CHAPTER 2

Theory and Literature Review

2.1 Theory

The aim of this chapter provides all the related theories concerning this study will be mentioned in two ways as economic theory and econometric theory. Firstly, the chapter mentions the mainly theory of economic growth. The second part of the chapter provides the review of related literature review on infrastructure investment and economic growth.

2.1.1 Economic Theory

The theories of economic will be emphasized concerning the relationship between investments and economic growth are (1) Solow Neoclassical Growth Model; (2) Keynesian Theory.

2.1.1.1 Solow Neoclassical Growth Model

In the 1950s, Solow neoclassical growth model was developed by Robert Solow and Trevor Swan. According to Solow growth model, another thing is being equal; saving/investment and population growth rates are important determinants of economic growth. This means that higher saving/investment rates lead to increase of more capital per worker and henceforth more output per worker (Chude & Daniel Izuchukwu, 2013). The model involves that the higher rate of gross domestic product (GDP) devoted to investment enhanced GDP growth rate. The higher depreciation rate of capital stock caused lower growth rate of GDP. Another way is that GDP will be raised because the earlier progress in technology or total factor productivity (Solow, 1962). The main conclusion of the Solow-Swan model is that sustainable growth over time is possible only through an increase in labour productivity (Romer, 2012). Increase in the productivity levels can be accomplished by an increase in the effectiveness of the labour, achieved often by technological progress. The Solow-Swan model treats technological progress as exogenous and puts it forward as the only possible explanation of long-term growth (Andreev, 2015).

The standards of living are differed from one nation to another country because the various countries have diverse resources endowment; disparities of income have led to creation of many economic models and theories that try to explain these discrepancies. The rate of development in technology can be attributed to several different factors such as investments in technology, knowledge spill overs, human capital and public infrastructure (Mastromarco and Zago, 2012). Better infrastructure can contribute to the technological progress and its determinants (Andreev, 2015).

2.1.1.2 Keynesian Model

According to the Keynesian model indicated that the during recession periods, the budgetary expansion should be undertaken to increase the aggregate demand in the economy thus boosting the GDP. This is with a view that an increase in government spending leads to improve the output of services in public sector and firms in the business sectors. In the business sector, if employment rises, income and profits of the firms will increase and result in the firm hiring more workers to produce the goods and services needed by the government.

Infrastructure affords the groundwork for economic activities thereby generating jobs and improving the quality of life. Furthermost of the modern practical studies afford the decisions that there is a positive relationship between infrastructure investments and the economy of growth. Like the other countries, an increase in infrastructure investment leads to the economic growth for both developing and developed countries. The lack of infrastructure was delaying the economic growth in many developing countries. The common understanding of macroeconomics dependable, there is one major dispute in empirical studies that infrastructure investment is considered to improve of the nation overall economic activity and it is really lead to the country of economic growth; slightly, it is possible lead to raise employment. If public investment is declined, the productivity of economic activity may be slower. Therefore, public investment could be helped to reduce the production costs. However, the falling public infrastructure investment had been a important factor affecting the decline in overall economic growth (Heintz, Pollin , & Garrett- Peltier, 2009). David Aschauer was to be used a production function approach to examine the link between investment in public infrastructure and output and production. He argued that public infrastructure investment should be considered as another factor input in the production function, similar to private sector inputs. Aschauer's found that a high correlation between low U.S. productivity growth in the 1970s and 1980s and a slowdown in public infrastructure investment (Jacqueline Johnson, 2010). Therefore, the following two are become the outstanding theories for understanding the connection between infrastructure investment and for country economic growth.

2.1.2 Econometric Theory

Theoretical model used to search the relation between economic growth and investment can be specified as a simple model:

$$GDP = f(INF, EMP, K) \qquad (2.1)$$

Where:

GDP stands for Gross Domestic Product at current price. INF stands for infrastructure investment. EMP stands for employment. K stands for non-infrastructure capital stock.

This model sets a hypothesis that GDP is a function of infrastructure investment, employment and capital stock. In fact, according to the national income identity, GDP can also be affected by consumption (C), government spending (G) and net export (NX). However here, the main study is about the relationship between infrastructure investment and economic growth; the above mentioned three factors are excluded from the model (Heintz, Pollin , & Garrett- Peltier, 2009).

In order to analyse and study the relationship between GDP, infrastructure investment, employment and capital stock both in long -term and short-term, and also to find out the causality and the direction among these variables, a set of methods of time series econometrics, namely Augmented Dickey Fuller (ADF) unit root test, Co-integration test using bound test, Error Correction Model under the broader framework of Autoregressive Distributed Lag (ARDL) model are used in this study. Even though some have argued that ARDL model does not highlight the fundamental structure of the economies, it is still meaningful to be used for the macroeconomic time series forecasting. The main reason for choosing ARDL model here in this paper is because the model itself is easy to be implemented and its forecasting results are very consistent.

2.1.2.1 Autoregressive Distributed Lag Model

The ARDL modelling approach was developed by Pesaran and Pesaran (1997), Pesaran and Smith (1998), Persaran and Shin (1999) and Pesaran et al. (2001). This model is adopted for the order of integration is mixed i.e, I(0) and I(1). The main advantage of ARDL approach over the conventional ECM is that it can be worked irrespective of whether the variables are I (0) and I (1). Another advantage of this approach is that the model takes sufficient number of lags to capture the data generating process on a general to specific modelling framework (Laurenceson and Chai, 2003, p.28) (Chaibboonsri, 2011). Furthermore, ARDL model derived dynamic error correction model (ECM) through a humble linear transformations. ECM model shows the effect of SR dynamic with the LR equilibrium without losing LR information (Dougherty, 2011). ARDL model is used in analysing the relationship between variables, in the LR and SR relationship between variables, and to indicate the extent of their impacts of public infrastructure investment on economic growth (Reungsri, 2010). The ARDL approach to co-integration is the resulting equation below;

$$Y_t = \beta_0 + \beta_1(Q_t) + \beta_2(R_t) + \beta_3(Z_t) + \varepsilon_t \quad (2.2)$$

Where,

Y_t = the value of a variable at time period *t*

Q_t = First independent variables time series data at t-time

R_t = Second independent variables time series data at t-time

Z_t = Third independent variables time series data at t-time

u_t = a vector of stochastic error terms;

β_0 , β_1, β_2 , β_3 , β_4 = parameters

For the above equation, following Pesaran and Pesaran (1997), Pesaran and Shin (1999) and Pesaran and Smith (2001), the error correction version of ARDL model is given as below;

$$\Delta\ Y_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i}\ \Delta Q_{t-i} + \sum_{i=1}^{p} \beta_{2i}\, \Delta R_{t-i} + \sum_{i=1}^{p} \beta_{3i}\, \Delta Z_{t-i}$$
$$+ \sum_{i=1}^{p} \beta_{4i}\, \Delta Y_{t-i} + \beta_5 Y_{t-1} + \beta_6 Q_{t-1} + \beta_7 R_{t-1} + \beta_8\, Z_{t-1} + \varepsilon_{1t} \qquad (2.3)$$

The principal part of equation (2.2) is denotes the SR dynamic of model (i.e β_1, β_2 , β_3 , β_4) and the next part with β_5, β_6 , β_7 , β_8 represents the LR relationship among in all variables. And then we take natural log in equation (3.7) then will be written as equation (3.8) and showed as below that;

$$\Delta\ lnY_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i}\ \Delta \ln Q_{t-i} + \sum_{i=1}^{p} \beta_{2i}\, \Delta \ln R_{t-i} + \sum_{i=1}^{p} \beta_{3i}\, \Delta \ln Z_{t-i}$$
$$+ \sum_{i=1}^{p} \beta_{4i}\, \Delta lnY_{t-i} + \beta_5 lnY_{t-1} + \beta_6 lnQ_{t-1} + \beta_7 lnR_{t-1}$$
$$+ \beta_8\, lnZ_{t-1} + \varepsilon_{1t} \qquad (2.4)$$

In this model, co-integration must use F-test for testing the existence of the long-run relationship among above the variables. The null hypothesis tested in this analysis is the null of non-existence of the LR relationship among the variables in equation 2.2 defined as follows;

$$(H_0 :\ \beta_5 = \beta_6 = \beta_7 = \beta_8 = 0)$$

And against the alternative hypothesis

$$(H_1 :\ \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq 0)$$

This can be denoted as follows:

F(Y \ Q, R, Z)

The F-statistic is estimated thus

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \, \Delta Q_{t-i} + \sum_{i=1}^{p} \beta_{2i} \, \Delta R_{t-i} + \sum_{i=1}^{p} \beta_{3i} \, \Delta Z_{t-i} + \sum_{i=1}^{p} \beta_{4i} \, \Delta Y_{t-i} + \varepsilon_t \qquad (2.5)$$

H_0: cointegration or long-run relationship is not found among the variables

H_1: cointegration or long-run relationship is found among the variables

If the F-statistic is greater than the lower bound and upper bound of the critical value, then the null of no long-run relationship between Y, Q, R and Z is rejected irrespective of the order of integration.

If the F-statistic is lower than the lower bound and upper bound of the critical value, then the null of no long-run relationship between Y, Q, R and Z is accepted irrespective of the order of integration.

Then the variable addition variables test is performed by adding Y_{t-1}, Q_{t-1}, R_{t-1} and Z_{t-1} into the equation. The F-statistic tests the joint null hypothesis that the coefficients of these variables are zero for this level. This can be denoted as F(Y \ Q, R, Z). If the F-statistic is greater than the lower bound and upper bound of the critical value, then the null of no long-run relationship between Y, Q, R, and Z is rejected irrespective of the order of integration. Following the significant of the lagged level variables in the error correction model explaining ΔQ_t, ΔR_t and ΔZ_t is considered. Subsequently the procedure for the F-statistic of F(Q\ Y, R, Z) , F(R \ Y, Q, Z) and F(Z \ Y, Q, R) the results are compared with the critical value. If there is a rejection of the H_0 of no long-run relationship, then the test results suggest that there is a long-run relationship between Y, Q, R and Z variables. That is variables Q, R, Z can be treated as long-run driving variables for the explanation of Y. Therefore, the long-run coefficients of the estimation and the associated model can now be accomplished by using ARDL model. On the other hand, if the test result accepted H_0, then variables Q, R and Z cannot be treated as long-run driving variables for the explanation of Y and the model should be estimated in the short-run dynamic equilibrium using the first differenced variables. Therefore, the ARDL approach to co-integration consists of two steps (Pesaran et al, 2001) in this research.

1) In key step is to analyse the existence of long-run relationship between one and another variable in equation.

2) The following step is to estimate the LR and SR coefficients of variables.

2.1.2.2 Testing for Unit Roots

In time series literature, variables are tested by several unit root tests available, including the Augmented Dickey-Fuller (ADF) tests. Assuming that Y_t is a time series variable that is tested in the following;

$$Y_t = \rho Y_{t-1} + u_t \qquad -1 \le \rho \le 1 \tag{2.6}$$

Where,

u_t = error term (Damodar N. Gujarati 2009)

A random walk model without drift, if ρ =1 in equation (2.4) that is a nonstationary stochastic process. If Y_t is nonstationary then transformed to the unit root test of stationary are as follows;

$$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + u_t \tag{2.7}$$

$$= (\rho - 1)\, Y_{t-1} + u_t$$

$$\Delta Y_t = \delta Y_{t-1} + u_t \tag{2.8}$$

Where, $\delta = (\rho - 1)$

$\Delta Y_t = Y_t - Y_{t-1}$

If, δ = 0 and ρ= 1 then equation (2.6) can be rearranged as equation (2.7)

$$\Delta Y_t = (Y_t - Y_{t-1}) = u_t \tag{2.9}$$

If δ = 0, it is a stationary which means that the first differences of a random walk time series are stationary.

2.1.2.3 Augmented Dickey-Fuller (ADF) test

Augmented Dickey Fuller (ADF) unit root test, an augmented version of Dickey Fuller (DF) test, is used to accommodate some form of serial correlation. Assuming that Y_t is a time series variable that is integrated of order I(1) without drift, these test can be extended for higher autoregressive processes. The extended DF test for higher order equations is the augmented dickey fuller (ADF) test. Considering a p^{th} order autoregressive processes are as follows (Reungsri, 2010);

$$\Delta Y_t = \alpha_1 Y_{t-1} + \sum_{j=1}^{p} \theta j \, \Delta Y_{t-j} + \varepsilon_t \quad (2.10)$$

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{j=1}^{p} \theta \mathrm{j} \, \Delta Y_{t-j} + \varepsilon_t \quad (2.11)$$

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 t + \sum_{j=1}^{p} \theta \mathrm{j} \, \Delta Y_{t-j} + \varepsilon_t \quad (2.12)$$

Where,

Y_t = the value of a variable at time period t

$\Delta Y_t = Y_t - Y_{t-1}$

α_0 = the constant term

t = the time trend

ε_t = an error term

2.1.2.4 Error Correction Model

First of all, Error Correction mechanism is used to define the relationship between short run dynamic and long run equilibrium (Sargan 1984) and later popularized by Engle and Granger corrects for disequilibrium (1987). This theorem, known as the Granger representation theorem, states that if two variables *Y* and *X* are co-integrated, the relationship between the two can be expressed as ECM (Dawn C.Porter, 2009).

The ECM test corrects the equilibrium error in one period by the next period that can be written as below;

$$\Delta Y_t = \alpha_0 + \alpha_1 \Delta X_t + \alpha_2 u_{t-1} + \varepsilon_t \quad (2.13)$$

Where,

$\Delta Y_t = Y_t - Y_{t-1}$

α_1 , α_2 = the dynamic adjustment coefficients

u_{t-1} = the lag of residual that represents the short run disequilibrium adjustment of the estimate of the long run equilibrium error term

ε_t = the error term (Gujarati 2009)

2.1.2.5 Co-integration Test

Co-integration means that all variables will be cointegrated if they have a long-run equilibrium, relationship between two or more time series variables which are individually non-stationary at their level form (Dawn C.Porter, 2009) . If all-time series variables are no unit root in the error term from the regression $Y_t = b_0 + b_1 X_t + u_t$, then Y and X are cointegrated (Derrick Reagle,Ph.D, 2001).

Suppose that, Y_t and X_t are regressed as follows:

$$Y_t = b_0 + b_1 X_t + u_t \quad (2.14)$$

$$u_t = Y_t - b_0 - b_1 X_t \quad (2.15)$$

b_1 = Cointegrated parameter

2.2 Literature Review

Muhammad S.Anwer and R.K.Sampath (1999) studied the causality relationship between investment and economic growth for 90 countries from the period 1960-1992. Indeed, this research also used the unit root test, co-integration test, Granger causality test. Among those countries, 15 and 23 countries found causality relationships in the SR and LR. In addition, there were only ten countries that had Bi-dierctional causality. And then, 18 and 10 countries that had unidirectional causation running from investment to GDP and Gross Domestic Product to investment and eleven countries had positive causality from GDP to investment and investment to GDP for 6 countries had positively relationship.

Peterperkins, Johannfedderke and John Luiz (2005) An analysis of economic infrastructure investment in South. In this paper, the author mentions the economics infrastructure such as railways, roads, ports, air travel, phone lines and electricity. So as to estimate the relation between economic growth and infrastructure investment, data collection by using seven macroeconomic variables, namely, railways, roads, ports, air travel, phone lines and electricity and economic growth. In approximating the parameter of the identified model, the method of econometric adjusting from the Pesaran, Shin and Smith (PSS F-statistic) (1996, 2001) is applied in this study. The empirical results have three mains finding. The first of finding is the relationship between economic infrastructure and economic growth appears to the same direction. Moreover, South Africa's stock of economic infrastructure has developed in segments. And finally, the economic infrastructure investment needs for the maintenance and expansion of infrastructure.

James Heintz, Robert Pollin, Heidi Garrett-Peltier (2009) considered how infrastructure investments support the US economy: employment, productivity and growth. In this paper, gross domestic product, transportation, energy, the systems of water, and school buildings of public were used as variables by the researchers. Input-Output model and Engle-Granger co-integration model are used in this research. According to this research, public infrastructure investment grew at an average annual rate of 4.0percentageand economic growth raised averaged 4.1 percentages in 1950-1979. But GDP growth also falls to 2.9 percentage average annual rate when public infrastructure investment growth slows dramatically to an average 2.3 percentage during 1980-2007. They had found that the relationship between infrastructure investment and economic growth are together.

Muhammad Afzal, Muhammad Shahid Farooq Hafiz Khalil Ahmad, Ishratbegum and M.Abdul Quddus (2010) An analysis of the relationship between school education and economic growth in Pakistan for the period 1970-71 to 2008-09. Annual time series data of real GDP, real physical capital, inflation and general school enrolment are used in this study. The purpose of this study is to test for the linkage between SR and LR relationship of economic growth and economic growth in Pakistan. For investigation the variables whether the data have unit root or not, three different tests, namely, Augmented Dickey-Fuller Test (ADF) and Phillips-Perron Test (PP) and Ng-Perron Unit Root Test for stationary have been performed. And then, ARDL model used a three-step procedure: Dynamic analysis, LR relationship and ECM analysis have been applied in this research. According to the empirical results, it can be concluded that the positive and significant effect of physical capital on economic growth is supported by both LR and SR dynamic models. The net school enrolment ratio on economic growth is found that significant direct effect in short-run as well as in long-run.

Pravakar Sahoo, Ranjan Kuman Dash, Greenthanjali Nataraj (2010), presented about infrastructure development and growth of economic in China for the period 1975 to 2007.They used the Autoregerssive-distributed lag model (ARDL) developed by Pesaran et al. (2001) and Generalised Methods of Moments developed by Hansen (1982) and Vector Error Correction Model. In this paper, gross domestic product (GDP), public expenditure on education, health (HEexp), total lobor force (LF_t), private investment (K_{pvt}), and public investment (K_{pub}), are used by the researchers. The result indicated that infrastructure development subsidizes positively related to economic growth in China.

Emilia Herman (2011) investigated the effect of economic growth on employment in EU countries between 2000 and 2010. The main finding of this paper is to study the employment elasticity of economic growth in EU. The data such as economic growth, employment and labor productivity were used by the researcher in this paper by using descriptive method.

The result shows that a low and positive employment elasticity of economic growth at the EU in the period 2000-2010. However, the negative effect of economic growth on employment in five countries within the EU. By the time, the positive effective of economic growth on employment faced in another country within EU. So, the impact of the economic growth process on employment varies from one country to another in EU.

Wolassa L. Kumo (2012) studied infrastructure investment and economic growth in South Africa: A Granger Causality Analysis between growth, economic infrastructure investment, and employment, exports and imports in South Africa for the period1960-2009 using bivariate vector auto-regression (VAR) model with and without a structural break. The researcher used economic infrastructure investments (EINFIg) and output growth (GDPg), exports (EX) and imports (IMP) as variables in this paper.and output growth (GDPg), exports (EX) and imports (IMP) as variables in this paper. He found that there is a strong causality between economic infrastructure investment and GDP growth. The result are showed both same directions implying that economic infrastructure investment drives the long term economic growth in South Africa while improved growth feeds back into more public infrastructure investments.

Syed Zeeshan Haider, Muhammad and UsmanAmjad, Sami Ullah and Tanveer Ahmed Naveed (2012) studied the role of infrastructure in economic growth: A case study of Pakistan.They used time series data collected from 1972 to 2009 by using GDP as the dependent variable and Gross Fixed Capital Formation (GFCF), Per Capita Health Expenditure (PCHE) and Total Generation of Electricity (TGE) used as proxy for infrastructure. Augmented Dickey Fuller (ADF) test and Johensen Cointegration and Ordinary Least Square (OLS) method are used in this research. The result shows there is no LR relationship exists but in the SR infrastructure is contributing to economic growth in economy.

Sakineh Sojoodi, Fakhri Mohseni Zonuzi and Nasim Mehin Aslani (2012) investigated the role of infrastructure in Promoting Economic Growth in Iran over the period of 1985 to 2008. Economic growth, public infrastructure capital and private capital are used this research by using ARDL model. The empirical result shows that progressive and significant impact on economic growth of Iran.

Chude, Nkiru Patricia and Chude, Daniel Izuchukwu(2013) investigated the impact of government expenditure on economic growth in Nigeria. Ex-post factor research design and applied time series econometrics technique were used by the researchers to examine the LR and SR effects of public expenditure on economic growth in Nigeria. The results indicated that total expenditure education is highly and statistically significant and have positive relationship on economic growth in Nigeria in the LR.

Albertina da Rosa Delgado (2013) investigated Expenditure Policy in Angola: Impact on economic development and inequality. The researcher used different type of government expenditure variables such as education, health, social security, transport and communication, environmental protection, agriculture, economic issues and general public services and GDP during the period from 1991 to 2011. This research tested Lag selection criteria test, Augmented Dickey-Fuller test, Johansen test for co-integration. He found that GE does not have causality between different types of GE and economic growth.

Siyanpeter, Eremionkhalerita, Makwe Edith (2015) analysed the impact of road transportation infrastructure on economic growth in Nigeria. Probit model was used to find out the primary data while multivariate model was used to analyse the secondary data to define the LR relationship between growth and road transportation in Nigeria. Different variables such as gross domestic product (GDP), road transportation (ROT), capital utilization (CUR), government expenditure on road transportation (GENOT), and exchange rate (EXCHR) are used in this paper. The result shows that the transport sector positive impacts on the economic growth in Nigeria.

Table 2.1 Summary table of the Literature Review

AuthorC	Title	Variables used in the	Econometrics Method	Findings
Muhammad S.Anwer and R.K.Sampath (1999)	Investment and Economic Growth	GDP, investment	Granger Causality approach, Augmented Dickey-Fuller (ADF) tests	The causality relationship between investment to GDP, GDP to investment and bi-directional causality in 90
Peterperkins, Johannfedderke and John (2005)	An Analysis of Economic Infrastructure Investment in South Africa	railways, roads, ports, telephones, electricity. GDP	PSS (Pesaran, Shin and Smith, 1996, 2001) F-test	The relationship between economic infrastructure investment and growth appears to run in both directions in South Africa.
James Heintz, Robert Pollin, Heidi Garett-Peltier (2009)	How Infrastructure Investments Support the U.S Economy: Employment, Productuion and Growth	GDP, Transportation, Energy, Water system and school	Engle-Granger Cointgration, Input-Output model	Infrastructure investment and economic growth rise or fall together

Table 2.1 Summary table of the Literature Review (Continued)

Author	Title	Variables used in the study	Econometrics Method	Findings
Muhammad Afzal, Muhammad Shahid Farooq Hafiz Khalil Ahmad, Ishratbegum and M.Abdul Quddus (2010)	Relationship between school education and economic growth in Pakistan ARDL Bounds Testing Approach to Cointegration	real GDP, real physical capital, inflation and general school enrollment	ADF, PP, and Ng-Perron unit root tests, ARDL approach to cointegration test.	Direct relationship between school education and economic growth in Pakistan, both in the short-run and the long-run.
Pravakar Sahoo, Ranjan Kuman Dash, Greenthanjali Nataraj (2010)	Infrastructure development and economic growth in China	GDP, public expenditure on education and health, labor force	ARDL and GMM ECM, ADF test	Infrastructure development contributes positively in economic growth in China.
Emilia Herman (2011)	The Impact of Economic Growth Process on Employment in EuropeanUnion Countries	GDP Employment, labor productivity	Descriptive methods	The Direct relationship between employment and economic growth, but different from one country to another in EU.

Table 2.1 Summary table of the Literature Review (Continued)

Author	Title	Variables used in the study	Econometrics Method	Findings
Wolassa L. Kumo (2012)	Infrastructure Investment and Economic Growth in South Africa: A Granger Causality Analysis	GDP, economic infrastructure investment, exports, imports	VAR model, Granger causality tests, Augmented Dickey-Fuller (ADF) and Phillips-Perron unit root tests	Economic infrastructure investment drives the long term economic growth in South Africa.
Syed Zeeshan Haider, Muhammad and UsmanAmjad, Sami Ullah and Tanveer Ahmed Naveed (2012)	Role of Infrastructure in Economic Growth: A Case Study of Pakistan	GDP, Gross Fixed Capital Formation, Per Capita Health Expenditure and Electricity	ADF test, Ordinary Least Square (OLS)	Infrastructure is positively and significantly contributing in Pakistan.
Sakineh Sojoodi, Fakhri Mohseni Zonuzi and Nasim Mehin Aslani (2012)	The role of infrastructure in Promoting Economic Growth in Iran	Economic growth, public infrastructure capital, private capital	ARDL model, ADF test, Cointegration test	Positive and significant impact on economic growth of Iran.

Table 2.1 Summary table of the Literature Review(Continued)

Author	Title	Variables used in the study	Econometrics Method	Findings
Albertina da Rosa Delgado (2013)	Expenditure Policy in Angola: Impact on Economic Development and Inequality	GDP, education expenditure, health expenditure, transport and communication, agriculture	OLS regression model, Dickey-Fuller test, Johansen test for cointegration	GE does not have causality between different types of GE and economic growth for Angolan.
Siyanpeter, Eremionkhalerita, Makwe Edith (2015)	The Impact of Road Transportation Infrastructure on Economic Growth in Nigeria	GDP, road transportation exchange rate, capital tiulization	Augmented Dickey Fuller, the Philips-Perron, Johansen Co-integration Test	There exists a long-run relationship between transportation infrastructure and economic growth in Nigeria.
Chude, Nkiru Patricia and Chude, Daniel Izuchukwu (2013)	Impact of government expenditure on economic growth in Nigeria.	RGDP , Education Expenditure	Ex-post, Error Correction Model (ECM),	Total government expenditure on education has significant effect on Gross Domestic Product in Nigeria.