Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.7, No.4, 2016

Implications of Infrastructural Development on Cameroon's Economic Emergence

Molem C. Sama[1], Akame, Afuge Jr.[2*]

1. Associate Professor, Department of Economics and Management, University of Buea-Cameroon. P.O. Box 63, Buea

2. PhD Student, Department of Economics and Management, University of Buea-Cameroon. P.O. Box 63, Buea

ABSTRACT

Coming at the wake of the quest for emergence in the country, this paper examines the implications of infrastructural development on the emergence of Cameroon. The paper uses secondary data from 1990 to 2012 collected from the World Development Indicators. Through the adoption of the Principal Component Analysis (PCA) and subsequent application of the single equation Instrumental Variable General Method of Moments (IVGMM) and the VECM methodology and associated Impulse-Response predictions, the study finds that all strands of infrastructure (economic, social and financial) positively and significantly affect economic growth in Cameroon. Moreover, the study finds that in the class of economic infrastructure, telephone network, road infrastructure and energy (electricity) production are the most significant forms of infrastructure worth emphasizing in the growth process; education and health infrastructure are the main growth-promoting social infrastructures while the mobilizations of savings and granting of domestic credits are more profound in the class of financial infrastructures that promote economic growth in the country. Based on the forecasts provided by the Impulse-Response graphs, the paper further finds that the current state of infrastructural development would slowly plunge the economy to emergence as solicited by 2035. On the basis of this, the study recommends that while security infrastructure expenditures are being reduced, there should be a joint and simultaneous provision of economic, social and financial infrastructures to drive Cameroon towards the highly solicited emergence.

Key Words: *Infrastructure, Economic Growth, Principal Component Analysis, Cameroon, Emergence.*

1. Introduction

The role of infrastructure in economic growth and development can be hardly overstated (World Bank, 1994). This was first emphasized and highlighted in a ground-breaking seminal contribution by Aschauer (1989), who finds that the stock of public infrastructure capital is a significant driver of aggregate total factor productivity and increase growth. As noted by the U.K. Department for International Development (DFID, 2002), the channels through which infrastructure influences sustainable growth and development range from reducing transaction costs and facilitating trade flows within and across borders; enabling economic actors to respond to new types of demand in different places; lowering the costs of inputs for entrepreneurs, or making existing businesses more profitable; creating employment of all sorts, enhancing human capital, and, improving environmental conditions, which link to improved livelihoods, better health and reduced vulnerability of the poor etc.

In Africa, infrastructure contributed about 99% points to per capita economic growth over the period 1990 to 2005, compared with 68% points attributable to structural and stabilization policies (Africa Infrastructure Knowledge Program, (AIKP) 2011). In Sub-Saharan African context, infrastructure development led to faster growth per capita in Sudan (1.76%), Botswana (1.66%), Mauritius (1.67%), Benin (1.63%), and Uganda (1.54%). However, the lack of modern infrastructure is an impediment to Africa's economic development and a major constraint on poverty reduction, economic growth as well as the attainment of the Millennium Development Goals (MDGs) in general (United Nations Human Settlements Programme (UN-HABITAT), 2011).

Given the inadequacy in basic infrastructures, the Africa Infrastructure Country Diagnostic Study (AICD) (2011) estimates the cost of addressing Africa's infrastructure at about USD 93 billion a year, about 15% of GDP, one-third of which is for maintenance. Unfortunately however, over the last decade, infrastructure investment in Africa and most developing countries has fallen significantly, driven by declining public and private investment.

As a result of this, African leaders have adopted the Programme for Infrastructure Development in Africa (PIDA) as the integrated continent-wide vision, strategic framework and agenda for infrastructure development PIDA is a follow up to various initiatives including the African Union (AU) Master Plan for Infrastructure. Others include the New Partnership for Africa's Development (NEPAD) Short-Term Action Plan (STAP), Infrastructure Project Preparation Facility (IPPF) housed at the African Development Bank (AfDB); and the AU-NEPAD African Action Plan.However, UN-HABITAT (2011) estimates show that if all African countries had infrastructure as good as that of Mauritius, the leading infrastructure provider in terms of access and quality, per capita economic growth in the region could increase by 2.2% points annually.

In Cameroon the period of economic boom was characterised by high growth with the average annual growth rate of the GDP being 8% permitting the country to maintain a high level of per capita income despite the high population growth rate of 3% (Amin, 1998) as well as devote more resources to infrastructural development in order to sustain this growth. Between 2000 and 2005, improvements in information and communication technologies boosted Cameroon's growth performance by 1.26% points per capita, while deficient power infrastructure held growth back by 0.28% points. The overall contribution of telecommunications, electricity, and roads to Cameroon's per capita growth between 2000 and 2005 was 1.05% points (AICD, 2011), mostly attributed to a faster accumulation of infrastructure assets than to improvements in infrastructure quality. On its part, the information and Communication Technology (ICT) sector was responsible for most of the contribution, adding 1.26 percentage points to the per capita growth rate while the power sector held back per capita growth by –0.28 percentage points (AICD, 2011).

More recently, Cameroon considers infrastructural development as a major priority not just of the state but of many other stakeholders of the development process especially the private sector and it constitutes a major emphasis in the Growth and Employment Strategy Paper (GESP) aimed at driving the country towards emergence by 2035. This is due to the enormous contribution all the various strands of infrastructure are expected to make in the country. According to AICD (2011), Cameroon already spends around $930 million per year on infrastructure, equivalent to 5.6% of its GDP and about half this expenditure goes toward operation and maintenance spending ($490 million).

Irrespective of such huge spending and commitment, the level of infrastructural development still remains comparatively low in Cameroon given the country's ranking in terms of access to basic infrastructure. According to a study by Kumar and Prabir (2008), Cameroon takes a bottom position in terms of infrastructure access and quality, occupying the 88th, 94th and 93rd positions in 1991, 2000, and 2005 respectively out of the 104 countries included in their study. This is confirmed by the general poor state of regional and local infrastructural facilities. Indeed, there is a general outcry of poor road infrastructure, frequent power shortages, inadequate telephone coverage and telecommunications services in most parts of the country alongside high cost of calls. Moreover, despite the huge financial resources devoted in the education, health, water and energy sectors, access to basic services is still very limited and the living conditions for a large population have even deteriorated (GESP, 2009). This has led to a slow growth rate of the country's GDP over time.

This paper thus aims at examining the role of various strands of infrastructures (economic, social and financial) in promoting economic growth in Cameroon and to forecast the long-run response of economic growth to infrastructure types and strands by 2035. Based on above situation, the paper provides answers to the questions whether the existing social, economic and financial infrastructures contribute in the economic growth of Cameroon and whether or not there is any long run infrastructure-economic growth cointegration in the country. Thus, the paper hypothesizes that economic, social and financial infrastructures do not influence economic growth in Cameroon.

The rest of the paper is structured to handle literature review, model specifications and techniques of analysis, empirical results, recommendations and conclusion.

2. Literature Review

A myriad of studies have been carried around the globe on the impact of infrastructure on economic growth and development in the likes of Aschauer (1989), Canning and Petroni (2004), Mishra et al. (2013), Demurger (2001), Benabdesselam (2013), Marc (2007), Sahoo et al (2012), Pereira and Pihno (2011), Pereeira and Andraz (2007), De la Fuente (2000) and a host of others. Holtz-Eakin and Schwartz (1994) developed a neoclassical growth model that explicitly incorporates infrastructure and is so as to provide a tractable framework within which to analyze the empirical importance of public capital accumulation to productivity growth in the USA through a series of growth path equations. Unlike would be expected, they found that raising the rate of infrastructure investment would have had a negligible impact on annual productivity growth between 1971 and

1986. In the same vein, Dholakia and Harlem (1994) developed multiple regression models to analyse the connection between a number of factors such as education, energy, telephone-lines, other physical infrastructures and economic development. Their results showed that simultaneous investment in the development input such as education, telecommunications and other infrastructure variables are complementary in helping to promote economic growth.

On his part, Canning (1999) aimed at evaluating the contribution of investment in various kinds of infrastructure to the aggregate output of the economy. He found that telephones have a larger impact on aggregate output than other kinds of infrastructure while power generation and transportation infrastructure produce approximately the same productivity effect of other capital investment, the productivity effect of telephone infrastructure is surprisingly higher in comparison. Similar results were obtained byCanning and Pedroni (2008).

Based on his cross-regional study comparing infrastructure provision in Spain and the US, De la Fuente (2000) finds that causality flows from infrastructure investment to economic growth, but posits that, as a “saturation point” is reached, the returns on such investment declines. He observes that appropriate infrastructure investment provision is probably a key input for development policy, even if it does not hold the key to rapid productivity growth in advanced countries where transportation and communication needs are already adequately served.

Rioja (2001) developed a general equilibrium model of a small open economy to study the effects of public infrastructure on output, private investment and welfare for three Latin American countries: Brazil, Mexico, and Peru. Findings from the study reveal that infrastructure can have positive effects on output, private investment and welfare. Meanwhile, Schiffbauer (2007) analyses the impact of infrastructure capital on different sources of economic growth. He demonstrates a link between (telecommunication) infrastructure capital and endogenous technological change in the context of a dynamic panel estimation applying aggregate country- as well as U.S. firm-level data. The main empirical finding is that the increase in telecommunication infrastructure during the last 30 years enhanced Research and Development (R&D) investments but did not affect the accumulation of physical or human capital.

Similar results are obtained by Demurger (2001) , Keho and Echui (2011), Babatunde et al. (2012), Kumo (2012) , Benabdesselam (2013),Noula and Sama (2014) who all find that various forms of infrastructures positively contribute to economic growth in respective instances.

3. Model Specifications and Techniques of Analysis

The various elements that constitute the strands of infrastructure considered in the paper are modelled with growth to estimate the individual elasticities in the following equations or models. The models draw allusion from the Cobb-Douglas production functions to take account of the elasticities of each strand and type of infrastructure and the implications of these on the country’s economic emergence as shown by changes in its GDP over time.

Economic Infrastructures and Economic Growth Equation

The effects of the various forms of economic infrastructure (measured by electricity (Elec), road development (RD), rail network (RN), and telephone (Tel)) on economic growth in Cameroon are modelled in a partially logged equation as follows:

$LnGrowth_t=\lambda_0+ \lambda_1 LnElec_t+ \lambda_2 RD_t+ \lambda_3 LnRN_t+ \lambda_4 Tel_t+ \mu_t$..[1]

Note that in the above model, electricity production (Elec) and telephone coverage (Tel) have been instrument by electricity consumption and internet access respectively.

Financial Infrastructure and Economic Growth Equation

Given that economic infrastructures alone do not determine economic growth, it is also imperative to examine the influence of each form of financial infrastructure on economic growth. Thus the financial forms of infrastructure are modelled in the estimable equation with economic growth as;

$LnGrowth_t = \beta_0+ \beta_1 LnDC_t+ \beta_2 LnNR_t+ \beta_3 LnGS_t+\omega_t$..[2]

Where DC, NR and GS denote domestic credit, natural resource rent and gross savings and are all expected to be positive to portray their positive influence on economic growth in Cameroon.

Social Infrastructures and Economic Growth Equation

In a similar fashion as in economic infrastructures, to capture the effect of the various forms of social infrastructure (health infrastructure (HI), education infrastructure (EDI) and security/military infrastructure (MI)) on economic growth as follows;

$LnGrowth_t = \alpha_0 + \alpha_1 LnHI_t + \alpha_2 LnEDI_t + \alpha_3 LnMI_t + \varepsilon_t$.. [3]

Overall Infrastructural- Economic Growth Model

The global growth model which is similar to the augmented Solow-Swan model with composite values for each form of infrastructure (economic, social and financial) gotten from the PCA analysis conducted on all the strands of infrastructure as follows:

$LnGrowth_t = \delta_0 + \delta_1 EI_t + \delta_2 SI_t + \delta_3 FI_t + \varepsilon_t$...[4]

Where; Growth=Economic Growth; EI is economic infrastructure; SI is social infrastructure; FI is financial infrastructure.

It is expected that the coefficients of the parameters in equations [1], [2], [3] and [4] above are positive to account for the a priori predicted positive effects of infrastructures on economic emergence.

On the basis of categorization of infrastructure into economic, social and financial infrastructure, two stages of estimation are done namely the Principal Component Analysis (PCA) to obtain composite indices for infrastructure and the General Method of Moment (GMM) to estimate the elasticities of each form of infrastructure. Also known as "parsimonious summarization" of the data, the Principal Component Analysis is a statistical procedure concerned with elucidating the covariance structure of a set of variables. The various representative indicators of infrastructure are formed through a matrix analysis with structure as follows:

$$I = \sum_{i=1}^{n} \frac{1}{n} a_{ij} \sum_{j=1}^{n} Z_j = \frac{1}{n} \begin{bmatrix} (a_{11} + a_{21} + \cdots a_{n1})Z_1 + \cdots \\ (a_{12} + a_{22} + \cdots + a_{n2})Z_2 + \cdots + (a_{1n} + a_{21} + \cdots a_{nn})Z_n \end{bmatrix} \ldots\ldots[5]$$

Where Z_j represents the different measures of infrastructure, a_{ij} are the resultant components of the matrix obtained through unrotated eigenvectors obtained through the PCA process on the data provided for various measures of infrastructures used in the study.

Having conducted the principal component to generate component variable for the various forms of infrastructure, the single equation General Method of Moments (GMM) that makes use of instruments (instrumental Variable GMM-IVGMM) is then used to estimate the growth models specified so as to obtain the individual and composite effects of the various forms and strands of infrastructure on economic growth. The rationale for the choice of this technique rest on the fact that it does not impose any restriction on the distribution of the data used in the study and also the method permits us to add moment conditions by assuming that past values of explanatory variables, or even past values of the dependent variable, are uncorrelated with the error term, even though they do not appear in the model..

Long-run Cointegrating Estimates

To forecast the long-run implications of infrastructural development on economic emergence in Cameroon, we applied a cointegrated process to ascertain the long-run association between strands of infrastructure and economic growth in Cameroon. However, time series data generated from the PCA analysis in this study show that the component estimates of economic, financial and social infrastructure are non-stationary at levels but stationary at first difference, same as the natural log value of the GDP. This gives rise to integrated processes amongst the various strands of infrastructure and economic growth of order 1 or I(1) processes. This means that the time series data generated for infrastructure exhibits a random walk, which becomes stationary only after first differencing indicating infrastructure and economic growth move together over time. This implies there is an adjustment process preventing further errors in the long run relationship between infrastructure strands and economic emergence, setting the pace for an error correction model. This makes the application of the VECM technique more suitable for further analysis.

As pointed out by Engel-Granger (1987), if variables are co-integrated it implies there exist some forces which restore the equilibrium relationship between the variables whenever it is broken. This return to equilibrium is achieved through the process of a dynamic short run adjustment represented by an error correction model. The implication here is that the correction mechanism is needed to recover all the information that was lost in the course of differencing the variables (infrastructures and GDP). It does this by introducing an error correction term that enables us to gauge the speed of adjustment of infrastructure variables and economic growth to their long- run equilibrium. A fundamental advantage of the VECM methodology is that the error correction term gives the proportion of all accumulated disequilibrium errors in the previous period but which have been corrected in the current period (Olubusoye and Oyaromade, 2008).

However, the cointegration method employed in the paper to forecast a long-run relationship between infrastructural development and economic emergence is based on Johansen's maximum likelihood framework. Johansen (1988) rely heavily on the relationship between the rank of a matrix and its characteristic roots. It takes its starting point in the Vector Auto regression (VAR) of order P.

$$\mathbf{Y_t=\lambda+\beta_1 Y_{t-1}+ \beta_2 Y_{t-2}+\dots \beta_p Y_{t-p}+\varepsilon_t}$$

$\mathbf{Y_t}$ is a n*1 vector of variables that are integrated of order 1

$\boldsymbol{\varepsilon_t}$is a n*1 vector of innovations.

This VAR can be rewritten as $\Delta \boldsymbol{Y_t} = \boldsymbol{\lambda} + \boldsymbol{\pi} \sum_{i=1}^{p-1} \boldsymbol{\Gamma_i}\, \Delta \boldsymbol{Y_{t-1}} + \boldsymbol{\epsilon_t}$

Where $\boldsymbol{\pi} = \sum_{i=1}^{P} \boldsymbol{A_i} - \boldsymbol{I}$ **and** $\boldsymbol{\Gamma_i} = \sum_{j=i+1}^{P} \mathbf{A_j}$

The resultant cointegrated VECM models are given as:

$$\Delta \quad GDP_t = ao + \sum_{i=1}^{n} \alpha_1 \Delta lnGDP_{t-1} + \sum_{i=1}^{n-1} \alpha_1\, \Delta \mathrm{EI}_{(t-1)} + \sum_{i=1}^{n-1} \alpha_3 \Delta \mathrm{FI}_{(t-1)} + \sum_{i=0}^{n-1} \alpha_4 \Delta \mathrm{SI}(t-1) + \partial \mathrm{ECM}_{t-1} + V_t \qquad [6]$$

4. Empirical Results

Based on the three criteria (the eigenvalue-one criterion, the proportion of variance accounted for, and the scree plot criterion) adopted for retaining components that would be representative of the various strands of infrastructure under consideration (economic, social and financial infrastructure), three components each having has eigenvalue greater than 1 and jointly accounting for a cumulative proportion of approximately 80.37% are retained. These three components constitute economic infrastructure, financial infrastructure and social infrastructure respectively.

For each of these three components however, the forms of infrastructures that load more (have eigenvector values greater than or equal to the benchmark value of 0.2) and are related to each other (measuring a given construct) and their associated eigenvectors are as given below on table. The factor loadings thus show that component 1 (economic infrastructure) is made up of electricity production, telephone network, rail and road network; component 2 natural resource infrastructure, gross savings and domestic credit while component 3 (social infrastructure) is made up of health facilities, educational facilities and security facilities. The respective eigenvectors are presented as appendix 2.

IVGMM Regression Results

Table 1 below shows estimates of elasticities of each strand of infrastructure and the component measures of economic (road, rail, telecom and electricity), social (education, health and security) and financial infrastructure (domestic credit, gross saving and natural resource rents) retained after PCA. The elasticities of each of the various forms of economic infrastructure retained for this study are presented as shown on the table below.

Table 1: GMM Results on Forms of Infrastructure and Economic Growth

Economic Infrastructure and Growth		Social Infrastructure and Growth		Financial Infrastructure and Growth	
Variables	**Coefficient**	**Variables**	**Coefficient**	**Variables**	**Coefficient**
TEL	0.340***	LNEDUI	0.133*	D.LNGS	0.362 ***
D. LnELEC	7.065***	LNHI	0.065***	LNNRR	0.704 ***
D. LnRN	0.286	D.LNMI	-0.005	LNDC	0.280 ***
D. LnRD	0.080**	_CONS	48.563***	_CONS	2.604
_cons	28.94***	-	-	-	-
R-squared	0.8725	R-squared	0.9441	R-squared	0.9299
Adj. R^2	0.8425	Adj. R^2	0.9353	Adj. R^2	0.9182
Wald $chi^2(4)$	44.14	Wald $chi^2(3)$	1610.27	Wald $chi^2(3)$	330.48
Prob> chi^2	0.0000	Prob> chi^2	0.0000	Prob> chi^2	0.0000

Source: Computed by Authors.

Note:***=1%, **=5%; *=10% level of significance and "D" denotes first difference stationarity.

As shown on column 2 of table 3 above, all the four forms of economic (hard) infrastructure have a positive effect on economic growth in Cameroon during our period of study. Specifically, increasing telephone (telecommunication) infrastructure in terms of telephone lines by one unit will cause economic growth to significantly increase by a magnitude of 34%. This results are in accordance with the a priori expectations and conform with earlier findings of Roeller and Waverman (2001) who find large positive effects of telecommunication investments on economic growth in a panel of 21 OECD countries from 1970-90 and that of Belaid (2004) confirms the results for a panel of 37 developing countries from 1985-2000. In a similar light, as electricity production (power infrastructure) increases by 1%, economic growth significantly increases by approximately 7.1%, in conformity with the findings of Calderón and Servén (2004) who find that indicators of telecommunication and energy infrastructure have positive and significant effect on growth as well as prior study by Noula and Sama (2011) in Cameroon. From the transport perspective, as the proportion of total paved roads increases by one unit (%), growth is significantly increases by 8% and corroborating the findings of Fernald (1999) which show that the rise in road services substantially increased the productivity across industry in the U.S.

As in the case of economic infrastructure, the various types of social infrastructure considered in this study positively influence economic growth in Cameroon except for military infrastructure which has a negative effect. Specifically, increasing expenditures on education as a means of raising educational infrastructure by 100% economic growth increases by 13.3%; increasing health facilities (infrastructures) by 100% would cause economic growth to rise by approximately 64.7% while military (security) infrastructure negatively influences growth in Cameroon such that increasing security infrastructures (increasing expenditures on military infrastructure by 100%) would decreases growth by roughly 0.5%. This military infrastructure finding is in line with that of Karagol and Palaz (2004) who found that defense expenditures had a negative impact on GDP in Turkey but in contrast with that of Kollias et al. (2004) who found that defense spending had a positive impact on GDP in Cyprus and Atesoglu (2002) who also found a positive long-run relationship between military spending and output for the U.S. economy.

At the same time, the various forms of financial infrastructure also exert a positive influence on economic growth in Cameroon as shown by the coefficients of their respective parameters. The elasticity of these various forms of financial infrastructure with respect to the growth rate of the economy is as presented on table 1 above. Specifically, a 100% increase in the rate of savings in Cameroon, would cause a significant increase in economic growth by approximately 14.1%; increasing the stock of domestic credit provided by the banking sector in Cameroon by 100% would increase economic growth by approximately 36.2%; meanwhile the mobilization of natural resource rents is insignificant in the growth process.

Also, the overall effect of each strand of infrastructure on economic growth is also presented. The elasticities of each of the various forms of economic infrastructure retained for this study are presented as shown on the table 2 below.

Table 1: GMM Results on Strands of Infrastructure and Economic Growth

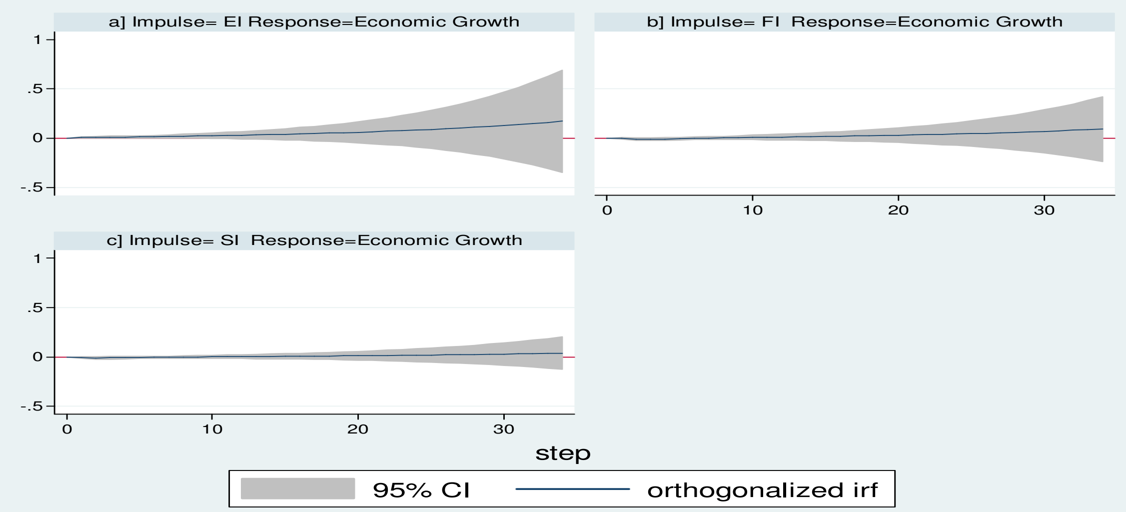
Infrastructure and Growth	
Variables	**Coef.**
EI	0.154***
FI	0.073 ***
SI	0.050***
_CONS	29.530 ***
R-squared	0.9441
Adj. R^2	0.9353
Wald $chi^2(3)$	1610.27
Prob> chi^2	0.0000

Source: Computed by Authors.

Note:***=1%, **=5%; *=10% level of significance.

Globally, the empirical results show that all the three categories of infrastructure positively and significantly influence economic growth in Cameroon. Particularly, as the stock or quantum of economic infrastructures increases by a unit, economic growth increases by 15.4% with the increase in growth being statistically significant. At the same time, increasing the stock of financial infrastructure by one unit causes economic growth to increase by 7.3 % while a unit increase in the stock of social infrastructures causes growth to rise by 5.03% with all these effects being significant at 1%. However, changes in economic, social and financial infrastructures in Cameroon jointly account for roughly 93.53% of the variation in the economic growth rate of Cameroon with approximately 6.47% of the variation in economic growth accounted for by other growth related variables not considered in this study such as political situation, aid flow, domestic and foreign investment, trade etc. Thus the derivative conclusion is that economic, financial and social infrastructures significantly influence economic growth in Cameroon.

These results are further re-emphasized by the resultant Impulse-response graphs that indicate the response of economic growth to shocks in economic, financial and social infrastructure during the period 1990 to 2035. The impulse-response functions derived through a VECM and cointegration process are illustrated on figure 1 below;



Figuer 1: Impulse Response Graphs

Source: Authors' Computations (2015)

The impulse response functions displayed by graphs on figure 1 above show that increments in infrastructural development have permanent long run effects on the economic growth of Cameroon measured by changes in its GDP. Figure 1a shows that an orthogonalized shock to the stock of economic infrastructures (EI) characterized by an increase in its quantum has a permanent, positive and increasing effect on economic growth and emergence in Cameroon. Same permanent and positive effects are felt by economic growth following a standard unit positive shock exerted on financial infrastructure (FI) and social infrastructure (SI).

However, the widths of the confidence intervals in all the three IRF grow with the forecast horizon which is from 2012 to 2035. This means that jointly increasing power infrastructure, road, telecommunication, savings and credit facilities, educational, health and security infrastructures will positive contribute towards emergence even earlier than anticipated. Specifically, the asymptotic confidence intervals on figure 1a show that there is a wider spectrum for economic infrastructure (in terms of roads, telecommunication and power) to propagate economic growth in Cameroon. This shows that economics infrastructures are of enormous and primordial importance in the struggle for economic emergence in Cameroon.

Furthermore, the empirical results above all indicate that infrastructural development significantly and positively influences the growth rate of Cameroon's economy over time. This is theoretically justified given that from a micro perspective investment in infrastructure is argued to raise the marginal product of private capital and labour used in production. From the economic perspective, core infrastructure such as road, telephone, rail and electricity are the necessary inputs for any production and distribution process both in private-sector and public sector production process. Indeed and as purported by Aschauer (1989), investments in core economic infrastructure such as road, electricity and rail allow goods and services to be produced and transported more quickly and at lower costs, resulting in both lower prices for consumers and increased profitability for firms. In fact, a well-developed transport and communications infrastructure network is a prerequisite for the access of less-developed communities to core economic activities and services. More so, roads appear as complementary input for the provision of human capital formation facilities to be effective (Gannon and Liu, 1997) and strong evidence exist in different other countries.

Moreover, well-functioning infrastructure such as electric power, road and rail connectivity, telecommunications, and other form of core infrastructure are necessary prerequisites for rapid growth. Economies also depend on electricity supplies that are free of interruptions and shortages so that businesses and factories can work unimpeded and so ensure regular production and supply of commodities. At the same time, good and widespread telecommunications network facilitates the rapid and free flow of information, which increases overall economic efficiency by helping to ensure that investors communicate with business partners and so make decisions with the most available and relevant information.

Similarly, social infrastructures are found to greatly promote economic growth and serve as veritable tool for economic emergence in Cameroon. Indeed, human capital theorists are of the opinion that improving on social infrastructure, particularly educational and health facilities improve on the knowledge and skill stock of the population whose benefit to the society eventually exceeds the private benefit. As Lucas (1988) argues human capital is an alternative to technological process to improve economic growth in a country. Moreover, it can be argued that as more expenditure is devoted to education it leads to an improvement in quality which in turn improves economic growth. Expenditure on social infrastructures such education, healthcare and security generates positive externalities by creating a healthy, educated and secured populace which affect their productivity. Social infrastructure such as education, health, and housing is essential to promote better utilization of physical infrastructure and human resources, thereby leading to higher economic growth and improving quality of life (Hall and Jones, 1999).

Indeed, interaction effect of government expenditure on education and health quality as well as security concerns of an economy is significant for economic growth to take place. Moreover, expenditures on social infrastructures have spill-over and external effects. From the perspective of the economy as a whole, the totality of training investments by firms and the government can further increase economic output and economy-wide performance thereby increasing chances of the economy emerging faster. These external effects can add considerably to the macroeconomic consequences of any initial investment in human capital (Wilson and Briscoe, 2004).

In the same vein, the above empirical findings reveal that financial infrastructures positively influence economic growth in Cameroon through savings mobilization and the granting of credit. Indeed, the financial sector in Cameroon and its associated infrastructures are of utmost importance to investors who are often short of the financial resources needed to pursue their investments. The banking services provided by banks and the services provided by capital markets such as the Douala Stock Exchange market fill the resource gap faced by investors and thus facilitate financial transactions that influence the productivity of firms and thus increasing economic growth in the country.

With this it is incontestable that there can be no meaningful growth and/or development without investment in infrastructure. This is so because the existence of physical capital paves the way for there to be an increase in the productivity of human and other forms of capital. Thus, by indicating that exogenous shifts in infrastructure growth can contribute to concurrent economic performance, investing in infrastructure constitutes one of the main mechanisms to increase income, employment, productivity and consequently, the competitiveness of an economy.

5. Recommendations

Amidst clarion calls for economic growth and emergence in Cameroon by 2035, this empirical study has proven that policymakers need to place more and rigorous emphasis on infrastructural development in Cameroon not just on paper but by implementing such policies. Such policies may require amongst others that budgetary investment allocations in Cameroon should be tilted towards transportation, telecommunication and energy production as prescribed in the GESP. Indeed, transportation infrastructure (especially road network) improvement should be the first priority of the government in order to increase the economy growth.

Moreover, although it may be accepted that the growth-enhancing effects of economic, social and financial infrastructure are not automatic and must be considered with care in each situation, and weighed against the costs, it is highly recommended that the spread or distribution of these infrastructures be evenly done especially linking highly contributing regions of the country. This would thus require that road construction projects in the country should be implemented such that constructed roads connect the industrial and commercial centres of the country to the other parts of the country. For such products to be implemented cost effectively there is an utmost need for the civil engineering sector in the country to be improved upon by providing the necessary funds and infrastructure they need. This will also warrant the promotion of technical education in Cameroon more than general education for such engineers are groomed and trained mainly through technical education.

Moreover, in the social domain, there should be resource reallocation from military infrastructure to other social domains such as education and health infrastructure which have proven to positively and significantly promote economic growth in the country. It is thus recommended that education policymakers should focuses on the provision of facilities aimed at improving the number of trained teachers, survival rates, reducing pupil-teacher ratios, schooling life expectancy and performance levels which will eventually promote economic growth and speed up the country's emergence even before 2035.

6. Conclusion

The empirical results of this study have proven that infrastructural development is a necessary prerequisite for economic growth to take place. In fact, economic, social and financial infrastructure should be developed hand in hand so that the impact of their synergy can be realized in full measure and impact positively on economic growth in Cameroon. These are bound to create a mutually stimulating and reinforcing effect on each other and spread other positive externalities in the economy as a whole. These will help achieve major benefits in the country as a whole in terms of faster economic growth, improved productivity, poverty alleviation and environmental sustainability. Unarguably, extensive and efficient infrastructure (economic, social or financial) is critical for ensuring the effective functioning of the economy most especially as infrastructure acts as an important factor determining the location of economic activity or industries in an economy. Investments in infrastructures such as transport, telecommunication, power, healthcare, education and financial services improve on the productivity of all inputs in the production process thereby strengthening long-run growth performance by facilitating market transactions and the emergence of externalities among firms or industries (Jimenez, 1995) within an economy. Thus, setting policy priorities targeting infrastructural development especially toward those that have the highest growth payoff would help to improve regional as well as nationwide economic growth prospects and accelerate the rate of progress towards the highly esteemed emergence of Cameroon even before 2035.

References

Africa Infrastructure Knowledge Program (2011) "Handbook on Infrastructure Statistics" World Bank and African Development Bank.

Amin, Aloysius A. (1998). "Cameroon's Fiscal and Economic Growth" *African Economic Research Consortium (AERC)*, RP85. Nairobi, Kenya.

Aschauer DA (1989). "Is public expenditure productive?" *J. Monetary Econ*., Vol.23, 177-200.

Aschauer, D. A. (1990). *Why is infrastructure important?* Conference proceedings, Conference series no. 34, Federal Reserve Bank of Boston, pages 21-68.

Babatunde, Onakoya A., Afees, Salisu A. and Olasunkanmi, Oseni I. (2012). "Infrastructure and economic growth in Nigeria: A multivariate approach" *Research Journal of Business Management and Accounting* Vol. 1(3), pp. 030 – 039. Available online at http://www.wudpeckerresearchjournals.org

Babatunde, O, Salisu, A. Afees, and Olasunkanmi (2012): "Infrastructure and economic growth in Nigeria: A multivariate approach." *Research Journal of Business Management and Accounting* Vol. 1(3),

Belaid, H. (2004), "Telecommunication, infrastructure and economic development", Working Paper .

Calderón, C. & Servén, L. (2004). The Effects of Infrastructure Development on Growth and Income Distribution. *The World Bank Policy Research Working Paper 3400.*

Canning, D. (1999). "Telecommunications Infrastructure, Human Capital and Economic Growth", CAER II Discussion paper 55, Cambridge

Canning, D., and Pedroni, P. (2008). "Infrastructure, long-run economic growth and causality tests for cointegrated panels." *The Manchester School* (76), 504-527.

De la Fuente, A. (2000). "Infrastructures and productivity: A survey. Barcelona, Instituto de Análisis Económico", CSIC, Working Paper. [Online] Available: http://pareto.uab.es/wp/2010/83110.pdf.

Deidda, L. and Fattouh B. (2002) "Non-Linearity Between Finance and Growth", *Economics Letters,* 74(2), 339 - 345.

Demurger, Sylvie (2001). "Infrastructure Development and Economic Growth: An Explanation for Regional Disparities in China*?" Journal of Comparative Economics*29, 95–117. Available online at http://www.idealibrary.com

DFID, (2002). *Making the Connections: Infrastructure for Poverty Reduction,* London.

Dholoakia, R Harlam, B. (1994). "Telecommunication and Economic Development." *Telecommunication Policy* 18 470-7.

Eberhard ,Foster, Cecilia, Fatimata, Camos, and Shkaratan (2008), "Underpowered: The State of the Power Sector in Sub-Saharan Africa", *AICD Background Paper 6, Africa Region, World Bank, Washington,DC.*

EIA (Energy Information Administration). (2007). "International Energy Data" U.S. Department of Energy. http://www.eia.doe.gov/emeu/international.

Fernald, J. (1999), 'Roads to prosperity - assessing the link between public capital and productivity', *American Economic Review* 89(3), 619–638.

Gannon, C. and Liu, Z. (1997). "Poverty and Transport." Washington, DC: The World Bank, Mimeo.

Government of Cameroon (2009). Growth and Employment Strategy Paper (GESP) (2009). *Reference Framework for Government action over the period 2010-2020*. Cameroon Government.

Holtz-Eakin, Douglas and Schwartz, Amy E. (1994). "Infrastructure In A Structural Model Of Economic Growth" National Bureau Of Economic Research (NBER) Working Paper Series, Working Paper No. 4824. 1050 Massachusetts Avenue

Keho, Yaya and Echui, Aka D. (2011). "Transport Infrastructure Investment and Sustainable Economic Growth in Côte d'Ivoire: A Cointegration and Causality Analysis" *Journal of Sustainable Development* Vol. 4, No. 6. http://dx.doi.org/10.5539/jsd.v4n6p23

Kumar, Nagesh and Prabir, De (2008). "East Asian Infrastructure Development in a Comparative Global Perspective: An Analysis of RIS Infrastructure Index" Research and Information System for Developing Countries. Discussion Papers. New Delhi

Kumo, Wolassa L. (2012). "Infrastructure Investment and Economic Growth in South Africa: A Granger Causality Analysis" African Development Bank Group. Working Paper. No 160

Lucas, R. (1988), "On the Mechanics of Economic Development," *Journal of Monetary Economics*, 22, 3-42.

Mishra, P. K.; Das, K. B. and Pradhan, B. B. (2009). "Credit Market Development and Economic Growth in India", *Middle Eastern Finance and Economics*, ISSN: 1450-2889.

NEPAD and African Union (2009). Advancing Regional and Continental Integration in Africa. THE AU/NEPAD African Action Plan 2010-2015:

NEPAD and African Union (2009). Infrastructure Development as Catalyst for Economic Growth in Africa." Thematic Paper jointly prepared by AU Commission and NEPAD Agency At the 17th Africa Partnership Forum (APF) Addis Ababa, Ethiopia.

Noula, Armand G. and Sama, Gustave L. (2014) "A Time Series Analysis of the Impact of Economic Infrastructure on Economic Growth in Cameroon: Case of Energy and Telecommunications" *International Review of Social Sciences* Vol. 2 Issue.8

Perkins , P., Fedderke, J. and Luiz, J. (2005), " An Analysis of Economic Infrastructure Investment in South Africa", *South African Journal of Economics*, Vol. 73 No. 2, June , pp. 211-228.

Rioja, F.K. (2001), "Growth, Welfare, and Public Infrastructure: A General Equilibrium Analysis of Latin American Economies," *Journal of Economic Development*, 26(2),119-130.

Roeller, L. and L. Waverman (2001), "Telecommunications infrastructure and economic development - a simultaneous approach', *American Economic Review* 91(4), 909–923.

Sahoo, Pravakar; Dash, Ranjan K. and Nataraj, Geethanjali (2012). "China's Growth Story: The Role of Physical and Social Infrastructure" *Journal of Economic Development*. Vol. 37, No.1

Schiffbauer, Marc (2007). "Calling for innovations - infrastructure and sources of growth" *Bonn Graduate School of Economics.* First version.

United Nations Human Settlements Programme (UN-HABITAT), (2011). "Infrastructure for Economic Development and Poverty Reduction in Africa" The Global Urban Economic Dialogue Series. Nairobi, Kenya.

Wilson, Rob A. and Briscoe, Geoff (2004). "The impact of human capital on economic growth: a review."In Tessaring, Descy, P. (2004). "Impact of education and training."Third report on vocational training research in Europe: background report. Cedefop Reference series, 54.

World Bank (1994), *World Development Report 1994: Infrastructure for development*, New York: Oxford University Press.

Appendices

Appendix 1: Components and Eigenvalues

Component	**Eigenvalue**	**Proportion of Variance accounted**	**Cumulative Proportion of Variance accounted**
Component 1	7.37645	0.4339	0.4339
Component 2	2.94384	0.1732	0.6071
Component 3	2.00096	0.1177	0.7248
Component 4	1.34217	0.0790	0.8037

Appendix 2: Eigenvectors (Factor Loadings) of Retained Components

Component 1 (Economic Infrastructure)		**Component 2 (Financial Infrastructure)**		**Component 3 (Social Infrastructure)**	
Variable	Eigenvector	Variable	Eigenvector	Variable	Eigenvector
Electricity	0.3592	Natural Resource	0.2898	Security	0.5120245
Telephone	0.3585	Gross savings	0.4383	Health	0.462645
Rail Network	0.2592	Domestic Credit	0.2614	Education	0.6835860
Road Network	0.3468				

Appendix 3: Components and their Significance Level

Eigenvalues	**Coefficients (Standard Errors)**	**P-value**
Component 1	7.376447 (2.175196)	0.001
Component 2	2.943842 (.868091)	0.001
Component 3	2.000962 (.5900515)	0.001
Rho	0.7248	
SE (Rho)	0.0465	