Eurasian Journal of Economics and Finance, 8(4), 2020, 217-230
DOI: 10.15604/ejef.2020.08.04.003

EURASIAN JOURNAL OF ECONOMICS AND FINANCE

www.eurasianpublications.com

A RECONSIDERATION OF THE HEALTH STATUS – ECONOMIC GROWTH NEXUS: EVALUATION OF THE GENDER DIFFERENTIAL EFFECT IN NIGERIA

Olufunmilayo Olayemi Jemiluyi
Corresponding Author: Adeleke University, Nigeria
Email: jemiluyi.olayemi@adelekeuniversity.edu.ng

Ifeoluwa Alao-Owunna
Adeleke University, Nigeria
Email: Ifeoluwa.alao-owunna@adelekeuniversity.edu.ng

Received: September 24, 2020 Accepted: December 1, 2020

Abstract

It is tempting to say that the health status-economic growth literature in Nigeria is exhaustive due to the large body of extant studies. However, gaps exist on the gender perspective to the relationship between health status and economic growth in Nigeria as the literature largely examined the relationship at the aggregate. Therefore, this study seeks to explore the gender dimension to the health-economic growth nexus in Nigeria using gender-disaggregated data on longevity. Applying the dynamic ordinary least square (DOLS) to the time series for the period between 1981 and 2018, the findings suggest there is gendered difference in the effect of male and female life expectancy at birth on economic growth. Specifically, the results show that male life expectancy at birth is positively correlated to economic growth while there is evidence of a negative relationship between female life expectancy at birth and economic growth. Also, foreign investment and credit to private sector were found to be negatively correlated with economic growth while the urbanization rate was found to have economic growth premium in the study period.

Keywords: Health Status, Economic Growth, Female Life Expectancy at Birth, Male Life Expectancy at Birth, Nigeria

JEL Classifications: I15, I18, J11

1. Introduction

A significant conclusion of the World Health Organization (WHO) Commission on Health and Macroeconomics (2001) is the undermining of the integral role of health in the economic growth process by the thrust of contemporary theoretical and empirical arguments of 'wealth is health' dominating the health-income literature. The "wealth is health" strand of the literature has long argued in favor of a unidirectional causal effect running from wealth to health; the focal point of the argument being health is a dividend of increased income (Nwude *et al*. 2020; Rahman *et al.* 2018; Lange and Vollmer, 2017; Hall and Jones, 2007).

However, with the advent of the endogenous growth theory and in particular the human capital-growth theory which emphasized the unequivocal role of improved human capital: education and health, in explaining the neoclassical growth residual, increasing recognition has been accorded the contributions of population health in the growth process (Barro, 1996; Romer, 1990; Grossman, 1972). In both developed and developing economies, improved health status has been associated with healthy life span, enhanced participation in economic activities and productivity with the attendant benefits of increased consumption, broader saving base and reduction of poverty (Ali and Khurram, 2017; Khalim, 2017; Bloom *et al.* 2015; Adedeji and Akinlo, 2016; Bloom and Canning, 2005; Bloom *et al.* 2004; (WHO) Commission on Health and Macroeconomics, 2001). Hence, improved health is no longer considered a by-product of economic development, but rather an important instrument in achieving the latter.

The global acceptance of the 'health is wealth' argument is evidenced in the increasing wave of both theoretical and empirical research on the economic importance of health by global development community[1], increasing health-targeted aid for the developing countries[2] and the inclusion of health specific goals in the global Millennium Development Goals (MDGs) as well as in the post 2015 Sustainable Development Goals (SDGs) (UNDP, 2015a, 2015b).

Similarly, in Nigeria, the issue of health has continued to dominate the discussions on economic development. Improved health is pivotal to inclusive and sustainable development in a developing economy like Nigeria where about 51.4 percent of its over 200 million population are classified as multidimensionally poor and 16.8 percent are classified as vulnerably poor (UNDP, 2019). Also, about two-third of the population is engaged in subsistence agriculture and other low-income jobs for which physical strength pays off (ILO, 2018). The chairperson and founder of Bills and Melinda Gates Foundation addressing the Nigeria's National Economic Council (NEC) remarked about the prevailing poor health in the country. He asserted that the issue of low average life expectancy consequent upon prevailing high mortality rate in the country, poor maternal health statistics and chronic children malnourishment are major constraints to the achievement of economic growth and prosperity in the country.

While the empirical analysis of the health-economic growth nexus in Nigeria remains an ongoing debate, the renewed interest stems from the increasing shared recognition of gender roles in economic growth process. There is an increasing consensus within the development community that the development policies and actions that fail to address the disparities between male and female and take into account gender-specific growth determinants will have limited effectiveness and serious costs implication (Bertay *et al.* 2020; Seguino and Were, 2014). The gender perspective to the economic growth effect of health in Nigeria is important for investigation as gender inequality including inequality in health remains significantly high and female comprises about half of the country's teeming population (World Bank, 2019; UNDP, 2019).

In most modern economies, there are gendered differences in health outcomes such as morbidity rates, life expectancy at birth, adult and child mortality rates (World Bank, 2019). For instance, while evidences have established higher morbidity rates among women, life expectancy at birth and mortality rates are in favor of women. Women have higher survival rates and hence live longer than men. Also, theoretical and empirical evidences have established gendered differences in the prevalence of diseases particularly infectious diseases among males and females. Men bear higher burden of infectious diseases, which are major causes of illness and death in Nigeria (Bernin and Lotter, 2014). According to IHME (2017), among the HIV-negative population in Nigeria, male make up the majority of TB cases and die at higher rates (64.7%) than

[1] Examples of such include the WHO's Commission on Macroeconomics and Health, which studied the diverse pathways through which health-related investment may impact on economic growth and development especially in the developing economies. The Pan American Health Organization (PAHO) and the Inter-American Development Bank Health projects testing the long-run economic growth impact of health in the Latin America and the Caribbean.

[2] There has been a remarkable growth in development assistance for health to developing countries especially since the 21st century. The Institute for Health Metrics and Evaluation's (IHME) Development Assistance for Health dataset shows that health aid to developing countries grew at an annual rate of 73.7 percent between 1990 and 1999, and had a growth rate 0f 163.6 percent between 2000 and 2010 growing from $10.7 billion to $28.2 billion.

females, while the proportion is far higher among the HIV-positive population. Although men bear a significant proportion of the burden of HIV/AIDS disease, women's share of population living with HIV is relatively higher than men. In 2018, 55.6% of adults living with HIV were women (UNAIDS, 2019).

Sequel to the enumerated facts, it is possible, therefore, that male and female health capital stocks have differential impact on economic growth. Thus, this study seeks to contribute to the ongoing investigation of the nexus that exists between health status and economic growth in Nigeria bearing in mind the possibility of gendered differences in the relationship. Although a sizeable proportion of the literature has examined the effect of health capital on economic growth nexus in Nigeria, a careful review of the literature reveals that studies that examine the gendered differences are rare. The tiny but growing body of literature on the gendered differences in the effect of health on economic growth has focused on the developed and emerging economies (Hassan and Cooray, 2012; Licumba *et al.* 2016; Hassan *et al.* 2017).

The remainder of the paper is structured as follows; the introductory section is followed by the review of the literature in Section 2. The methodology is presented in Section 3 while section 4 and 5 focus on the empirical result and conclusion of the study respectively.

2. Literature review

The review of both policy and empirical health-economic growth literature reveals an existence of a large body of panel and country-specific studies for developed, emerging and developing economies alike. Although, there seems to be a near-consensus on the pro-growth effect of better health status, the literature is still characterized with diverse findings which have been factored on methodology used, period of study and heterogeneity of countries in panel studies.

Using life expectancy as measure of health capital, earlier works of Knowles and Owen (1995), Barro (1996), Bloom and Williamson (1998) and Sachs and Warner (1997) establish that a positive relationship exists between health status and economic growth. In the same vein, investigating the differences in economic growth rates between the East and South Asia countries, Bloom *et al.* (2004) conclude that health status plays significant role in the East Asia's rapid economic growth and South Asia's slow economic progress. Using survival rate, Bhargava *et al*. (2001) also document the economic growth advantage of health in a panel of 70 countries. The empirical findings based on random effect method of estimation shows that improved health status promote economic growth particularly in the poorer countries. Bloom *et al.* (2004) test the health-economic growth relation based on panel data in ten years intervals over 1960-1990. The non-linear two stage least square estimation affirms that health capital is a significant determinant of economic growth.

Furthermore, Aghion *et al.* (2010) assess the output growth effect of rate of improvement in health in cross-country regression involving 96 countries. Combining the Nelson-Phelps (1966) and Lucas (1988) approaches in a unified framework, the OLS estimates reveal that increased per capita outcome is associated with higher initial level of health as well as improvement in health. Swift (2011) similarly investigates the growth-inducing effect of health in a panel study of 13 OECD countries. The Johansen multivariate cointegration analysis covering a two centuries period (1820-1920 and 1921-2001) provides evidence in support of the positive effect of health on total GDP as well as GDP per capita. Similarly, Strittmatter and Sunde (2011) in a long panel of European countries corroborate the positive relationship between improvement in health and economic growth. Examining the role of health in the economic growth process of a panel of European Union (EU) member countries, Alina *et al.* (2013) affirm the health-led economic growth hypothesis. However, the study also concludes that longer life expectancy with lower adult mortality rates birth elderly population with consequent negative effect on economic growth.

In a critique of Acemoglu and Johnson (2007), Bloom *et al.* (2014) using the same dataset and instrumenting initial health rather than predicted mortality adopted by Acemoglu and Johnson (2007), the instrumental variable estimate shows that improvement in health has a significant effect on economic growth, with an additional year in life expectancy causing between 5% and 15% rise in income over a three decades period. The study therefore hinges Acemoglu and Johnson's (2007) conclusion of negative growth-effect of health on a priori exclusion of initial

health from the estimated growth model and the adoption of predicted mortality change instrument, which has no predictive power for improvement in health. Somayeh *et al*. (2013) adopt the fixed effect method to examine the growth-effect of health in a two-group panel of 14 developing countries and 16 developed countries, the results indicate that improved health status has a significant positive impact on economic growth in both groups of countries.

In a panel study comprising of 141 developing countries Ngangue and Manfred (2015) likewise explore the association between improvement in health and economic growth using dynamic panel estimators including fixed effect, instrumental variable and generalized method of moment (GMM) over the period 2000-2013. The study establishes that better health status plays a significant positive role in economic growth process. Stratifying the countries into income group, the findings show that while the relationship is consistent for the low- and high-income, the effect is not significant for the middle-income countries. Ali and Khurram (2017) investigate the contributions of the demographic factors and population health in the phenomenal increase in the South Asia's GDP in the last two decade. Using the fixed and random effect estimation techniques, the study upholds the growth-enhancing effect of population health, asserting that improvement in health signaled by increasing life expectancy and reduction in mortality rates plays significant role in the growth of the economies of the South Asian countries, and hence their development. In a survey of literature, Ndedi *et al.* (2017) examine the role of health in economic development. In affirmation of the health-led growth hypothesis, the conclusion suggests that increase in funding for health promote economic growth.

In spite of the large body of evidence in favor of the pro-growth effect of health, some studies assert that health does not lead to significant growth in the economy. For example, Caselli *et al.* (1996) using a panel data in five years interval over 1960-1985, show that additional year in life expectancy does not translate to a significant increase in economic growth. Similarly, the findings stemming from the OLS and instrumental variable analysis of Acemoglu and Johnson (2007) assert that although increased life expectancy is associated with significant rise in population, the analysis shows no evidence of significant effect of improved health on GDP growth. Also, Lehmijoki and Palokangas (2011) conclude that increase in life expectancy only raises the population size, thereby causing a dilution of the income per capita. Based on an empirical examination of the hypothesis whether decreasing rate of mortality induces growth, Fiaschi and Fioroni (2015) assert that without an accompanying technological progress, decline in mortality rate due to improved health status will only birth a Malthusian regime with implications of low GDP growth and reduced GDP per capita.

Moreover, a sizeable body of the literature provides evidences on sub-Saharan Africa, Nigeria inclusive. Analyzing the focal role of human capital in economic development in the continent of Africa, Eggoh *et al.* (2015) examine the effect of health on economic growth in a panel of 49 African countries. Both the OLS and GMM estimates reveal that public spending on health has a negative effect on economic growth, while health proxied by life expectancy and survival to age 65 has positive effects of small magnitude. Testing for the threshold effect of longevity on productivity and economic growth in a panel of sub-Saharan Africa, Adedeji and Akinlo (2016) find that longevity is an increasing function of labor productivity and economic growth, with significant positive threshold effects at ages 46.7 years on labor productivity and 67.5 years on economic growth. In another contribution on the SSA region, Waziri *et al.* (2016) assess the economic growth impact of the HIV/AIDS scourge in SSA. Analyzing the effect of the disease on life expectancy and the implication for growth in a decade period from 2002-2012, the GMM estimates show that HIV/AIDS epidemic is growth-inhibiting in the region, with a 10% increase in its prevalence rate accounting for a decline of 0.14% in GDP growth. Also, employing the GMM estimator, Aboubacar and Xu (2017) assess the health-economic growth relation in a panel of 36 SSA countries and corroborate the stance that spending on health is positively related to economic growth in the region.

Accounting for the possible reasons for divergence of findings, a strand of the literature argue that the diversity of result might be due to assumption of linear relationship characterizing the literature. Thus, Hansen (2012) considering the possibility of non-linearity in the relationship investigate the nexus in a panel of 119 countries over a four-decade (1940-1980) period. Confirming the existence of non-linearity in the relationship, the study concludes that the

assumption of linear relationship impedes the accurate analysis of the relationship and that health contributes robustly to economic growth within a non-linear framework. Criticizing Acemoglu and Johnson (2007)'s finding, Desbordes (2011) argues that the conclusions of Acemoglu and Johnson (2007) might have stemmed from functional form misspecification based on the assumption of a linear relationship. Estimating the relationship within a nonlinear framework using the same dataset, the instrumental approach results indicate that life expectancy is positively correlated with GDP, and hence GDP per capita, conditional on each country's initial level of life expectancy. Estimating a non-linear model and focusing on the role of demographic transition in the nexus between health capital and growth of economic output, Cervellati and Sunde (2011) find that health has a strong positive effect on income per capita in post-transitional countries and a negative causal impact in pre-transitional economies. In a more recent study, Khalim (2017) test a non-linear quadratic effect of life expectancy on output growth in a panel of 164 countries. The cross-section random effect analysis establishes a non-linear quadratic positive effect of health on economic growth, with a maximum turning point of 66 years.

Furthermore, a review of the literature show that there exists a tiny but growing strand of the literature examining the gendered differences in the relationship between health status and economic growth. Disaggregating the role of health by gender, Hassan and Cooray (2012) estimate the disaggregated effect of male and female health on economic growth in a panel of 83 countries. Accounting for endogeneity with different estimators and instruments, the study suggests that while improvement in male health is growth-inducing, female health has a negative effect on output growth. Licumba *et al.* (2015) study the gender differential effect of health in a panel of Southern Africa Development Community (SADC) member states. Using the fixed effect estimation method, the study finds that while both male and female life expectancy are positively related to economic growth, the magnitude is relatively higher for male. More recently, Mandal *et al.* (2018) test for the existence or otherwise of gendered difference in the effect of education and health dimensions of human capital on economic growth in a country panel of 127 countries for the periods between 1975 and 2010. Adopting the dynamic panel model of GMM and classifying the countries into developed and developing countries, the study shows that the growth effect of health differs across gender. Specifically, female health is correlated with economic growth in the developed countries, while male health is associated with economic growth in the developing countries.

3. Data, technique of analysis and methodology

3.1. Technique of analysis

For the achievement of the objective of this study, we employed time series data analysis in order to investigate the existence or otherwise of long-run or cointegrating relationship between health status and economic growth. It is no longer a novel issue in econometric analyses that the application of OLS to cointegrating series may generate inconsistent and biased estimates due to the problem of serial correlation or heteroscedasticity in the model (Stock and Watson, 1993; Philips and Hansen, 1990; Philips, 1986). Thus, several variants of the OLS estimator was developed to remedy the inherent challenges of modeling long-run or cointegrated relationships with OLS. An important example of such estimators is the dynamic ordinary least square (hereafter DOLS) developed by Stock and Watson (1993). The DOLS technique of analysis is adjudged more efficient to the ordinary least square (OLS), mitigating the associated deficiencies of OLS including endogeneity among the regressors, serial correlation in the error term as well as simultaneity bias among the regressors (Masih and Masih, 1996; Stock and Watson, 1993).

As a parametric method, DOLS has enjoyed wide application in estimating long-run relationships involving cointegrated variables of different orders of integration. Sequel to the inclusion of the lagged first difference of the regressors and lead terms in DOLS regression, the stochastic error term of a DOLS model is independent of all past shocks in the stochastic regressors thus dealing with simultaneity and small-sample bias (Harris and Solis, 2005; Masih and Masih, 1996). Moreover, aside its capability to allow for higher orders of integration, DOLS has also be found superior and more efficient in small samples relative to a number of alternative methods and its ease of implementation is widely acknowledged in the literature (Kao and Chiang,

2000; Masih and Masih, 1996). In all, DOLS estimator has been found useful for robust estimation of both time series and panel data analyses, producing asymptotically unbiased and normally distributed estimated coefficients (Harris and Sollis, 2005; Kao and Chiang, 2000; Masih and Masih, 1996). Hence, we employed DOLS to evaluate the long-run coefficient of the time series model.

3.2. Data

Annual time series from 1982 to 2018 were employed for the analyses. All data were sourced from the 2019 edition of the World Development Indicators (WDI) database of the World Bank. For the empirical analysis of the effect of gender dimension of health on economic growth, health data proxy by life expectancy is disaggregated by gender. Specifically, we adopt male and female life expectancy at birth to account for gender differential effect of health on economic growth in Nigeria. Life expectancy has been widely used in extant literature to measure improvement in health (Acemoglu and Johnson, 2007, 2014; Bloom and Canning, 2005; Bloom *et al.* 2015; Adedeji and Akinlo, 2016). While the study seeks to explore the gender dimension of health-economic growth nexus, other determinants of economic growth were included as control variables in order to avoid misspecification error. A strong correlation has been established between foreign direct investment (FDI) and economic growth (Choe, 2003; Zhang, 2001). Thus, FDI is included in the analysis to assess the impact of foreign investment on economic growth in Nigeria. Domestic credit to private sector tends to make fund available for investment purposes, which in turn promote economic growth, hence, the effect of domestic credit to private sector is assessed on economic growth. Also, the nexus between urbanization rate and economic growth has enjoyed extensive documentation in the literature (Gross and Quyang, 2020; Nguyen and Nguyen, 2018). Nigeria is urbanizing faster relative to other countries in the African continent. Between 2014 and 2050, Nigeria together with India and China are expected to account for 37% of the projected growth in the global urban's population (United Nations, 2014). Thus, urbanization rate is also incorporated in the growth regression. Table 1 presents the definition, adopted codes and unit of measurement of the variables employed in this study.

Table 1. Definitions of variables

Variables	Definitions	Units of measurement
GDPC	GDP per capita	US$
MLEX	Male life expectancy at birth	Year
FLEX	Female life expectancy at birth	Year
FDI	Foreign direct investment net inflows	US$
URBPG	Urban population growth rate	Percent
DCPS	Domestic credit to private sector	Percent

Source: Author's computation based on World Bank Group (2019)

3.3. Methodology

To uncover the long-run relationship between gender disaggregated health and economic growth, we adopt the production function approach of Bloom *et al.* (2004), a theoretical model based on the endogenous growth theory. Bloom *et al.* (2004) re-specified the Cobb Douglas production to incorporate the role of human capital into the growth process as argued by Nelson and Phelps (1966) and Lucas (1988):

$$Y_t = A_{it} K_{it}^{\alpha} L_{it}^{\beta} e^{\theta h_{it}} \tag{1}$$

The effect of the human capital term on economic growth is expressed as power of an exponential. So, health is captured in the human capital θh. In particular, three human capital terms including level of schooling, work experience and health status were identified in Bloom *et*

al. (2004). While the study could not affirm the presence of externalities of human capital in form of education and work experience, health is found to have a significant positive effect on economic growth.

From equation (1), output Y therefore depends on total productivity A, physical capital K, labor L and human capital h. In order to obtain a growth equation, equation (1) is logarithmically transformed as follows;

$$y = \alpha + \alpha k + \beta l + \theta h \quad (2)$$

where $y, k, and\ l$ are the logs of $Y, K\ and\ L$ respectively. For estimation purposes, the production function in equation (2) is converted into an econometrical equation. So, equation (2) becomes;

$$y = \alpha + \alpha k + \beta l + \theta h + e \quad (3)$$

Following Hassan *et al*. (2017) adaptation of the production function growth model, we modified equation (3) by disaggregating the human capital factor θh into two aggregate components of health based on gender[3]. Therefore, the standard model for this study is presented in equation (4)

$$y = \phi_0 + \phi_1 mlex + \phi_2 flex + \phi_4 X + e \quad (4)$$

where y is economic growth proxy by per capita GDP, $mlex$ and $flex$ are male and female life expectancy at birth respectively and X_{it} is a vector of control variables including foreign direct investment, domestic credit to private sector and urbanization rate.

4. Results

4.1. Descriptive statistics

Based on the descriptive statistics reported in Table 2, all the variables show high level of consistency as the mean and median values of each variables are within the reported minimum and maximum values. Except for the gender disaggregated life expectancy (MLEX and FLEX) and domestic credit to private sector (DCPS) series which have standard deviation ranging between 2.57 and 5.89, all other series have low standard deviation values (ranging between 0.06 and 0.78). For those with high variance, the values are widely spread around mean, while the individual data for the low variance series is clustered around the mean value. In all, the degree of urbanization (URBPG) series has the least deviation from the mean with a standard deviation of 0.08 while the highest degree of dispersion is exhibited by the domestic credit to private sector (DCPS) series.

Table 2. Summary statistics of the variables

Variables	GDPC	MLEX	FLEX	FDI	URBPG	DCPS
Mean	7.44	46.96	48.96	0.33	2.58	15.52
Median	7.32	45.18	47.39	0.50	2.59	16.08
Maximum	7.85	53.09	54.84	1.76	2.71	26.56
Minimum	7.19	44.41	46.93	-1.36	2.49	3.02
Std. Dev.	0.24	2.87	2.57	0.78	0.07	5.89
Skewness	0.59	0.90	1.07	-0.53	0.09	-0.10
Kurtosis	1.77	2.27	2.64	2.71	1.66	2.15

Source: Author's computation (extracted from E-views-9)

[3] The relative importance of examining the gender separate effect of human capital on economic growth was brought to the forefront by Barro and Lee (1994), which extended the earlier work of Barro (1991) by including both education and health human capital stock and further disaggregate education into separate male and female effect.

For the inference on the normality assumption, the measure of asymmetry of the probability distribution of each series around its mean indicated by the skewness statistics show that all the series except foreign direct investment are positively skewed (rightward). Furthermore, the degree of peakedness of the series' distribution evidenced in the kurtosis values provides varying information about the distribution of the series of interest. For a normally distributed series, the coefficient of the kurtosis is expected to be 3.0, and such a distribution is said to be mesokurtic. It is a relatively high peak distribution (leptokurtic) if the kurtosis value is higher than 3 and a relatively high flat-topped distribution (platykurtic) when the kurtosis value is lesser than 3. Thus, the reported kurtosis values for the adopted series are all below 3, indicating that all the series are platykurtic. This corroborates the skewness statistics, which indicate that none of the series is normally distributed.

4.2. Unit root test

Most series of economic variables exhibit trending behavior in the mean i.e they have non-stationarity property. Employing such series in econometric analyses tends to produce spurious estimates. Hence, in order to determine the existence or otherwise of long run relationships among the variables of choice, this study tests for the stationarity of the series of the variables using some of the tests offered in the statistical theory. Specifically, we adopt the Augmented Dickey-Fuller (ADF) test, which has been well popularized in the literature and the results are presented in Table 3.

Table 3. Results of the augmented Dickey-Fuller (ADF) unit root test

Variables	t-Statistics	
	Level	***1st Difference***
GDP per capita (GDPC)	0.5493	4.1532*
Male life expectancy at birth (MLEX)	0.8800	4.2187*
Female life expectancy at birth (FLEX)	1.8572	4.0716*
Foreign direct investment (FDI)	2.0335	4.4756*
Urban population growth rate (URBPG)	2.7117***	4.9319*
Domestic credit to private sector (DCPS)	1.9703	5.0861*

Note: * and *** indicate statistical significance at 1 and 10 percent respectively.
Source: Author's computation (extracted from E-views-9)

4.3. Johansen cointegration test

Following Engle and Granger (1987) criticism of linear regression in analyzing nexuses among economic series, establishment of cointegration among time series has become critical to estimating non-spurious regression. According to Granger and Newbold (1974, 1977), a regression is said to be spurious when two or more variables are regarded as causally related due to either a coincidence or an unknown third factor. A possible outcome of spurious regression is misleading statistical inference stemming from incorrectly estimated statistical relationships.

In order to mitigate the inherent challenges of linear regression, Engle and Granger (1987) suggested cointegration of the non-stationary time series. The existence of cointegration among non-stationary time series indicates that the series will not deviate from equilibrium in the long-run. Although, the Engle-Granger two-step cointegration method is popular in the literature, the Johansen cointegration test, which uses the results of the trace statistics and maximum eigenvalues to test for the cointegration ranks among series, is considered superior to the Engle-Granger method. While the Engle-Granger method is a single equation model, the Johansen test allows for more than one cointegrating relationship. Hence, this study adopts the Johansen cointegration test and the result is presented in Table 4.

Table 4. Results of Johansen cointegration test

Hypothesized No of CE(s)	Eigenvalue	Trace statistics	Prob value
None	0.9736	306.2	0.0000
At most 1	0.9413	178.9	0.0000
At most 2	0.6954	79.7	0.0000
At most 3	0.5242	38.1	0.0044
At most 4	0.2875	12.1	0.1504
At most 5	0.0078	0.28	0.5996

Source: Author's computation (extracted from E-views-9)

Based on the reported result in Table 4, the trace test indicates four cointegrating equations at 1 percent level of significance. Thus, the model shows evidence of long-run relationship

4.4. Dynamic ordinary least square estimator (DOLS)

The results of the DOLS regression is presented in Table 5. The result shows the coefficients, direction and significance of the main dependent variables as well as the control variables on economic growth in Nigeria. The coefficients of the gender disaggregated measures of health status suggest that there is gender difference in the effect of health status on economic growth in Nigeria. While the relationship between male life expectancy and economic is positive, the economic-growth effect of female life expectancy is negative. In both cases, the effect is statistically distinguishable from zero. Quantitatively, an additional year in male life expectancy causes about a dollar increase in GDP per capita, while on the other hand an additional year in female life expectancy has a reducing effect of almost same magnitude on GDP per capita. The obtained result is in consonance with the findings of Hassan and Cooray (2012) who in a sample of 89 countries found that each additional year of male life expectancy results in about 2 percent increase in output growth while each additional female life expectancy leads to a negative effect of same magnitude.

Table 5. Summary of DOLS regression

Variables	Coefficients	t-Statistics	Prob. Value
MLEX	1.2189	5.6422	0.0001
FLEX	-1.2072	-5.3390	0.0001
FDI	-0.0958	-3.2765	0.0060
URBPG	1.5761	3.0873	0.0087
DCPS	-0.0071	-3.4198	0.0309

Note: Adj. R^2 = 0.9914. Wald test statistics (χ^2) = 82.5 p-value = 0.0000. Dependent variable: GDP per capita (GDPC)

The obtained results are not unlikely for Nigeria where the gender gap in the labor market is biased in favor of men (World Bank Group, 2019; ILO, 2018). The interlinkages between health and labor productivity on one hand and the interaction between labor productivity and output growth on the other hand have been extensively documented in the literature (Adedeji and Akinlo, 2016; Kuhn and Klaus, 2016; Umoru and Yaqub, 2012). Hence, in Nigeria, improvement in male health is likely to contribute more significantly to economic growth trajectory than that of female, given that the labor statistics are skewed in favor of men (World Bank, 2019; ILO, 2018). While the rate of participation in the labor force and employment rate have continued to decline for both men and women in Nigeria, the statistics remain significantly biased in favor of men. For example, the average female labor force participation rate fell from 55.3 percent in the decade between 2000 and 2009 to 50 percent in the decade between 2010 and 2019. In the same periods, average male labor force participation fell from 64.4 percent to 60 percent. In the same vein, the average proportion of female in total employment declined from 53.2 percent to 47.4, while male employment rate fell from 62 percent to 57.1 percent.

Moreover, a significant proportion of women working population are engaged in agriculture and other low-income jobs. For instance, while there has been significant change in the composition of female sectorial employment in Nigeria, with more women moving into the industrial and service sectors, about one-third of women working population is engaged in agriculture (World Bank, 2019). Also, the average percentage of women in vulnerable employment in Nigeria was 86.9 percent in the period between 1990 and 1999 while it fell to 84.8 percent in the decade between 2010 and 2019. Thus, men tend to be more productive and improvement in men's health is likely to contribute more positively to economic growth (reference).

For the control variables, foreign direct investment is found to have a reducing effect on economic growth in Nigeria during the period of study. While this is contrary to a large body of evidence which has documented positive nexus between foreign direct investment and economic growth (Choe, 2003; Zhang, 2001; Adegbite and Ayadi, 2010), the finding is in consonance with the conclusions of Carbonell and Werner (2018) and Herzer (2012), which found that foreign direct investment has economic growth-disadvantage in Spain and for a panel of developing economies respectively. Similarly, financial development measured by domestic credit to private sector has a significant negative effect on economic growth. In particular, a percentage increase in domestic credit to private sector leads to a decline of 0.007 in per capita GDP. This might be an indication of the ineffectiveness of Nigerian financial sector in channeling credit to the productive sectors of the economy. Due to massive malpractices and corruptions in the financial sector, a little chunk of aggregate bank credits is directed towards investment purposes while a significant proportion is channeled into non-growth yielding activities (Oluwabiyi, 2015).

However, urbanization is strongly correlated with economic growth in Nigeria, with a percentage increase in the growth rate of urbanization causing about 1.6 increase in GDP per capita in Nigeria. The obtained result might not be unconnected to the fact that the largest proportion of economic activities in Nigeria take place in the urban centers. Thus, increasing rate of urbanization yields economic premium. Similar stance has been corroborated in Gross and Quyang (2020), Nguyen and Nguyen (2018) and Solarin (2017).

In order to affirm the robustness of the estimated model, we test the hypothesis that all non-intercept coefficients are equal to zero. The reported Wald test statistics and the associated p-value in the lower panel of Table 5 affirms the rejection of the null hypothesis. Also, the adjusted R^2 shows that the variables included in the model explain 99 percent variation in the dependent variable.

5. Conclusion

In this paper, we have focused on validating the existence or otherwise of gender differences in the effect of health status on economic growth in Nigeria. Based on time series covering the period of 1981 to 2018, we adopted disaggregated health data measured by life expectancy at birth by gender and employed the dynamic ordinary least square (DOLS) estimator to examine whether there exists long-run relationship between gendered health and economic growth. Based on the obtained results, it is found that there is differing responses of economic growth to health status by gender. Specifically, male life expectancy is correlated with economic growth while female life expectancy is negatively related to economic growth in Nigeria.

An important policy implication emerges that in order to harness the economic growth premium of health, policymakers need to pay attention to improvement in both male and female health. Moreover, effort should be geared towards bridging gender gap in the labor market so that improvement in female health can likewise translate to economic growth advantage.

However, it is worthy to note that this study is constrained by the availability of data to offer a more rigorous evaluation using variety of gender-specific dependent and independent variables. Future research may consider employing heterogeneous gender-specific variables in evaluating the health status – economic growth relation.

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