the “residual” gap by adding human capital growth variables to the Solow neoclassical growth model (3).

Among the most important findings regarding economic growth over the long run period, is the one most relevant to the study of human capital in history, that the residual has increased greatly over time. When people acquired certain knowledge or skills, it does not only help in the short run period but also, in the long run, it yields more output-on investment and return to skills.

In general, we conclude by saying that all these growth models consider human capital as a fundamental tool and a driving force for economic growth and development, especially in the long run. Ultimately, the newest contribution to the field of human capital theory and economic growth is the Consolidated Growth models by (31). The idea is to explain economic development with a focus on a very long-term economic growth and strategy approach. In these models, human capital is attributed to a crucial role in the creation of sustainable economic growth.

What is being observed in these investigations is that higher growth of technological change/progress in a given sector can lead to a greater demand for the educated and skilled workforce through training courses. To fill this research gap and to contribute to the current literature, in this study, based on the recent theory of economic growth and human capital development, the study seeks to access the effect of human capital components on the economic growth of Liberia. Many of these pieces of empirical literature have been focused on developing economics rather than least develop economics or (third world) countries that have wealth in natural resources but yet lacked the human capital components. In this perspective, the key objective of this study is to investigate the impact of human capital resources and contribution as a steady pathway to economic growth for Liberia.

### 2.1 Approach of measuring human capital

The new and standardized approach of measuring human capital is those that are partially acceptable through the conceptual framework of the United Nations Development Program (UNDP) Human Development. The structure of the index is instituted to health care delivery, knowledge or education, and the standard of living with many sub-combined variables such as adult literacy rate, gross enrollment ratio, life expectancy at birth, and GDP per capita in a country.

International Labor Office (ILO) tends to utilize a similar index considering the quality aspects such as the Key Indicators of the Labor Market (KILM). It appears like these two measurements are based on the consideration of quality aspects with other economic perspectives. This brings us to the conclusion that an
investment in the human capital resource of a person can influence one's productivity levels. Whereas, other indicators that can add to estimating a more accurate concept of human capital are rarely considered.

2.2 Liberia’s human capital outlook, index, and ranking

According to the UNDP Human Development report of 2019 on Liberia’s HDI, the value for 2018 is 0.465 that placed the country in the low-ranking human development category and placing it at 181 out of 189 total countries and territories globally. That shows that the West African nation is still struggling to provide basic education, healthcare delivery, and as well as other social services for its people at all levels. Between 2000 and 2018, Liberia’s HDI value grew from 0.422 to 0.465, an upsurge of 10.2 showing Liberia’s progress in each of the HDI indicators illustrated in table 1 below.

However, between the period 1990 and 2018, Liberia’s life expectancy at birth rose to 17.7 years, mean years of schooling increased by 2.1 years, and expected years of schooling contracted by 0.9 years. Liberia’s gross national income GNI per capita also increased by 12.7 percent at about the same period 1990 and 2018.

### Table 1: Liberia’s HDI trends based on consistent time-series data

<table>
<thead>
<tr>
<th>Year</th>
<th>LIFE_Exp</th>
<th>Expected years of schooling</th>
<th>Mean years of schooling</th>
<th>GNI per capita (2011 PPP$)</th>
<th>HDI value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>46.0</td>
<td>.</td>
<td>2.6</td>
<td>923</td>
<td>.</td>
</tr>
<tr>
<td>1995</td>
<td>48.3</td>
<td>.</td>
<td>3.1</td>
<td>261</td>
<td>.</td>
</tr>
<tr>
<td>2000</td>
<td>51.7</td>
<td>10.5</td>
<td>3.5</td>
<td>1,209</td>
<td>0.422</td>
</tr>
<tr>
<td>2005</td>
<td>55.4</td>
<td>10.0</td>
<td>3.8</td>
<td>889</td>
<td>0.417</td>
</tr>
<tr>
<td>2010</td>
<td>59.6</td>
<td>9.5</td>
<td>4.1</td>
<td>1,020</td>
<td>0.441</td>
</tr>
<tr>
<td>2015</td>
<td>62.3</td>
<td>9.6</td>
<td>4.4</td>
<td>1,137</td>
<td>0.463</td>
</tr>
<tr>
<td>2016</td>
<td>62.8</td>
<td>9.6</td>
<td>4.5</td>
<td>1,091</td>
<td>0.463</td>
</tr>
<tr>
<td>2017</td>
<td>63.3</td>
<td>9.6</td>
<td>4.7</td>
<td>1,085</td>
<td>0.466</td>
</tr>
<tr>
<td>2018</td>
<td>63.7</td>
<td>9.6</td>
<td>4.7</td>
<td>1,040</td>
<td>0.465</td>
</tr>
</tbody>
</table>

**Source:** United Nations Population Division. World Population Prospects: created by the author with figures generated from the UNDP Human Development report of 2019

According to World Bank, the plan for Africa Human Capital development is that for all countries, the key to success in an increasingly globalized and digital economy is ensuring that people have the talents and potentials to take advantage of economic opportunities and be fruitful. The current World Bank’s new Human Capital Index (HCI) measures the potential productivity of Africa's next generation.

Africa’s HCI score account for 0.4 compared to the global average of 0.57. That is, under certain
circumstances, babies born in Sub-Saharan Africa today will be only 40% as productive when they grow up as they could be if they had finished training and healthy enough (as determined by the index). It has a direct effect and implication on the overall well-being not only of people and families but also the whole economies of the continent on a larger scale.

Countries placed at the bottom of the index like Mali, Niger, South Sudan, Chad, and Liberia will register the heaviest foregone income and be left further behind in the wakeup of the global economy. At the same time, countries with significantly developed human capital on the continent can enjoy quite a series of benefits such as reduced poverty gap, increased employment opportunities for the youth, equitable income and wealth distribution, gender equality, and sustainable economic growth rate. On the contrary, countries with poor human capital development like Liberia and those countries beneath can experience low life expectancy and experience high mortality rates.

Liberia as a low-income country in West Africa, to develop her human capital and close on these gaps to achieve some level of economic growth continue to strive on public policy measures to embark on some educational programs by both past and present leadership had failed on, but these have only served as channels for the corrupt elect-political leaders and their allies to steal public resources and to enrich themselves at the expense of the minority. The Liberian education system from time to time has been hardly hated with multiples of challenges through civil unrest. Covering the period between (1989–2003), with the aftermath of the 14-year-long civil war that climaxed in 2003, the entire structure of the Liberian education system has experienced a long history of political, social, and economic fragility, and insecurity leaving its human capacity in a broken state.

Also, with the end of the violent conflict in 2003, the country continues to make efforts in rebuilding and strengthening its human capital capacity through the provision of affordable education. When the nation confronted the deadly EBOLA pandemic in 2014, many lives were taken away. Approximately 15,000 plus Liberians died at the same time thousands went jobless and unemployed. Still then, the country remains committed through its governments in embarking on intensive efforts at post-war and post-Ebola development challenges and to hooping its people for a brighter future.

The government of Liberia commitment is best outlined in the Poverty Reduction Strategy (PRS) 2008–2012, which prioritizes four pillars of activity: (1) enhancing national security, (2) revitalizing key sectors of the economy, (3) strengthening administration and improving on the rule of law, and (4) enhancing infrastructure development and fulfilling basic social services, including education (32).

Due to these circumcises and among others like the current COVID-19 health care crisis, the standard of education in Liberia and the strength of human capital development remains very poor while the shortage of qualified and innovative teachers in primary and secondary institutions is lacking. Given the high prospects to achieving economic growth in Liberia which human capital development may be the way out, a modern and digitalized education system will be a priority. Also, well-educated and career-driven teachers in the classroom, and a real-time health care delivery system may help Liberia to overcome some of these goals and meet her
potential in the long run. The contribution of the real-time health care system and modern education system put in place could serve as a major component of human capital development for Liberia need not be ignored.

In Sub-Saharan Africa (SSA), the account for human capital remains a major challenge of which related to access to essential services. Government public spending hobbit in sectors that support the attainment of human capital is extremely low in Liberia and even lower than in all other regions of the world with Mali, Niger, South Sudan, and Chad being at the bottom of the region in their low human capital capacities. Figure 1 displaced the full version of regions and their HCI scores with Liberia among the lowest in the “World Bank Africa Human Capital Plan” and ranking.

**Figure 1:** Liberia’s position in Africa among the lowest with HCI scores

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**Source:** World Bank Africa Human Capital Plan:

### 3. Material and method

Empirically, to analyze the relationship between human capital and economic growth, we employed the Ordinary Least Square and linear regressions model using an extended Solow-Swan Exogenous Growth Model. The Solow-Swan model is used to describe economic growth within the framework of neoclassical economics. However, it is an exogenous growth model reliant on capital accumulation, labor, and population growth that is meant to increase productivity.

The Robert Solow and Trevor Swan model has been existent since 1956 and is cited in most empirical work of scholars on economic growth, and analysis research. The model is used to examine the impact of human capital resource and development when public (government) investment on Health care, Life Expectancy at birth (LIFE_Exp), Labor Force (LABOR), Population (POPpg) growth, and foreign AID on the Gross National Income (GNI_PPP) of Liberia. Our model selection also draws insights from the empirical works of (33).
In the same vein, our model concord with (34) empirical study using multiple regression and a linear model to represent variations in a dependent variable as a linear function of several descriptive variables in addressing the nexus of human capital investment components and economic growth. This study uses annual Time-Series data from the period 2000 to 2019. The data used in the study is sourced from the World Bank Development Indicators (WBDI) database. We performed a unit root test for stationary at “level” and then, “1st difference” while allowing the EViews-7 statistical tool to automatically select Schwarz Info Criterion with maximum legs of 4 to obtain ADF (Augmented Dickey-Fuller) test.

### 3.1 Model presentation

#### Table 2: Data Measurement and Sources

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description and Measurement</th>
<th>Source(s) of Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNI_PPP</td>
<td>GNI per capita based on purchasing power parity (PPP) or (Gross National Product)</td>
<td>World Bank, World Development Indicators database</td>
</tr>
<tr>
<td>HEALTH</td>
<td>Current health expenditure per capita, PPP (current international $)</td>
<td>World Bank, World Development Indicators database</td>
</tr>
<tr>
<td>LIFE_Exp</td>
<td>Life Expectancy at Birth</td>
<td>World Bank, World Development Indicators database</td>
</tr>
<tr>
<td>LABOR</td>
<td>Total Labor Force</td>
<td>World Bank, World Development Indicators database</td>
</tr>
<tr>
<td>POPg</td>
<td>Annual population growth rate</td>
<td>World Bank, World Development Indicators database</td>
</tr>
<tr>
<td>AID</td>
<td>Foreign aid was proxied by the ratio of official aid and other development assistance</td>
<td>World Bank, World Development Indicators database</td>
</tr>
</tbody>
</table>

We formulate the equation as:

\[ \hat{Y}_t = mx + b + \epsilon_t \]

Where: \( \hat{Y}_t \): Dependent variable, \( X_t \): Independent variable, \( b \) = Constant term, \( t \) = Time trend

\( \epsilon_t \) is the error term, which is the difference between the actual value of a dependent variable and its predicted value.

Econometrically, the model for this research analysis is stated as:

\[ \hat{Y}_t = \beta_0 + \beta_1X_t + \beta_2X_t + \beta_3X_t + \beta_4X_t + \beta_5X_t \ldots \epsilon_t \]

Where: \( \beta_0 \) is known as the Intercept while \( \beta_1, \beta_2, \ldots \) and \( \beta_5 \) are explanatory variables with \( \hat{Y} \) known as the Coefficients. Thus; \( \hat{Y} = \text{GNI}_\text{PPP}, \beta_0=\text{Intercept}, \beta_1=\text{HEALTH}_t, \beta_2=\text{LIFE}\_\text{EXP}_t \)

\( \beta_3=\text{LABOR}_t, \beta_4=\text{POP}_t, \beta_5=\text{AID}_t, \epsilon_t = \text{Error term} \)

The above equation can be expressed in a linear function given an empirical version of the research model as

\[ \text{GNI}_\text{PPP}_t = \beta_0 + \beta_1 \text{HEALTH}_t + \beta_2 \text{LIFE}_\text{EXP}_t + \beta_3 \text{LABOR}_t + \beta_4 \text{POP}_t + \beta_5 \text{AID}_t + \epsilon_t \]
3.2 Empirical results presentation and discussion of findings

Descriptive statistics:

The Multiple Regression Model was run using E-Views7 to determine the effects of Health, Life Expectancy, Total Labor Force, Population (POP), and foreign AID on the Gross National income (GNI_PPP) of Liberia from the period 2000 to 2019. In this multiple regression model, GNI per capita income is used as a dependent variable in the study, whereas Health, Life Expectancy, LABOR, Population growth rate (POP), and foreign AID are defined as independent variables or explanatory variables in the model. In order to estimate the effect of the variables on the gross national product of Liberia, the Multiple Regression Model is applied. See the Descriptive Statistics of the variables in Table 3 below.

<table>
<thead>
<tr>
<th>Source: Author’s Computation using EViews Version 7.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 3: Descriptive Statistics</td>
</tr>
<tr>
<td>GNI_PPP</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Std. Dev.</td>
</tr>
<tr>
<td>Skewness</td>
</tr>
<tr>
<td>Kurtosis</td>
</tr>
<tr>
<td>Jarque-Bera</td>
</tr>
<tr>
<td>Probability</td>
</tr>
<tr>
<td>Sum</td>
</tr>
<tr>
<td>Sum Sq. Dev.</td>
</tr>
<tr>
<td>Observations</td>
</tr>
</tbody>
</table>

The table showing the descriptive statistics also contains the mean, median, maximum, minimum, and standard deviation for the total of 18 observations covering the period 2000 to 2019. The table displaced key values/outputs like the probability, Skewness, Kurtosis, Jarque-Bera the sum, and the Sum Sq. Dev.

3.3 Interpreting regression coefficients for linear relationships

Applying the Ordinary Least Square (OLS) technique to the variables used in the study, the summary statistics of the test showed that the model of the study is well-tailored and that the variables are statistically significant. The independent variables in the model explain 95.51% best fit the model of the dependent variable, therefore, we say that our model is statistically significant. The p-value is less than the significant level of 0.5, so our sample data prove enough evidence to reject the null hypothesis for the entire population. Our data favor the hypothesis that there is a non-zero correlation, meaning that (there are some linear relations between our variables).

The changes in the independent variable are associated with changes in the dependent variable at the population level. The sign of our regression coefficient in Table (4) tells us whether there is a positive or
negative correlation between each of the dependent variables. The negative coefficient of our explanatory variables of mainly HEALTH, LIFE Expensify (Exp), and foreign AID suggests that as the independent variable increases by whatever percent, the dependent variable tends to decrease. The coefficient estimation predicates the mean of the “Ŷ” variable changes given a one-unit shift in the explanatory variable while holding other variables in the model constant.

Our explanatory variable population (POPg) has a direct link and association with gross national income (GNI_PPP). The coefficient of the constant variable recorded -3.18E+11 indicating a negative relationship between the constant parameter and the Gross National Income (GNI_PPP) level. Although, the constant parameter has no significant effect on the model rather than reflecting the value of GNI when other independent variables are held constant, see Table 4.

The R-squared value in our linear regression models also shows a goodness-of-fit in our prediction. Our regression summary also flagged out the percentage of the variance in the dependent variable that the independent variables explain jointly. The R-squared value measures the strength of the relationship between our model and the “Ŷ” variable. Our R-squared (R²) explains 95% strength of the variance in the dependent variable goodness-of-fit. In summary, this explains how well our sample data (size) in the model fits the distribution for our observed population.

<table>
<thead>
<tr>
<th>Table 4: Ordinary Least Squares (OLS) Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
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<tr>
<td>C</td>
</tr>
<tr>
<td>HEALTH</td>
</tr>
<tr>
<td>LIFE_Exp</td>
</tr>
<tr>
<td>POPg</td>
</tr>
<tr>
<td>AID</td>
</tr>
<tr>
<td>R-squared</td>
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<tr>
<td>Adjusted R-squared</td>
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<tr>
<td>S.E. of regression</td>
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<td>Sum squared resid</td>
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<tr>
<td>Log likelihood</td>
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<tr>
<td>F-statistic</td>
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<td>Prob(F-statistic)</td>
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</table>

Source: Author’s Computation using EViews Version7.

Table 4 contains the summary statistics of the regression output and highlighting the coefficients, the significance tests, and the R² statistic. In other words, the independent variables (GNI_PPP) predict the dependent variables better than just predicting the mean for everything.

4. Conclusion and discussion

This study empirically investigated the effect of human capital on economic growth in Liberia. Human capital accumulation and its effects on economic growth was the main hypothesis that was investigated and tested in this study. To assess the hypothesis empirically, the study employed an Econometrics model while
combining endogenous growth variables to test the effect of the variables. The empirical analysis was estimated by using a time series data technique of the Ordinary Least Square model on a set of variables from the period of 2000 to 2019. The overall evidence obtained from the study proves that the population growth rate can account for human capital accumulation and contribution to economic growth positively and statistically.

It implies that as the population increases and is supported through the provision of intensive formal education (average total years of schooling) in a society, it enables the accumulation of human capital through learning. This supports the idea that countries with a youthful population growth rate can invest in human capital by investing in tertiary and holistic education that could benefit the people in the long run. Moreover, the inclusion of Population (POPg) in the model signifies the overall quality of the labor force in the economy, and the result is statistically significant.

Our regression Coefficient output of Life Expectancy at birth, foreign AID, and government expenditure on HEALTH in the model is negative and statistically insignificant and that AID is not a way out for Liberia, but to invest more in health care, education, and the training of people. The future of human capital accumulation and its contribution to economic growth in Liberia as a least developed country is still lacking, and therefore, economic growth and development, in the long run, could take a downward turn if policymaker (s) failed to act, particularly in prioritizing health care and education.

We can conclude that the clear evidence that investments in people (e.g., education, training, health) could serve as a tool and a pathway to long-run economic growth. Health care, education, and population growth rate are joint investments that may offer scope for a more integrated policy approach to empower the total workforce. The endogenous growth model and theories have claimed that education has a positive effect on economic growth and that has been proven in this study. It shows that enrolment rates in school and the overall education of an individual in a society can serve as a valid indicator (variable) for capturing human capital, and calls for more investment in the quality aspects of healthcare and education.

4.1 Research limitations

Although there are other key variables that the study may have included in the model for robust results, due to the lack of data for some important indicators and therefore it limits the research to those variables with data access and availability that could have predicted a better outcome of the study by increasing the sample size. Moreover, from a geographical standpoint, the lack of previous studies on the chosen topic is very difficult to find. Statistically, the tests failed to identify some important relationships or connections among the variables due to the small sample size.

To address this problem in future research and to build on this study, it is necessary that one base the same study on a larger sample size to end up with more accurate results. Lastly, to flag that the author doesn’t have long years of experience in writing scientific papers or discussing complex economic issuers and analysis that’s why the depth and scope of this study may be limited as compared to scholars with a lot of years and expertise in the field.
**Acknowledgments**

The authors would like to acknowledge Mr. Benjamin Ohene Kwapong Baffoe and Dr. Li Ziyu for the mentorship, and professional advice at the time of conduction this research. Lastly, the authors recognize all the authors and papers cited in this manuscript.

**Author contribution**

Both authors discussed the results and contributed to the final version of the manuscript. More specifically, Faliku Stephen Dukuly has contributed to the conception, developed the econometric model, data collection, data analysis, and interpretation of results, whereas Dr. Kun Huang plays a supervisory role throughout the drafting and structuring of this research while the two authors conceived of the presented idea in the paper.

**References**


Appendix - A

Table 5: Sample of the data set used in the study

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Source: Author’s Computation using EViews Version 7.
Appendix- B

**Figure 2:** Histogram accounting for Liberia’s GNI per capita based on purchasing power parity (PPP) 2000-2019

![GNI_PPP](image)


Appendix- C

**Figure 3:** Histogram accounting for total government expenditure on health (2000-2019)

![HEALTH](image)

**Appendix- D**

**Figure 4:** Labor Force, total contribution (2000-2019)

![Labor Force Graph](image1)


**Appendix- E**

**Figure 5:** Life Expectancy at birth (2000-2019)

![Life Expectancy Graph](image2)

Appendix- F

**Figure 6:** Liberia’s Annual Population Growth rate (2000-2019)

Source: Author’s Computation using EViews Version 7.

Appendix- G

**Figure 7:** Inflow of Foreign AID and other development assistance (2000-2019)

Source: Author’s Computation using EViews Version 7.
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My research interests center around Agricultural Development and Food Security, Macroeconomics, International Trade Theory and Policy, and Rural Development. I plan on continuing my research and doctoral studies in Agricultural, Policy, and Development with a focus on Food and Agricultural Economics.

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