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# IMPACT OF LIFE EXPECTANCY ON ECONOMY GROWTH IN NIGERIA (1980-2012)

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## ABSTRACT

This paper examines the impact of life expectancy on economic growth in Nigeria between 1980 and 2012 through the application of augmented Solow (1956) growth model adopted from Mankiw, Romer & Weil (1992). The model incorporated life expectancy as an additional variable to the traditional neoclassical inputs (labour and capital). The model built is estimated using Ordinary Least Square (OLS) and Autoregressive Distributed Lag (ARDL) estimation techniques. The result establishes that life expectancy has a positive impact on economic growth in Nigeria. Thus, life expectancy is a statistically significant explanatory variable for productivity growth in Nigeria. The study suggested that government should, as a matter of urgency, increase her expenditure on the health sector, and the various health care facilities in Nigeria should be upgraded and adequately equipped with materials and qualified health workers.

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**Keywords:** Life expectancy; autoregressive distributed lag; labour; capital; economic growth

**JEL CODE:** 040

## 1. Introduction

**T**HE literature is replete with works on the relationship between life expectancy and economic growth. Life expectancy at birth indicates the number of years a new born infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life (World Development Indicator, 2015). Many of the endogenous growth theorists establish the key role of human capital in economic growth (Romer 1986, 1989, 1990, Lucas 1988, Quah and Rauch, 1990, Grossman and Helpman 1991, Rivera-Batiz and Romer 1991). In the same vein, Isola and Alani (2012) support the human capital as a source of economic growth hypothesis. Using data from Nigeria, they examined the different measures of human capital development to economic growth in Nigeria. They found that little commitment had been accorded health sector when compare to education.

Furthermore, the impact of health on economic growth may be viewed from both the micro and macro levels. At the micro level, Schultz (2002) has provided evidence of good health as a necessary condition for school attendance. Also at the macro level, several studies (Barro and Lee 1994; World Bank 1994 and Barro 1991, 1995) have shown that there is a strong link between measures of aggregate health such as life expectancy and economic growth.

According to Yaqub, Ojapinwa and Yussuff (2012), Nigeria's rate of infant mortality (91 per 1000 live births) is among the highest in the world. It therefore becomes imperative to ask if governance has an impact on the effectiveness of health expenditure in Nigeria. Their study using the OLS revealed that there is a negative relationship between per capita GDP and infant mortality, which is in line with theoretical expectation, the coefficient of per capita GDP is however insignificant. In addition, their result indicates that the coefficient of health expenditure indicates that a one percent increase in health expenditure is associated with 0.03 reductions in infant mortality rate. In addition, in the life expectancy equation, per capita income is rightly signed and significant. However, the coefficient of the variable is small. A one percent increase in per capita income will only lead to a 0.006 percent increase in life expectancy. Also, their results revealed that higher per capita income would deliver lower infant and infant mortalities and high life expectancy, which is consistent with results in the literature; and also there is link between public health expenditure and infant and under-5 mortalities are negative but the efficacy of public spending in lowering infant and under-5 mortalities is positively related with the level of governance, which supports the argument for good governance. The two-stage least squares regressions results reported in the life expectancy equation without the governance variables, both public health expenditure and per capita GDP are wrongly signed although significant but when the governance variables are included, the variables became rightly signed. The coefficient of per capita GDP is 0.01 while that of public health expenditure is 0.02. This implies that a one percent increase in per capita income and public health expenditure would increase life expectancy by 0.1 and 0.02 percent respectively. This result conforms to what obtains under OLS. It should be noted that most of the evidences in the human capital growth regression analysis are cross-country regression analyses of developing countries and OECD countries. Many of the empirical analysis are yet to be done for individual countries. The findings from this paper have a strong implication on health policy in Nigeria.

The theoretical framework adopted for this study has its basis in the endogenous growth models popularized by Mankiw, Romer and Weil (1992). It is a term used to sum up the contributions of various proponents to a model of long-run economic growth within the framework of neo classical economics. The theory postulates that policy measure can have an impact on the long run growth of an economy. The model was adopted because it built a model of long run growth without the assumption of fixed proportions in production thus demonstrating steady state growth.

Hence, the lack of consistent findings in the literature, the questions of which direction dominates and possibly specification problems in the early works, lends justification to

the analysis that we pursue in this study. In addition, the contribution of this paper is to fill these gaps using Ordinary Least Square (OLS) and Autoregressive Distributed Lag (ARDL) estimation techniques. Therefore, this study seeks to evaluate the growth impact of life expectancy to determine the extent and magnitude of its contributions to the Nigerian economy, from 1980 to 2012.

The paper comprises five sections: section one deals with introduction, section two is review of theoretical and empirical literature. Section three provides the model specification and sources of data while section four presents empirical results. Section five discusses the conclusions, economic implications and policy relevance.

## 2. Literature Review

In a simple analogy, following Hicks and Streeten (1979), one of the most important indicators of health capital is life expectancy at birth. For example, in Nigeria, life expectancy at births moved from 42.0 years in 1992 to 47.4 and 50.0 in 1980 and 1982 respectively. It recorded an average of 49.0 and 51.0 between 1983 and 1985 and 1986 respectively, before it evened out at an average of 52.0 for the period 1990 to 1993 (Odusola, 1998). Furthermore, life expectancy at births in Nigeria evened out at an average of 54.0 for the period 2001 to 2005 and with an average of 50.5 for the period 2006 to 2012 (CBN, 2006-2012 and NBS 2005-2010). Following UNDP (1996) standard, this life expectancy at births recorded for the periods under review is considered relatively low when compared with the average of 70 years of all developing countries and 75 years for the developed countries. In a related study, Kee (2001) also considered infant mortality rates, life expectancy at births and standardized mortality rates as major indicators of population health status. In the same vein, Moris (1979) regarded life expectancy at birth and infant mortality as very good indicators of the physical quality of life.

In a related study, Weil (2007) suggested that health's positive effect on GDP is strongest among poor countries. For rich countries, the existing empirical evidence whether health capital formation stimulates GDP growth at all is mixed. For instance, while Rivera and Currias (1999a, 1999b and 2004) find a positive effect of health expenditure growth on productivity growth for OECD Countries, Knowles and Owen (1995 and 1997), as well as McDonald and Roberts (2002) rejected the hypothesis that life expectancy is a statistically significant explanatory variable for productivity growth in high-income countries. On a similar note, Oni (2014) using the Nigerian data and employing measures of the determinants of economic growth like gross capital formation, total health expenditures and life expectancy rate amongst others, found out that life expectancy rate exerts negative impact on growth more than other chosen variables. Bhargava, Jamison, Lau and Murray (2001) even estimated a negative effect of the adult survival rate on economic growth for the US, France and Switzerland. Acemoglu and Johnson (2006) reached a similar conclusion.

In a related study by Amaghionyeodiwe and Osinubi (2004) and Addison and Wodon (2007), there is a positive relationship between per capita income and life expectancy.

Their results indicated that at low-income levels there is a sharp improvement in health as incomes increase. In addition, there is a strong positive relationship between the life expectancy and per capita income up to a threshold per capita income level of about \$375. The relationship becomes weak as income rise beyond that point, although it remains positive. Other researcher such as Loto (2011) that have used Nigerian data and Johansen cointegration technique and the vector error correction methodology, posited that the impact of expenditure on health was found to be positively related to economic growth.

Furthermore, Bakare and Olubokun (2011) reported that in spite of expansion in public expenditure, much impact has not been made in the area of reduction of infant, under five and maternal mortalities since 1970. For instance, Nigeria's rate of infant mortality (91 per 1000 live births) is among the highest in the world, and the immunization coverage has dropped below thirty percent while the mortality rate for children under age five is 192 deaths per one thousand. By year 2007, it was reported that more than one hundred and thirty four thousand women died from pregnancy complications. In addition, the life expectancy ratio on the average has been on the decline over the study period.

Other studies such as Gupta et al (2002), Baldacci, Clement, Gupta and Cui (2004) and Bloom, Canning and Sevilla (2001) conducted for other countries all emphasized that health expenditure is positively related to economic growth. What differs from one country to another is the extent and magnitude of its contributions. For instance, Gupta et al (2002) found that government expenditure on the health care play an important role in determining life expectancy at birth rates. They concluded that there is a positive effect of public expenditure on social indicators such as health and education but with little increases in return to health expenditure. Similarly, Bloom, Canning and Sevilla (2001) in their study suggested that a one year improvement in a population life expectancy contribute to a recent increase in output. In addition, in a study of India, the World Bank (2004) examined the impact of per capita GDP, per capita health expenditure and female literacy on infant mortality using state-level data over the period 1980-99. The study observed that both per capita public spending on health and per capita GDP are inversely related to infant mortality rate, but the results were observed not to be very robust to alternative specification of the model.

### **3. Methodology**

In order to appropriately capture the impact of life expectancy on economic growth in Nigeria, this study employs the augmented Solow (1956) growth model adopted from Mankiw, Romer and Weil (1992). The model incorporated life expectancy as an additional variable to the traditional neoclassical inputs (labour and capital). The data used for this study are basically time series data covering 1980 – 2012, a period of forty (42) years. The data were sourced from Central Bank of Nigeria (CBN) Statistical Bulletin (various editions), National Bureau of Statistics and World Development Indicator (various issues). The model assumed a Cobb-Douglas production function specified as:

$$Y = AK^\alpha (hL)^\beta \quad 1$$

Where  $Y$  = Output level in the economy,  $K$  = Stock of physical capital,  $h$  = Level of human capital,  $A$  = Level of Technology,  $L$  = Labour;  $\alpha$  and  $\beta$  are elasticities of capital and labour respectively.

Econometrically, the model is specified as follows:

$$Y = AK^\alpha (hL)^\beta U \quad 2$$

When transformed into a log-linear form, we have,

$$\text{Log}Y = \alpha_0 + \alpha_1 \text{Log}K + \alpha_2 \text{Log}hL + \varepsilon \quad 3$$

Where  $\alpha_0 = \text{Log}A$  and  $\varepsilon = \text{Log}U$

If an additional variable (life expectancy) is included in, the model stated above, the model becomes;

$$\text{Log}Y = \alpha_0 + \alpha_1 \text{Log}K + \alpha_2 \text{Log}hL + \alpha_3 \text{LEB} + \varepsilon \quad 4$$

A-priori expectation:  $\alpha_1, \alpha_2, \alpha_3 > 0$ .

Output level or economic growth ( $Y$ ) is proxied by real gross domestic product; stock of physical capital ( $K$ ) is proxied by gross capital formation, total stock of human capital ( $hL$ ) is proxied by population while life expectancy is represented by ( $LEB$ ).

### 3.1 Estimation Procedure

The model built is estimated using Ordinary Least Square (OLS) and Autoregressive Distributed Lag (ARDL) estimation techniques. The estimated models are thereafter evaluated to ascertain whether the results obtained satisfy theoretical, statistical as well as econometrics requirements.

$\log(\text{rgdp})$  c  $\text{Log}(\text{kap})$   $\log(\text{pop})$   $\text{lep}$

### 3.2 Results and Discussions

**Table 1: Phillips-Perron Unit Root Tests**

| Variable | "t" Value at Levels | "t" Value at First Difference | Order of Integration |
|----------|---------------------|-------------------------------|----------------------|
| LogY     | -0.4509             | -15.458                       | 1                    |
| LogK     | -0.0087             | -11.6430                      | 1                    |
| LoghL    | -0.3809             | -3.3580                       | 1                    |
| LEB      | -1.6789             | -6.4422                       | 1                    |

Source: Authors' Computation

Table 1 above shows that none of the variables is stationary. The first difference of all the variables are however stationary. This implies that all the variables are integrated of order 1.

**Table 2: ARDL Co-integration Bounds Test**

| Test Statistic | Value  | K |
|----------------|--------|---|
| F-statistic    | 2.9487 | 3 |

Source: Authors' Computation

Critical Value Bounds at 5% Significance: Lower (2.94), Upper (9.43)

Table 2 above shows that there is an inconclusive evidence of long-run relationship among the variables. The f-statistic falls in between the lower (2.94) and upper (9.43) bounds.

**Table 3: Short-Run Regression (LogY) by ARDL**

| Variable       | Coefficients            | "t" Value    | "p" Value |
|----------------|-------------------------|--------------|-----------|
| Intercept      | -55.3462                | -2.7333      | 0.0109    |
| LogY(-1)       | 0.4179                  | 1.9798       | 0.0580    |
| LogK           | -0.1350                 | -0.7252      | 0.4746    |
| LoghL          | 3.2912                  | 2.9122       | 0.0071*   |
| LEB            | 0.1079                  | 0.8940       | 0.73792   |
| $R^2 = 0.5829$ | Adjusted $R^2 = 0.5211$ | $F = 9.4342$ |           |

Source: Authors' Computation

(\*) Significant at 5% level of significance

Table 3 above shows that GDP at lag one, labour (proxied by population) and life expectancy have positive impact on economic growth (GDP). This agrees with the a-prior expectation. Capital (proxied by gross capital formation) however has a negative impact on GDP. This is contrary to the a-prior expectation. The negative capital may be connected to the inadequacy in capital formation in Nigeria. Raising capital for business is still a major challenge in Nigeria. Only the positive impact of population is statistically significant at 5% level of significance. The R-square shows that the dependent variables jointly explain 58.29% of variation in economic growth (GDP). The F-statistic of 9.4342 shows that the model is statistically significant.

**Table 4: Long-Run Regression of (LogY) by OLS**

| Variable       | Coefficients            | "t" Value     | "p" Value |
|----------------|-------------------------|---------------|-----------|
| Intercept      | -74.3626                | -3.8759       | 0.0006    |
| Log K          | 0.01425                 | 0.0783        | 0.9382    |
| Log hL         | 4.2163                  | 4.0506        | 0.0003    |
| LEB            | 0.1912                  | 1.5451        | 0.1332    |
| $R^2 = 0.5499$ | Adjusted $R^2 = 0.5034$ | $F = 11.8123$ |           |

Source: Authors' Computation

Table 4 above shows that capital (proxied by gross capital formation) (LogK), labour (proxied by population) (LoghL) and life expectancy (LEB) all have positive impact on economic growth (GDP). This agrees with the a-prior expectation and it is consistent with those of other researchers such as Loto (2011), Gupta et al (2003), Ogungbenle, Olawumi, and Obasuyi (2013) among others. However, only the coefficient of labour (proxied by population) is statistically significant at 5% level of significance. Others are

not statistically significant. The R-square shows that the dependent variables jointly explain 54.99% of variation in economic growth (GDP). The F-statistic of 11.8123 shows that the model as a whole is statistically significant.

#### 4. Conclusion and Recommendation

This study evaluates the growth impact of life expectancy to determine the extent and magnitude of its contributions to the Nigerian economy, from 1980 to 2012 through the application of the Ordinary Least Square (OLS) and Autoregressive Distributed Lag (ARDL) estimation techniques. In spite of the little attention paid to the health sector within the period coupled with fluctuations in the percentage of budgetary allocations to the sector, the results of the empirical analysis showed that life expectancy has a positive impact on economic growth in Nigeria. The study therefore, supports the human capital as a source of economic growth hypothesis.

A major policy implication of the results of the study is that, the government should increase her expenditure on the health sector and that the various health care facilities in Nigeria should be up-graded and adequately equipped with materials and qualified health workers. This will go a long way to increase the level of investment in Nigeria and the productive years of Nigerians.

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