International Journal of Business, Economics and Management
2020 Vol. 7, No. 4, pp. 222-238.
ISSN(e): 2312-0916
ISSN(p): 2312-5772
DOI: 10.18488/journal.62.2020.74.222.238

THE IMPACT OF SOCIAL MEDIA ON ECONOMIC GROWTH: EMPIRICAL EVIDENCE OF FACEBOOK, YOUTUBE, TWITTER AND PINTEREST

Prince Asare Vitenu-Sackey

Jiangsu University, Zhenjiang, P. R. China.
Email: pavsackey@gmail.com Tel: +8618652738651

Article History
Received: 27 February 2020
Revised: 3 April 2020
Accepted: 7 May 2020
Published: 21 May 2020

Keywords
Social Media
Economic growth
Facebook
YouTube
Twitter
Pinterest.

JEL Classification:
C23; O30; O40.

ABSTRACT

The study assessed the impact of social media on economic growth in a global perspective hence the use of 198 countries as sample for the period 2009 - 2017. The study utilised and adopted panel data methodologies such as panel corrected standard errors, two-stage least square and panel quantile regression methods for its regression analysis. The study's theoretical basis was on the endogenous growth model. The findings of the study support the two hypothesis that exist between social media and economic growth nexus. In relevance, the study concludes that social media has both positive and negative impact on economic growth perhaps fixed broadband, number of internet users and secure internet servers are the major drivers of social media. In particular, the study found that Facebook and Pinterest negatively affect economic growth as this finding is in support of the second hypothesis of social media and economic growth nexus. The positive relationship finding supports the first hypothesis that the abolishment of barriers to entry to enable users of social media to publish and disseminate information without any limitations with the support of proper and efficient internet and broadband supply then social media could positively affect economic growth because the multiplicity of media such as wikis, blogs, pictures, videos etc. to a large extent propel the potential of social media in relation to dissemination of information and knowledge whereas ensuring a multi-channel diffusion and codification of knowledge as YouTube and Twitter showed positive and significant impact on economic growth.

Contribution/Originality: This study contributes in the sparse literature on the nexus between social media and economic growth specifically the individual effects of social media platforms. The study's focus was on Facebook, Twitter, YouTube and Pinterest. However, the endogenous growth theory or model was used as the study's theoretical basis.

1. INTRODUCTION

Out of the world's 7.7 billion population, it is estimated that about 3.5 billion people use the internet or can be found online. Social media usage has occupied the internet space as about 1/3 of the world's population use various social media platforms. The rise of social media is largely attributed to the unthinkable and extraordinary change, and transformation of social behaviour because about a generation ago social media was not part of human life. Now it has transformed the daily lives of one-third of the global populace (Ortiz-Ospina, 2019).

In 2004, the first social media site to reach one million active users was Myspace which had competition from the likes of Facebook but some years along the line, it is the opposite story. Most social media platforms that exist

about a decade ago are not active lately. In relevance, Facebook has occupied the largest space of social media penetration as it has the largest market share. According to Statcounter (2020) Facebook has a market share of 64.99% followed by Twitter 14.29%, Pinterest and YouTube have 8.31% and 3.10% respectively see Figure 1. In 2009, Facebook had a market share of 48.14% and as at March, 2020 has increased its market share by 74.07% to 64.99%, Pinterest has increased its market share by 8.31% and Twitter has also increased its market share by 50.5%. The rapid increase in social media penetration sparks fears in relation to the negative effects that could possibly arise as a result of their usage. These negative effects could range from psychological and economic impacts. However, this study resonates on the argument whether there is a link between economic growth and social media.

In a recent study, Dell'Anno, Rayna, and Solomon (2016) argued that the link between social media and economic growth is negative hence a possible increase in social media usage could significantly reduce economic growth. In their study, they employed panel data of 44 – 86 countries and used LSDV model with fixed effects to arrive at their conclusion. The current study has discovered that there is a few studies on the linkage of social media and economic growth hence the motivation to wade into the study to find out the economic impact of social media. Social media is widely considered as a conduit for people and knowledgeable capital as most platforms provide the function of knowledge acquisition through sharing and access to information by users. On the other, the use of social media could be realized of no economic value as most platforms do not provide contents of economic value hence could reduce productivity as it can distract attention of labor from productive gains. In view of this, the study's objective is to firstly assess the impact of social media on economic growth. The individual effects of four major social media platforms are considered to assess their impact on economic growth. Secondly, the study intends to assess how social media impact in higher and lower gdp per capita countries.

The study encompasses an introduction in section 1, section 2 presents the hypothetical assumptions of social media and economic growth nexus, section, section 3 highlights on the econometric methodology and data, section 4 presents the empirical results and findings discussion and lastly section 5 concludes the study.

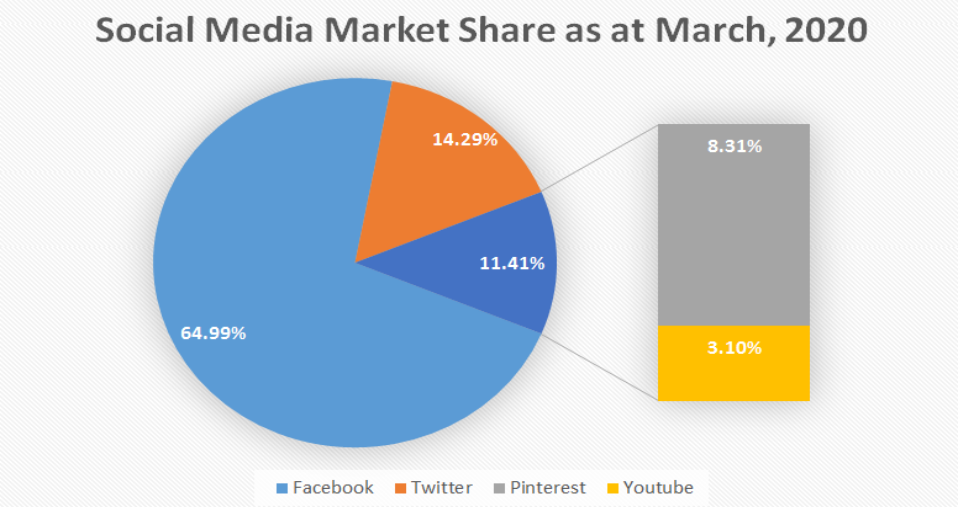

Figure-1. Social media market share.

2. HYPOTHETICAL ASSUMPTIONS OF THE NEXUS BETWEEN SOCIAL MEDIA AND ECONOMIC GROWTH

Two schools of thought or hypotheses relate to the nexus of social media and economic growth. The first hypothesis assume that the abolishment of barriers to entry to enable users of social media to publish and disseminate information without any limitations with the support of proper and efficient internet and broadband supply (Czernich, Falck, Kretschmer, & Woessmann, 2011) then social media could positively affect economic growth because the multiplicity of media such as wikis, blogs, pictures, videos etc. to the large extent propel the potential of social media in relation to dissemination of information and knowledge whereas ensuring a multi-

channel diffusion and codification of knowledge (Rayna & Striukova, 2010) therefore, there is a positive impact of social media on economic growth.

The second hypothesis posits there is negative impact of social media on economic growth such that as enormous contents are published on social media platforms, it could possibly increase the transaction cost for coordinating and searching for information. Also, the substitution effect could be realized as social media users would substitute labour for leisure perhaps the use of social media could distract the attention of workers which to a large extent affect productivity. Moreover, most social media platforms are not monetary and can be account for GDP partially thus the substitution of paid-for leisure (e.g. films, newspapers, books etc.) for leisure that are non-monetary. Most importantly, majority of social media platforms are financed through revenues or expenses; these are inadequate proxy for social media consumption and are insignificantly related to social media consumption or production (Dell'Anno et al., 2016; Rayna & Striukova, 2010).

3. EMPIRICAL METHODOLOGY AND DATA

3.1. Theoretical Framework

The study's theoretical proponent is established on the endogenous growth model. The endogenous growth theory gained much attention and became prominent due to the unsuccessful functioning of the neoclassical theories for not being able to explain the fundamental qualities or characteristics of economies that could propagate growth over prolonged and extended time period. In generic, the endogenous growth model represents the endogenous production function that can be expressed as:

$$GDP = AK,.\alpha_i\, L^{1-\alpha}\, i\, K^{\beta} \quad (1)$$

To assume symmetry across the simplicity of industries as every industry would utilize the same level of labour and capital. Consequently, then aggregate production function can be assumed as:

$$GDP_t = AK^{\alpha}\, L\beta \quad (2)$$

In this equation, GDP_t represents the measure of economic growth over time thus GDP per capita at time, K represents capital stock which encompasses the human and physical capital investment and L represents labour. However, in Equation 1 and 2 the production functions are endogenous because the residual component A is endogenous as it measures technological advancement and progress. Moreover, α and β connotes the elasticity of output of labour and capital in retrospective. In the study's empirical composition, the endogenous growth model considers role of information technological advancement such as secure internet servers, fixed broadband subscriptions and internet usage, investment in physical and human capital thus gross capital formation and school enrolment rate and other policies such as trade openness as these can be critical and crucial ingredients for social media usage and economic growth. The basic assumption or intuition is that social media usage can be efficient when there is consistent and constant supply of internet services with reliable technological support. Also, among other things, the able functioning of social media platforms rely or depend on the openness of the economy and total factor productivity. Therefore A can be found as:

$$A = (SM, IntUsers, FBS, SIS, Trade) \quad (3)$$

In Equation 3 all other things being equal, it is assumed that the efficiency of social media (SM) in which all factor inputs are utilized rely on internet users (IntUsers), fixed broadband subscription (FBS), secure internet servers (SIS) and openness (TRADE) of an economy.

3.2. Model Specification

In order to achieve the study's objective, a model is proposed or constructed on the basis of the endogenous growth model utilised by Dell'Anno et al. (2016):

$$GDPCAP = f(SM, FBS, IntUsers, SIS, GCF, SET, L, TRADE) \quad (4)$$

In Equation 4, economic growth is the function of social media, fixed broadband subscription, internet users, secure internet servers, gross capital formation school enrolment in tertiary education, labour participation rate and trade openness. This equation relies on the endogenous growth model as A represents technology advancement, K represents investment, L represents labour availability and participation in the economy and other macroeconomic policies thus trade openness;

Where:

SM = Social Media (Facebook (FB), Twitter (TWT), YouTube (YT), Pinterest (PNT)).

A_1 (FBS) = Fixed Broadband Subscribers.

A_2 (IntUsers) = Internet users.

A_3 (SIS) = Secure Internet Servers.

K_1 (GCF = Investment thus Gross Capital Formation.

K_2 (SET) = Investment in human Capital (Education) thus School enrolment rate in tertiary education.

L = Labour (Labour participation rate).

TRADE = Openness of the economy (Trade openness).

The empirical and econometric model of the study can be found as:

$$GDPCAP_{i,t} = \beta_0 + \beta_1 SM_{i,t} \begin{pmatrix} FB \\ TWT \\ YT \\ PNT \end{pmatrix} + \beta_2 A_1 (FBS)_{i,t} + \beta_3 A_2 (IntUsers)_{i,t} + \beta_4 A_3 (SIS)_{i,t} + \beta_5 K_1 (GCF)_{i,t} + \beta_6 K_2 (SET)_{i,t} + \beta_7 L (L)_{i,t} + \beta_8 (TRADE)_{i,t} + \varepsilon_{i,t} \quad (5)$$

In Equation 5 the definition of the variables SM (FB, TWT, YT, PNT), FBS, IntUsers, SIS, GCF, SET, L and TRADE can be found above. However, ε represents the error term, i represents the cross-section of 198 countries used as the sample for the study and t also represents the time period for the study thus 2009 to 2017. Moreover, β_0 represents the coefficient of the intercept and β_1 to β_8 represent the coefficients of the independent variables to be estimated.

3.3. Econometric Methodology

In pursuit to achieve the objectives of the study, three econometric models are used thus panel corrected standard errors, two-stage least square and panel quantile regression models. Firstly, panel corrected standard errors method is used to analysis the data for ascertain the impact of social media on economic growth. This method generates more accurate z-statistics and improve the parameter efficiency as it simultaneously solve the problem of cross-equation residual correlation, autocorrelation and cross-sectional heteroscedasticity (Beck & Katz, 1995). The problem of the incapability of reverse causality was realized in the utilization of panel corrected standard errors (Berger & Di Patti, 2006; Tarek, Raihan, & Duasa, 2014). In order to overcome this problem, two-stage least square (2SLS) is used for robust test due to its capability of solving the observed reverse causality. However, the use of 2SLS enables the advantage of solving or correcting the bias of the omitted variables. Conversely, the two-stage least square method corrects for the endogeneity of social media and economic growth that could possibly be encountered and perhaps provide accurate parameter estimates in more consistent manner than the ordinary least squares.

Subsequently, the study further utilizes panel quantile methodology to understand how social media usage or penetration impacts or functions in the upper and lower quantiles of economic growth as in lower and upper gross domestic product per capita countries. By application of this method, the driven factors of social media (Facebook,

Twitter, YouTube and Pinterest) on economic growth can be examined in different quantile levels for robust estimations. In so doing, the study considers the model proposed by Koenker and Bassett (1978) for panel quantile regression and adopted from Cheng, Ren, and Wang (2019):

$$Q\Delta GDPCAP_{i,t}(\tau/.) = a_{1,\tau}\,\Delta SM_{i,t} + a_{2,\tau}\,\Delta FBS_{i,t} + a_{3,\tau}\,\Delta IntUsers_{i,t} + a_{4,\tau}\,\Delta SIS_{i,t} + a_{5,\tau}\,\Delta GCF_{i,t} + a_{6,\tau}\,\Delta SET_{i,t} + a_{7,\tau}\,\Delta L_{i,t} + a_{8,\tau}\,\Delta TRADE_{i,t} + \beta_i, \quad i = 1,\ldots..N, t = 1,\ldots.,T \tag{6}$$

In Equation 6, α_1 to α_6 represents the coefficients of the parameters to be estimated, Δ stands for the different quantile levels for each variable, i represents the cross-section of the countries in the panel, β represents the error term and t represents the time period of 2009 to 2017. Again, SM represents social media, FBS represents fixed broadband subscription, IntUSERS stands for internet users, SIS represents secure internet servers, GCF represent Gross capital formation, SET represents school enrolment in tertiary education, L represent labour participation rate and TRADE refers to trade openness.

Conversely, Koenker (2004) proposed that the appropriate approach for solving the major problem on Equation 6 conventionally accepted as the traditional linear approach is non-practical for quantile regression therefore to reduce the unobserved fixed effects, the right approach is to use the L_1-norm penalty term. Apparently, the appropriate method to estimate the model is as follows;

$$argmin^{a} \sum_{k=1}^{k}\sum_{i=1}^{N}\sum_{t=1}^{T} w_k \rho_{\tau k}\{\Delta GDPCAP_{i,t} - a_1,\tau SM_{i,t} - a_2,\tau FBS_{i,t} - a_3,\tau SIS - a_4,\tau IntUsers - a_5,\tau GCF - a_6,\tau L - a_7,\tau TRADE - a_8 - \beta_i\} + \mu \sum_{i=1}^{N} |\beta_i| \;\; i = 1,\ldots\ldots,N, t = 1,\ldots.,T \tag{7}$$

In the Equation 2, $\rho_{\tau(y)} = y(\tau - 1_{y<0})$ is the traditional check function, 1_A is the indicator function. Where $\Delta GDPCAP_{i,t}$ represents GDP per capita in country i at time t and K is the index of quantiles. W_k is equal to 1/K which stands for the relative weight on k-th quantile, and at the same time used to explain the implications of various quantiles in the estimation (Cheng et al., 2019; Koenker, 2004; Zhu, Duan, Guo, & Yu, 2016). Furthermore, μ is equal to 1 and represents the tuning parameter (Cheng et al., 2019; Lamarche, 2011; Zhu et al., 2016). The description of the variables in equation can be found beneath Equation 6.

3.4. Data

The study used data sourced from the World Bank's data repository specifically World Development Indicators and GlobalStat (Statcounter.com). The period used for the study span from 2009 to 2017 due to data availability for 198 countries (see Appendix for list of countries); in addition, 2009 was used as the start year for the study because that is the year that Facebook which is now the largest social media platform gained much attention globally. Moreover, that year precedes the world financial crisis period of 2007 and 2008 perhaps from that recession, many countries planned towards higher economic growth. The study's independent variable is social media as it aims to assess its impact of economic growth. Therefore, the study utilizes four major social media platforms with the highest penetration rates and a combined market share of about 92% thus Facebook, Twitter, YouTube and Pinterest as proxies to measure social media to assess their individual effects on economic growth. The dependent variable in this regard is economic growth hence gross domestic product per capita. Apparently, the study relies on the endogenous growth model hence the use of other variables in the production function. More details on the variables can be found in Table 1. In order to obtain good elasticities of the yet to be estimated coefficients, the study's variables are all transformed into their natural logarithm for reliability and also avoid spurious regression.

Table-1. Data Source and variables description.

Variable	Description	Source
GDPCAP	GDP per capita (constant 2010 US$)	World Development Indicators - World Bank
lnFBS	Fixed broadband subscriptions (per 100 people)	World Development Indicators - World Bank
lnIntUsers	Individuals using the Internet (% of population)	World Development Indicators - World Bank
lnSIS	Secure Internet servers (per 1 million people)	World Development Indicators - World Bank
lnGCF	Gross capital formation (constant 2010 US$)	World Development Indicators - World Bank
lnL	Labor force participation rate, total (% of total population ages 15-64) (modeled ILO estimate)	World Development Indicators - World Bank
lnSET	School enrollment, tertiary (% gross): This is the ratio of total enrolment, that officially corresponds to the secondary level of education regardless of age, to the population of the age group	World Development Indicators - World Bank
lnTRADE	Trade (% of GDP)	World Development Indicators - World Bank
lnFB	Social media - Facebook users in percentage	gs.statcounter.com
lnTWT	Social media - Twitter users in percentage	gs.statcounter.com
lnYT	Social media - YouTube users in percentage	gs.statcounter.com
lnPNT	Social media - Pinterest users in percentage	gs.statcounter.com

4. EMPIRICAL RESULTS AND FINDINGS DISCUSSION

4.1. Descriptive Statistics

To present the descriptive statistics of the variables, Table 2 displays the results. From the table, it can be reported that gross domestic product per capita for the sample period grew at an annual average rate of 8.689%. However, the median value of 8.695 indicates that economic growth or gross domestic product per capita for countries in the study's samples far exceeded the minimum average.

Table-2. Descriptive statistics.

	lnGDPCAP	lnFB	lnPNT	lnTWT	lnYT	lnINTUSERS	
Mean	8.689	4.337	0.446	1.181	0.432	3.266	
Median	8.695	4.434	0.000	1.197	0.802	3.681	
Maximum	12.163	4.601	3.993	4.162	3.565	4.594	
Minimum	5.363	0.000	-3.507	-2.659	-4.605	-1.514	
Std. Dev.	1.486	0.355	1.037	0.921	1.689	1.210	
Skewness	-0.04	-5.302	0.138	-0.165	-0.728	-1.234	
Kurtosis	2.118	48.923	3.397	3.636	2.716	3.893	
Jarque-Bera	58.22810	164933.4	17.339	38.104	163.409	511.803	
Probability	0.000	0.000	0.000	0.000	0.000	0.000	
Obs.	1782	1782	1782	1782	1782	1782	
	lnFBS	lnSIS	lnGCF	lnMCS	lnL	lnSET	lnTRADE
Mean	0.955	3.509	18.403	4.342	3.776	2.344	4.189
Median	1.603	3.508	22.394	4.625	4.220	2.795	4.391
Maximum	4.157	11.952	29.199	5.795	4.504	4.839	6.516
Minimum	-7.368	-3.923	0.000	-1.262	0.000	-0.727	-1.787
Std. Dev.	2.368	3.082	9.634	0.974	1.277	1.707	1.091
Skewness	-0.871	0.165	-1.291	-3.162	-2.567	-0.327	-2.855
Kurtosis	2.937	2.054	2.894	14.178	7.753	1.519	12.185
Jarque-Bera	225.986	74.463	495.926	12247.37	3634.309	194.684	8684.144
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Obs.	1782	1782	1782	1782	1782	1782	1782

Note: lnGDPCAP = Economic growth, lnFB=Facebook, lnFBS=Fixed Broadband Subscription, lnGCF = Gross capital formation, lnIntUsers =Internet users, lnL = Labour, lnPNT = Pinterest, lnSET = School enrolment in Tertiary, lnSIS = Secure internet servers, lnTRADE = Trade openness, lnTWT = Twitter, lnYT = YouTube.

In addition, economic growth displays differential patterns in countries globally as the minimum and maximum values of growth in gross domestic product per capita are 5.363% and 12.163% respectively. Consequently, this result signifies the assertion that there is wide disparity in heterogeneous (differential) rates of growth in the countries sampled for the study over the period of study. Social media thus Facebook, Twitter, YouTube and Pinterest shows annual average growth rate of 4.337%, 1.181%, 0.432% and 0.446% respectively. Also, the minimum values of 0.000%, -2.659%, -4.605%, -3.507% and maximum values of 4.434%, 4.162%, 3.565% and 3.993% respectively. In terms of standard deviation, lnGCF (Gross capital formation) has the highest value over the sample period thus 9.634; this highlights the variability of gross capital formation in the sampled countries. The study's data is not in normal distribution because the Jarque-Bera test confirmed that all the variables have a significance level of 1% hence the null hypothesis that the data is in normal distribution is rejected. Moreover, this implies that there may be a problem of endogeneity hence the utilization of panel corrected standard errors, two-stage least square and panel quantile regression method to resolve the bias of reverse causation or simultaneous by controlling the combined endogeneity effects of social media and economic growth and the other explanatory variables.

4.2. Correlation Matrix

The computation of correlation matrix is of essence because it reveals the problem of multicollinearity among the dependent and the independent variables. However, the study performed correlation matrix and the results can be found in Table 4. From the table, it is evidenced that Facebook has a negative sign to explain a negative correlation with economic growth at a probable significance of 1% with a coefficient of 0.164. On the other hand, Twitter, YouTube and Pinterest showed positive sign of correlation with economic growth at 1% significance level with coefficients of 0.279, 0.092 and 0.328 respectively. In relevance, the study could not accept the null hypothesis that there is an evidence of multicollinearity because the rule of thumb for multicollinearity posits that no two independent variables should have coefficients of -/+0.80 with the dependent variable hence the problem of multicollinearity could exist in the findings. In that regard, the highest value of coefficient in the study is 0.789 followed by 0.719, therefore, the null hypothesis is rejected to accept the alternate hypothesis that there is no multicollinearity.

4.3. Group Unit Root Test Analysis

The test for unit root is important to assess the stationarity of the data series in time series as regression performed on non-stationary time series would produce spurious results and elasticity of the coefficients would be outrageous. However, the study performed group unit root test to check for stationarity of the data series. Table 3 below exhibits the results and at level form by using Levin, Lin & Chu test, Im, Pesaran and Shim W-stat test, ADF-Fisher and PP-Fisher Chi-square tests, the null hypothesis that posits that there is an evidence of unit root in the data series hence the data time series is not stationary is rejected at 1% significance level consistently and respectively.

Table-3. Group unit root test.

Group unit root test: Summary					
Exogenous variables: Individual effects					
				Cross-	
Method	**Statistic**	**Prob.****	**Sig.**	**sections**	**Obs**
Null: Unit root (assumes common unit root process)					
Levin, Lin & Chu t*	-4.2998	0.000	***	13	23008
Null: Unit root (assumes individual unit root process)					
Im, Pesaran and Shin W-stat	-34.199	0.000	***	13	23008
ADF - Fisher Chi-square	1080.63	0.000	***	13	23008
PP - Fisher Chi-square	1786.66	0.000	***	13	23153

Note: *** Indicates 1% significance level.

4.4. Cointegration Test

After checking for stationarity in the data series, the next step possibly is to check for cointegration relationship among the study's variables because this test reveals the long run relationship among the variables hence the coefficients that will be produced in the regression analysis could be confidently use to explain the position of the study. Notwithstanding that, the null hypothesis of cointegration test posits that the independent variables and the dependent variable have no cointegration relationship hence they are not cointegrated and do not have any long run relationship. The outcome of the cointegration test rejects the null hypothesis at 1% significance level and the rule of thumb is to reject the null hypothesis at 5% significance level or below see Table 5.

4.5. Assessment of the Impact of Social Media on Economic Growth (Panel Corrected Standard Errors Regression Results)

By assessing the impact of social media on economic growth, the study relied on four major social media platforms with the largest penetration rates to examine their individual effects on economic growth. However, panel corrected standard errors regression method is used to perform the regression analysis at this stage. The outcome of the regression analysis can be found in Table 6; from the table, it can be reported that social media with proxy measures of Facebook, Twitter, YouTube and Pinterest has both negative and positive relationship with economic growth as expressed in the hypothetical assumption outlined earlier. In view of the estimates, elasticity coefficient of Facebook indicates that 10% increase in the usage of Facebook could reduce economic growth by 4.08% at 1% significance level. Also, the elasticity coefficient of Pinterest signals that 10% increase in the usage of Pinterest could affect economic growth by 0.38% but insignificant. However, YouTube and Twitter show positive signs at significance level of 1% respectively. Moreover, the elasticity coefficients of both variables show that 10% increase in the usage of both could possibly increase economic growth by 0.85% and 1.88% respectively. The study found out that the movers of social media thus internet users, fixed broadband subscription and secure internet servers firmly support social media usage to impact economic growth. In their account, all of these variables positively and significantly affect economic growth. In other words, as part of factors of productivity, these variables cushions the growth of an economy in technological context. However, their elasticity coefficients exhibit that 10% increase in internet usage or users could increase economic growth by 1.81% and 10% in both secure internet servers and fixed broadband subscribers could also increase economic growth by 1.49% and 2.91% respectively.

Table-4. Correlation matrix.

Correlation												
Probability	**lnGDPCAP**	**lnFB**	**lnPNT**	**lnTWT**	**lnYT**	**lnIntUsers**	**lnFBS**	**lnSIS**	**lnGCF**	**lnL**	**lnSET**	**lnTRADE**
lnGDPCAP	1											
lnFB	-0.164***	1										
lnPNT	0.328***	-0.112***	1									
lnTWT	0.279***	-0.386***	0.283***	1								
lnYT	0.092***	-0.306***	-0.073**	0.264***	1							
lnIntUsers	0.668***	-0.053**	0.244***	0.195***	-0.017	1						
lnFBS	0.787***	-0.139***	0.312***	0.195***	0.092***	0.782***	1					
lnSIS	0.719***	0.033	0.524***	0.165***	-0.121***	0.652***	0.722***	1				
lnGCF	0.107***	-0.022	-0.123***	0.136***	-0.001	0.242***	0.180***	0.105***	1			
lnL	-0.178***	0.061**	-0.191***	0.016	0.004	0.122***	-0.102***	-0.127***	0.481***	1		
lnSET	0.274***	-0.025	0.035	0.072**	0.040*	0.468***	0.448***	0.328***	0.440***	0.285***	1	
lnTRADE	0.066**	0.021	0.067**	-0.011	0.043*	0.151***	0.118***	0.136***	0.275***	0.232***	0.179***	1

Note: *** Indicates 1% significance level, ** indicates 5% significance level. lnGDPCAP = Economic growth, lnFB=Facebook, lnFBS=Fixed Broadband Subscription, lnGCF = Gross capital formation, lnIntUsers =Internet users, lnL = Labour, lnPNT = Pinterest, lnSET = School enrolment in Tertiary, lnSIS = Secure internet servers, lnTRADE = Trade openness, lnTWT = Twitter, lnYT = YouTube.

Table-5. Cointegration Test.

Sample: 1 1782						
Included observations: 1782						
Null hypothesis: Series are not cointegrated						
Dependent	**tau-statistic**	**Prob.***	**Sig.**	**z-statistic**	**Prob.***	**Sig.**
lnGDPCAP	-8.686	0.0000	***	-589.879	0.0000	***
lnFB	-21.935	0.0000	***	-962.481	0.0001	***
lnFBS	-14.208	0.0000	***	-400.837	0.0000	***
lnGCF	-9.163	0.0000	***	-270.744	0.0000	***
lnIntUsers	-13.458	0.0000	***	-363.514	0.0000	***
lnL	-7.428	0.0005	***	-242.310	0.0000	***
lnPNT	-21.976	0.0000	***	-967.924	0.0001	***
lnSET	-13.407	0.0000	***	-327.135	0.0000	***
lnSIS	-12.161	0.0000	***	-891.962	0.0001	***
lnTRADE	-10.345	0.0000	***	-420.220	0.0000	***
lnTWT	-17.673	0.0000	***	-967.411	0.0001	***
lnYT	-8.396	0.0000	***	-466.996	0.0000	***

Note: *** Indicates 1% significance level. lnGDPCAP = Economic growth, lnFB=Facebook, lnFBS=Fixed Broadband Subscription, lnGCF = Gross capital formation, lnIntUsers =Internet users, lnL = Labour, lnPNT = Pinterest, lnSET = School enrolment in Tertiary, lnSIS = Secure internet servers, lnTRADE = Trade openness, lnTWT = Twitter, lnYT = YouTube.

Table-6. Regression results (Panel corrected standard errors).

PCSE	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
lnFBS	0.291	0.306	0.284	0.313	0.276
	(8.35)***	(9.02)***	(8.09)***	(9.01)***	(8.07)***
lnIntUsers	0.181	0.160	0.195	0.173	0.170
	(2.80)**	(2.51)**	(2.98)**	(2.63)**	(2.69)**
lnSIS	0.149	0.134	0.154	0.173	0.173
	(8.70)***	(8.20)***	(8.94)***	(7.94)***	(9.62)***
lnGCF	0.007	0.005	0.009	0.007	0.004
	(1.12)	(0.80)	(1.31)	(1.10)	(0.67)
lnL	-0.109	-0.113	-0.118	-0.116	-0.115
	(-2.16)**	(-2.29)**	(-2.34)**	(-2.29)**	(-2.34)**
lnSET	-0.084	-0.078	-0.089	-0.088	-0.082
	(-2.35)**	(-2.20)**	(-2.47)**	(-2.43)**	(-2.38)**
lnTRADE	-0.033	-0.024	-0.044	-0.033	-0.025
	(-0.69)	(-0.51)	(-0.89)	(-0.67)	(-0.52)
lnFB	-0.408				-0.240
	(-3.97)***				(-2.29)**
lnTWT		0.188			0.155
		(4.51)***			(3.45)***
lnYT			0.085		0.047
			(6.13)***		(3.32)***
lnPNT				-0.038	-0.102
				(-0.99)	(-2.72)**
Constant (Intercept)	9.676	7.796	7.881	7.983	8.794
	(19.57)***	(29.62)***	(29.70)***	(30.05)***	(17.03)***
R-squared	0.695	0.699	0.695	0.687	0.708
Wald Chi-squared	661.20***	682.39***	650.11***	638.82***	718.16***
Autocorrelation	No	No	No	No	No
Observations	1782	1782	1782	1782	1782

Note: *** Indicates 1% significance level, ** indicates 5% significance level. lnGDPCAP = Economic growth, lnFB=Facebook, lnFBS=Fixed Broadband Subscription, lnGCF = Gross capital formation, lnIntUsers =Internet users, lnL = Labour, lnPNT = Pinterest, lnSET = School enrolment in Tertiary, lnSIS = Secure internet servers, lnTRADE = Trade openness, lnTWT = Twitter, lnYT = YouTube.

4.6. Robust Check: Two Stage Least Square Regression Analysis Results

In order to strongly and significantly infer on the findings of the study, two-stage least square method is used as robust check method against the panel corrected standard errors method used as the main regression method. Evidence from the robust check method can be found in Table 7. The results provided by the robust check method

have similarities with the main regression method (panel corrected standard errors) but in model 4 where the individual effect of Pinterest is examined, it showed negative and significance but in the main regression method it was insignificant. Evidently, from model 1 to model 5, the study can confidently confirm that social media with proxy measures of Facebook, Twitter, YouTube and Pinterest, have both positive and negative relationship with economic growth. As the results in Table 7 depicts that Facebook has an elasticity coefficient of -0.408, Twitter has an elasticity coefficient of 0.188, YouTube has an elasticity coefficient of 0.085 and Pinterest has an elasticity coefficient of -0.038 in their respective models from model 1 to model 4. In model 5, where the combined effect of all the social media platforms were taking into consideration, Facebook showed an elasticity coefficient of -0.240, Twitter showed an elasticity coefficient of 0.155, YouTube showed an elasticity coefficient of 0.047 and Pinterest showed an elasticity coefficient of -0.102. Consequently, a 10% increase in social media usage thus Facebook, Twitter, YouTube and Pinterest could affect economic growth by -2.40%, 1.55%, 0.47% and -1.02% respectively. In relevance, the dynamism of social media on economic growth is both positive and negative.

Table-7. Robust Check (2-Stage least square Method).

2SLS	Model 1	Model 2	Model 3	Model 4	Model 5
lnFBS	0.291	0.306	0.284	0.313	0.276
	(18.22)***	(19.70)***	(17.58)***	(19.75)***	(17.24)***
lnIntUsers	0.181	0.160	0.195	0.173	0.170
	(6.39)***	(5.69)***	(6.85)***	(6.01)***	(6.07)***
lnSIS	0.149	0.134	0.154	0.145	0.173
	(15.46)***	(14.20)***	(15.68)***	(13.43)***	(15.88)***
lnGCF	0.007	0.005	0.009	0.007	0.004
	(2.93)**	(2.09)**	(3.47)***	(2.88)**	(1.72)*
lnL	-0.109	-0.113	-0.118	-0.116	-0.115
	(-5.63)***	(-5.93)***	(-6.15)***	(-5.97)***	(-6.07)***
lnSET	-0.084	-0.078	-0.089	-0.088	-0.082
	(-5.83)***	(-5.42)***	(-6.15)***	(-6.00)***	(-5.83)***
lnTRADE	-0.033	-0.024	-0.044	-0.033	-0.025
	(-1.77)*	(-1.29)	(-2.30)**	(-1.72)*	(-1.32)
lnFB	-0.408				-0.240
	(-7.19)***				(-3.90)***
lnTWT		0.188			0.155
		(8.64)***			(6.29)***
lnYT			0.085		0.047
			(7.03)***		(3.73)***
lnPNT				-0.038	-0.102
				(-1.66)*	(-4.34)***
Constant (Intercept)	9.676	7.796	7.881	7.983	8.794
	(37.36)***	(72.96)***	(74.08)***	(74.60)***	(30.69)***
R-squared	0.695	0.699	0.695	0.687	0.708
RMSE	0.823	0.817	0.823	0.834	0.806
F-statistics	505.17***	514.32***	504.29***	485.69***	389.88***
Observations	1782	1782	1782	1782	1782

Note: *** Indicates 1% significance level, ** indicates 5% significance level, * indicates 10% significance level. lnGDPCAP = Economic growth, lnFB=Facebook, lnFBS=Fixed Broadband Subscription, lnGCF = Gross capital formation, lnIntUsers =Internet users, lnL = Labour, lnPNT = Pinterest, lnSET = School enrolment in Tertiary, lnSIS = Secure internet servers, lnTRADE = Trade openness, lnTWT = Twitter, lnYT = YouTube.

4.7. Panel Quantile Regression Results (Cross-Check Method)

The second objective of the study is to assess the impact of social media thus Facebook, Twitter, YouTube and Pinterest on economic growth in its respective quantiles. In pursuit to use this approach, it is assumed that the study would be afforded the needed insight to properly understand how Facebook, Twitter, YouTube and Pinterest affect economic growth in the upper and lower quantiles as in lower and higher gross domestic product per capita countries. The outcome of the panel quantile regression can be found in Table 9. Evidence provided in the table

support the findings of both the main and robust check regression methods (Panel corrected standard errors and 2-Stage least square method). The results confirm both positive and negative relationship between social media and economic growth. In particular, Facebook in the 5th to 10th quantiles showed insignificant impact on economic growth but from 15th and 50th quantiles showed consistent negative and significant impact on economic growth signaling elasticity coefficients of -0.327, -0.320, -0.305, -0.293, -0.269, -0.248, -0.226, and -0.229 respectively. This implies that in the lower quantiles which represents lower gross domestic product per capita countries, 10% increase in Facebook usage could significantly reduce economic growth by 3.27%, 3.20%, 3.05%, 2.93%, 2.69%, 2.48%, 2.26% and 2.29% in retrospective. In the upper quantiles, thus higher gross domestic product per capita countries, from 55th quantile to 75th quantile, 10% increase in Facebook usage could reduce economic growth by 2.53%, 2.89%, 3.37%, 2.98% and 2.67% respectively. On the other hand, in the 80th, 85th and 95th quantiles, Facebook usage do not necessarily affect economic growth as the results showed insignificant elasticity coefficients but showed significance in the 90th quantile as there seems to be inconsistency from 85th to 95th quantiles.

To account for the other social media platforms, Twitter and YouTube showed positive elasticity coefficients signaling positive relationship between the two and economic growth. The positive coefficients implies that an increase in Twitter and YouTube usage could increase economic growth significantly. In a particular, 10% increase in YouTube usage could increase economic growth by 0.57%, 0.55%, 0.51%, 0.60%, 0.61%, 0.68%, 0.57%, 0.58%, 0.65%, 0.60%, 0.55%, 0.39%, 0.43%, 0.42%, 0.44%, 0.49%, 0.55%, 0.60% and 0.52% from 5th to 90th quantiles except 95th quantile which produced an insignificant elasticity coefficient. Relatively, Twitter also showed positive elasticity coefficient from 10th quantile to 95th quantile except in the 5th quantile which produced insignificant coefficient. The positive elasticity coefficients implies that 10% increase in Twitter usage could increase economic growth significantly by 1.42%, 0.93%, 0.87%, 0.83%, 0.93%, 1.19%, 1.34%, 1.34%, 1.27%, 1.40%, 1.42%, 1.54%, 1.81%, 1.83%, 1.46%, 1.45%, 2.11% and 2.10% from 10th to 95th quantiles.

Notably, Pinterest showed negative and significant elasticity coefficients from 5th quantile to 75th quantile but insignificant elasticity coefficients from 80th quantile to 95th quantile. This implies that 10% increase in Pinterest usage could reduce economic growth significantly by 1.18%, 1.30%, 0.81%, 1.02%, 1.08%, 1.07%, 0.98%, 1.15%, 1.22%, 1.23%, 1.08%, 1.26%, 1.12%, 1.14% and 1.00% respectively from 5th quantile to 75th quantile.

In brief, the results for assessing the impact of social media on economic growth with regards to high and low gdp per capita countries highlights that the impact of social media do not necessarily matter whether it is a higher gdp per capita or lower gdp per capita country, the effect is the same. Unequivocally, the study can statistically infer that the relationship or impact of social media on economic growth is in two-folds thus positive and negative, and this finding support the two assumptions or hypotheses of social media and economic growth nexus.

5. CONCLUSION

The study assessed the impact of social media on economic growth in a global perspective hence the use of 198 countries as sample for the period 2009 - 2017. The study utilised and adopted panel data methodologies such as panel corrected standard errors, two-stage least square and panel quantile regression methods for its regression analysis. The findings of the study support the two hypothesis that exist between social media and economic growth nexus. In relevance, the study concludes that social media has both positive and negative impact on economic growth perhaps fixed broadband, number of internet users and secure internet servers are the major drivers of social media (Czernich et al., 2011).

In particular, the study found that Facebook and Pinterest negatively affect economic growth as this finding is in support of the second hypothesis of social media and economic growth nexus also it is consistent with studies from Rayna and Striukova (2010) and Dell'Anno et al. (2016). They argue that as enormous contents are published on social media platforms, it could possibly increase the transaction cost for coordinating and searching for information. Also, the substitution effect could be realised as social media users would substitute labour for leisure

perhaps the use of social media could distract the attention of workers which to a large extent affect productivity. Moreover, most social media platforms are not monetary and can be account for GDP partially thus the substitution of paid-for leisure (e.g. films, newspapers, books etc.) for leisure that are non-monetary. Most importantly, majority of social media platforms are financed through revenues or expenses; these are inadequate proxy for social media consumption and are insignificantly related to social media consumption or production.

The positive relationship finding supports the first hypothesis of the study as YouTube and Twitter showed positive and significant impact on economic growth in support of literature from Rayna and Striukova (2010) and (Czernich et al., 2011). They argued that the abolishment of barriers to entry to enable users of social media to publish and disseminate information without any limitations with the support of proper and efficient internet and broadband supply then social media could positively affect economic growth because the multiplicity of media such as wikis, blogs, pictures, videos etc. to a large extent propel the potential of social media in relation to dissemination of information and knowledge whereas ensuring a multi-channel diffusion and codification of knowledge.

6. LIMITATIONS TO THE STUDY

The study unequivocally acknowledges possible drawbacks that could or was encountered in its objective to assess the dynamics that social media has on economic growth. Undoubtedly, most social media platforms allow numerous accounts by a single person and most account owners do not usually access their accounts hence the problem of multiplicity in the accounting for social media penetration could be problematic. Therefore, the problem of multiple counting of users could arise by way of overestimation.

Furthermore, the study realised bidirectional causalities of Pinterest, YouTube and Twitter with economic growth but a unidirectional causality of economic growth with Facebook see Table 8. In this regard, the introduction of lags with the regressors were not considered because the notion that a problem of endogeneity could crop up was not envisaged as the social media platform with the largest penetration rate (Facebook) did exhibit bidirectional causality with the dependent variable thus economic growth.

Table-8. Granger causality test.

Pairwise Granger Causality Tests				
Sample: 1 - 1782				
Lags: 9				
Null Hypothesis:	**Obs**	**F-Statistic**	**Prob.**	**Significance**
LNFB does not Granger Cause LNGDPCAP	1773	0.360	0.954	
LNGDPCAP does not Granger Cause LNFB		2.591	0.006	**
LNPNT does not Granger Cause LNGDPCAP	1773	3.950	0.000	***
LNGDPCAP does not Granger Cause LNPNT		11.711	0.000	***
LNTWT does not Granger Cause LNGDPCAP	1773	2.007	0.035	**
LNGDPCAP does not Granger Cause LNTWT		6.010	0.000	***
LNYT does not Granger Cause LNGDPCAP	1773	2.916	0.002	**
LNGDPCAP does not Granger Cause LNYT		5.623	0.000	***

Note: *** Indicates 1% significance level, ** indicates 5% significance level. lnGDPCAP = Economic growth, lnFB=Facebook, lnPNT = Pinterest, lnTWT = Twitter, lnYT = YouTube.

Table-9. Panel quantile regression Method (Results).

Quantile	5th	10th	15th	20th	25th	30th	35th	40th	45th	50th
lnFB	-0.232	-0.239	-0.327	-0.320	-0.305	-0.293	-0.269	-0.248	-0.226	-0.229
	(-1.110)	(-1.455)	(-4.417)***	(-4.702)***	(-5.656)***	(-5.874)***	(-0.269)***	(-4.333)***	(-3.656)***	(-2.589)**
lnYT	0.057	0.055	0.051	0.060	0.061	0.068	0.057	0.058	0.065	0.060
	(2.094)**	(3.011)**	(3.449)***	(4.494)***	(4.822)***	(5.306)***	(4.568)***	(4.301)***	(4.446)***	(3.614)***
lnTWT	0.021	0.142	0.093	0.087	0.083	0.093	0.119	0.134	0.134	0.127
	(0.270)	(3.143)**	(2.494)**	(2.766)**	(2.719)**	(2.900)**	(3.995)***	(4.538)***	(4.730)***	(4.671)***
lnPNT	-0.118	-0.130	-0.081	-0.102	-0.108	-0.107	-0.098	-0.115	-0.122	-0.123
	(-2.483)**	(-3.980)***	(-2.941)**	(3.881)***	(-4.152)***	(-4.301)***	(-3.774)***	(-4.155)***	(-4.065)***	(3.646)***
lnFBS	0.226	0.229	0.241	0.237	0.247	0.253	0.253	0.253	0.261	0.278
	(4.704)***	(8.351)***	(10.537)***	(10.863)***	(9.448)***	(8.807)***	(8.641)***	(8.278)***	(8.381)***	(9.258)***
lnIntUsers	0.257	0.226	0.233	0.238	0.204	0.173	0.143	0.143	0.135	0.124
	(3.146)**	(4.174)***	(3.997)***	(3.754)***	(2.779)**	(2.462)**	(2.411)**	(2.464)**	(2.333)**	(2.400)**
lnSIS	0.164	0.203	0.196	0.200	0.217	0.239	0.243	0.244	0.239	0.227
	(4.000)***	(6.832)***	(7.234)***	(7.290)***	(8.015)***	(10.734)***	(12.424)***	(12.410)***	(12.470)***	(11.857)***
lnGCF	0.001	0.000	0.000	0.001	0.000	0.002	0.003	0.004	0.004	0.008
	(0.237)	(-0.055)	(0.133)	(0.416)	(-0.037)	(0.795)	(0.855)	(1.318)	(1.333)	(2.854)**
lnL	-0.093	-0.044	-0.055	-0.061	-0.042	-0.048	-0.060	-0.074	-0.078	-0.111
	(2.105)**	(-1.521)	(-2.418)**	(-2.692)**	(-1.920)**	(-2.211)**	(-2.815)**	(-3.204)***	(-3.154)**	(-4.480)***
lnSET	-0.051	-0.053	-0.041	-0.049	-0.056	-0.068	-0.071	-0.069	-0.067	-0.074
	(-1.177)	(-2.203)**	(-2.063)**	(-2.479)**	(-2.828)**	(-3.830)***	(-4.052)***	(-3.765)***	(-3.596)***	(-4.223)***
lnTRADE	-0.009	-0.010	-0.058	-0.035	-0.047	-0.062	-0.052	-0.051	-0.043	-0.030
	(0.210)	(-0.216)	(-1.455)	(-0.814)	(-1.184)	(-2.460)**	(-2.365)**	(-2.261)**	(-1.827)*	(-1.174)
Constant (Intercept)	7.365	7.344	8.104	8.103	8.210	8.325	8.380	8.380	8.380	8.582
	(7.639)***	(9.241)***	(19.371)***	(18.901)***	(26.178)***	(33.281)***	(35.619)***	(33.444)***	(31.745)***	(20.915)***
Pseudo R-squared	0.451	0.495	0.514	0.521	0.525	0.521	0.514	0.509	0.502	0.495
Adjusted R-squared	0.447	0.492	0.511	0.518	0.522	0.518	0.511	0.506	0.499	0.492
Quasi-LR stat.	764.093***	1503.940***	2034.997***	2350.021***	2540.551***	2630.128***	2657.267***	2553.432***	2424.995***	2296.202***
observations	1782	1782	1782	1782	1782	1782	1782	1782	1782	1782

Table-9. Continue.

Quantile	55th	60th	65th	70th	75th		80th	85th	90th	95th
lnFB	-0.253	-0.289	-0.337	-0.298	-0.267		-0.378	-0.370	-0.119	-0.009
	(-1.675)*	(-3.904)***	(-5.848)***	(-0.298)***	(-4.212)***		(-1.020)	(-1.156)	(-1.859)*	(0.105)
lnYT	0.055	0.039	0.043	0.042	0.044		0.049	0.055	0.060	0.052
	(3.029)**	(2.005)**	(2.275)**	(2.320)**	(2.478)**		(2.249)**	(2.368)**	(2.700)**	(1.492)
lnTWT	0.140	0.142	0.154	0.181	0.183		0.146	0.145	0.211	0.210
	(4.671)***	(5.414)***	(5.433)***	(5.114)***	(3.947)***		(2.023)**	(2.135)**	(4.172)***	(2.675)**
lnPNT	-0.108	-0.126	-0.112	-0.114	-0.100		-0.059	-0.027	0.001	-0.070
	(-2.947)**	(-3.282)***	(-3.020)**	(-2.976)**	(-2.556)**		(-1.554)	(-0.620)	(0.028)	(-0.808)
lnFBS	0.269	0.267	0.250	0.245	0.252		0.278	0.285	0.277	0.279
	(8.877)***	(9.837)***	(10.017)***	(10.494)***	(9.977)***		(12.627)***	(13.621)***	(8.649)***	(0.279)
lnIntUsers	0.142	0.152	0.162	0.201	0.200		0.193	0.212	0.240	0.220
	(2.771)**	(3.114)**	(3.236)***	(3.798)***	(3.350)***		(3.990)***	(4.498)***	(4.317)***	(1.086)
lnSIS	0.218	0.211	0.207	0.192	0.179		0.148	0.126	0.096	0.077
	(11.458)***	(12.487)***	(12.583)***	(10.467)***	(10.781)***		(9.011)***	(7.889)***	(6.962)***	(3.517)***
lnGCF	0.009	0.008	0.008	0.009	0.008		0.006	0.006	0.003	0.001
	(2.948)**	(2.555)**	(2.644)**	(2.878)**	(2.109)**		(1.463)	(1.350)	(0.571)	(0.065)
lnL	-0.116	-0.149	-0.159	-0.186	-0.190		-0.157	-0.156	-0.143	-0.167
	(-4.022)***	(-4.713)***	(-5.037)***	(-5.523)***	(-5.661)***		(-5.147)***	(-5.183)***	(-3.177)**	(-0.710)
lnSET	-0.079	-0.074	-0.062	-0.076	-0.088		-0.095	-0.108	-0.112	-0.103
	(-4.855)***	(-4.578)***	(-3.816)***	(-4.411)***	(-4.177)***		(-4.055)***	(-4.680)***	(-4.237)***	(-1.378)
lnTRADE	-0.020	-0.016	-0.018	0.000	0.025		0.007	0.015	0.045	-0.012
	(0.793)	(-0.716)	(-0.864)	(-0.009)	(1.078)		(0.303)	(0.713)	(1.482)	(-0.068)
Constant (Intercept)	8.731	9.133	9.424	9.313	9.305		10.075	10.194	9.186	9.618
	(12.089)***	(25.028)***	(33.681)***	(34.725)***	(30.511)***		(5.904)***	(6.932)***	(28.905)***	(14.436)***
Pseudo R-squared	0.489	0.483	0.476	0.467	0.457		0.439	0.410	0.368	0.325
Adjusted R-squared	0.486	0.480	0.473	0.464	0.453		0.436	0.407	0.364	0.321
Quasi-LR stat.	2168.358***	2078.395***	2020.073***	1868.414***	1664.975***		1464.458***	1170.276***	787.8444***	404.5241***
Observations	1782	1782	1782	1782	1782		1782	1782	1782	1782

Note: *** Indicates 1% significance level, ** indicates 5% significance level, * indicates 10% significance level. lnGDPCAP = Economic growth, lnFB=Facebook, lnFBS=Fixed Broadband Subscription, lnGCF = Gross capital formation, lnIntUsers =Internet users, lnL = Labour, lnPNT = Pinterest, lnSET = School enrolment in Tertiary, lnSIS = Secure internet servers, lnTRADE = Trade openness, lnTWT = Twitter, lnYT = YouTube.

Funding: This study received no specific financial support.
Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.

REFERENCES

Beck, N., & Katz, J. N. (1995). What to do (and Not to Do) with time-series cross-section data. *American Political Science Review*, *89*(3), 634–647.Available at: https://doi.org/10.2307/2082979.

Berger, A. N., & Di Patti, E. B. (2006). Capital structure and firm performance: A new approach to testing agency theory and an application to the banking industry. *Journal of Banking and Finance*, *30*(4), 1065-1102.Available at: https://doi.org/10.1016/j.jbankfin.2005.05.015.

Cheng, C., Ren, X., & Wang, Z. (2019). The impact of renewable energy and innovation on carbon emissions: An empirical analysis for OECD countries. *Energy Procedia*, *158*, 3506 – 3512.Available at: https://10.1016/j.egypro.2019.01.919.

Czernich, N., Falck, O., Kretschmer, T., & Woessmann, L. (2011). Broadband infrastructure and economic growth. *The Economic Journal*, *12*(552), 505–532.Available at: https://doi.org/10.1111/j.1468-0297.2011.02420.x.

Dell'Anno, R., Rayna, T., & Solomon, H. (2016). Impact of social media on economic growth - evidence from social media *Applied Economics Letters*, *23*(9), 633-636.Available at: https://dx.doi.org/10.1080/13504851.2015.1095992.

Koenker, R., & Bassett, J. G. (1978). Regression quantiles. *Econometrica*, *46*(1), 33-50.Available at: https://doi.org/10.2307/1913643.

Koenker, R. (2004). Quantile regression for longitudinal data. *Journal of Multivariate Analysis*, *91*(1), 74 -89.

Lamarche, C. (2011). Measuring the incentives to learn in Colombia using new quantile regression approaches. *Journal of Development Economics*, *96*(2), 278-288.Available at: https://doi.org/10.1016/j.jdeveco.2010.10.003.

Ortiz-Ospina, E. (2019). The rise of social media. Retrieved from: https://ourworldindata.org/rise-of-social-media

Rayna, T., & Striukova, L. (2010). Web 2.0 is cheap: Supply exceeds demand. *Prometheus*, *28*(3), 267–285.Available at: https://doi.org/10.1080/08109028.2010.522332.

Statcounter. (2020). Social media statistics. Retrieved from: https://gs.statcounter.com/social-media-stats.

Tarek, A.-K. L. S., Raihan, S. M. Z., & Duasa, J. (2014). The relationship between capital structure and performance of Islamic banks. *Journal of Islamic Accounting and Business Research*, *5*(2), 158–181.Available at: https://doi.org/10.1108/JIABR-04-2012-0024.

Zhu, H., Duan, L., Guo, Y., & Yu, K. (2016). The effects of FDI, economic growth and energy consumption on carbon emissions in ASEAN-5: Evidence from panel quantile regression. *Economic Modelling*, *58*, 237-248.Available at: https://doi.org/10.1016/j.econmod.2016.05.003.

APPENDIX

List of Countries

Afghanistan	Denmark	Kyrgyz Republic	Portugal
Albania	Dominica	Lao PDR	Puerto Rico
Algeria	Dominican Republic	Latvia	Qatar
American Samoa	Ecuador	Lebanon	Romania
Andorra	Egypt, Arab Rep.	Lesotho	Russian Federation
Angola	El Salvador	Liberia	Rwanda
Argentina	Equatorial Guinea	Libya	Samoa
Armenia	Estonia	Lithuania	San Marino
Aruba	Eswatini	Luxembourg	Sao Tome and Principe
Australia	Ethiopia	Macao SAR, China	Saudi Arabia
Austria	Fiji	Madagascar	Senegal
Azerbaijan	Finland	Malawi	Serbia
Bahamas, The	France	Malaysia	Seychelles
Bahrain	Gabon	Maldives	Sierra Leone
Bangladesh	Gambia, The	Mali	Singapore
Barbados	Georgia	Malta	Slovak Republic

Belarus	Germany	Marshall Islands	Slovenia
Belgium	Ghana	Mauritania	Solomon Islands
Belize	Greece	Mauritius	South Africa
Benin	Greenland	Mexico	Spain
Bermuda	Grenada	Micronesia, Fed. Sts.	Sri Lanka
Bhutan	Guam	Moldova	St. Kitts and Nevis
Bolivia	Guatemala	Monaco	St. Lucia
Bosnia and Herzegovina	Guinea	Mongolia	St. Vincent and the Grenadines
Botswana	Guinea-Bissau	Montenegro	Sudan
Brazil	Guyana	Morocco	Suriname
Brunei Darussalam	Haiti	Mozambique	Sweden
Bulgaria	Honduras	Myanmar	Switzerland
Burkina Faso	Hong Kong SAR, China	Namibia	Tajikistan
Burundi	Hungary	Nauru	Tanzania
Cabo Verde	Iceland	Nepal	Thailand
Cambodia	India	Netherlands	Timor-Leste
Cameroon	Indonesia	New Zealand	Togo
Canada	Iran, Islamic Rep.	Nicaragua	Tonga
Central African Republic	Iraq	Niger	Trinidad and Tobago
Chad	Ireland	Nigeria	Tunisia
Chile	Isle of Man	North Macedonia	Turkey
China	Israel	Northern Mariana Islands	Turkmenistan
Colombia	Italy	Norway	Tuvalu
Comoros	Jamaica	Oman	Uganda
Congo, Dem. Rep.	Japan	Pakistan	Ukraine
Congo, Rep.	Jordan	Palau	United Arab Emirates
Costa Rica	Kazakhstan	Panama	United Kingdom
Cote d'Ivoire	Kenya	Papua New Guinea	United States
Croatia	Kiribati	Paraguay	Uruguay
Cuba	Korea, Rep.	Peru	Uzbekistan
Cyprus	Kosovo	Philippines	Vanuatu
Czech Republic	Kuwait	Poland	Venezuela, RB
Vietnam	West Bank and Gaza	Zambia	
Virgin Islands (U.S.)	Yemen, Rep.	Zimbabwe	