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THE NEXUS OF THE INFRASTRUCTURE SECTOR, EMPLOYMENT AND ECONOMIC GROWTH

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The world is changing rapidly, in ways that leave many people behind. The discontent with economic growth in recent decades played an important role in the US election of 2016 and the Brexit referendum in the same year. Advances in technology over the recent years have suggested interventions that came with a promise to make everyone better off. Built infrastructure is considered a major sector of the economy throughout the world. Its sheer size and role in economic growth is used to justify its importance. The literature considered revealed that the construction sector is considered an investment sector. The endogenous growth theory is mobilized to explain the relationship of the built infrastructure sector to economic growth and employment. The fundamental dynamics of the built infrastructure sector are studied in relation to economic growth, with a view to ascertaining if there is a basis for national governments to stimulate economic growth and job creation through investment in infrastructure. This will enable policy makers to make better use of the built infrastructure sector. Cointegration analysis of time series total construction output (TCO), construction employment (CE) and GDP data for South Africa reveal that a positive short run relationship does exist between these variables, subject to other factors being equal. However, empirical evidence suggests that there is no obvious link between TCO, CE and GDP. While the endogenous growth theory show that construction influences investment, which is a major factor in determining economic growth, the growth process per se has been shown to be a complex phenomenon.

Keywords: cointegration analysis, economic growth, infrastructure, political economy

INTRODUCTION

The term infrastructure is defined as the basic physical and organizational structures and facilities that are needed for a society or an economy to function (Black et al. 2009). Included under infrastructure is water, sewerage, electricity, gas, communication, air transport, railways, harbours and roads (ONS 2011). Therefore, in construction, the use of the term infrastructure is generally limited to describe fixed assets.

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In the South African statistics, all work that is undertaken by the construction sector such as schools, human settlements, offices, hospitals and transport networks are referred to as infrastructure (Stats SA 2007). While the percentage share of infrastructure related to construction as well as that for R&M can be easily determined from the UK construction statistics, it is not possible to do this from the South African construction statistics. Hence, the terms construction and infrastructure are used interchangeably throughout this research.

There is a great deal of interest in the role of the construction sector in economic growth. Increases in infrastructure spending in South Africa (SA) since 2003 have seen a steady increase in the number of jobs created, as well as skills shortages that accompany such increases. These increases in infrastructure development came as a result of government's increased expenditure, largely driven by large SOEs such as Eskom, Transnet and SANRAL. Infrastructure developments that accompanied the hosting of the 2010 Soccer World Cup also played a significant role in driving up demand in the sector.

According to the CIDB (2007), construction labour refers to all persons involved in physical construction work. It includes both skilled and unskilled labour. As a labour-intensive sector of the economy, construction heavily relies on the skills of its workforce. Skill can be described as the ability to perform particular tasks at a certain level of competence. These competencies include the ability to perform a set of tasks, the ability to understand what others are doing and why, as well as the ability to adapt to changes and unforeseen circumstances. Unskilled labour is more informal and unclearly defined, comprising labourers who lack relevant qualifications and various forms of education and learning (Makhene and Thwala 2009).

A skills shortage can be described as an insufficient supply of suitably qualified workers willing to work under existing market conditions, particularly at prevailing wages (OECD 2016). The impact of skills shortages and how to deal with such skills issues is an important area of study. The OECD identified the cyclic nature of construction work and the poor image of the construction sector as major contributing factors to skills shortage in the sector. This has influenced employment patterns whereby employers try to shield themselves from the fluctuations through the use of sub-contractors (Dlamini 2016). This allows big contractors to shift employment costs from fixed to variable in nature. This in turn results in changes in training and development as employers are not incentivised to train temporary or transient workers for the benefit of competitors.

Economic growth and employment creation in SA have become the preoccupation of every government department over the past two and a half decades since the 1994 dawn of democracy. The challenge has been to create an economic and socio-political environment where citizens would have access to jobs and enterprise opportunities. In the wake of the abolition of apartheid in 1994, it became necessary to build new infrastructure and develop skills to take advantage of the opportunities that were emerging. As an investment sector, infrastructure development became an important factor in the agenda of the ANC government. It set out to rebuild infrastructure that had deteriorated for decades under the apartheid government, especially in rural areas. The reconstruction and

development programme (RDP) that was adopted as a road map was informed by the view that infrastructure is crucial to growth.

While Fedderke et al. found a direct impact for infrastructure investment on economic growth, Du Plessis and Smit (2007) reached a different conclusion. In a study of SA's growth revival after 1994, Du Plessis and Smit used growth accounting to distinguish the relative contributions of capital, labour and total factor productivity to post-apartheid growth at aggregate, sectoral and subsectoral levels. The study investigated infrastructure, as a type of capital financed by the public sector. Du Plessis and Smit found that openness to capital flows and a stable macroeconomic environment had been leading causes of SA's growth recovery after 1994. They also found that an indirect channel via higher private sector investment in productive capital supported the growth recovery.

For much of the first decade of SA's democratic transition, its macroeconomic agenda, conceived in the policy programme of the growth, employment and redistribution (GEAR) strategy of 1996 was defined by neoliberal principles. The neoliberal economic agenda came under attack from the ANC alliance partners (COSATU and the SACP), which from 2003 forced shifts in economic policy in a more developmental direction (Habib 2008). While remarkable transformation has occurred since then, economic growth and employment generation were disappointing.

The SA government's fiscal policy seeks to support structural reforms of the economy consistent with long-run growth, employment creation and an equitable distribution of income. This research aimed to investigate the correlation of construction output, construction employment and economic growth. The problem identified is how the various national plans, policies and strategies impact on the performance of the construction sector.

LITERATURE REVIEW

Construction is considered a major sector of the economy throughout the world. It accounts for about 10% of most countries' gross domestic product (GDP) and 50% of gross fixed capital formation (GFCF). A sector of the economy this big cannot but has an impact on economic growth and employment. Its sheer size and role in economic growth and job creation are used to justify its importance. There should be no conflict between construction output and employment maximisation in the construction sector in the short or long-term. A strategy to increase output through activities consuming more labour and less scarce resources is the only feasible way forward for many developing economies such as SA.

Construction output

Early studies in political economics focused mainly on explaining the role of the construction sector in economic development. Strassmann (1970) studied the role that the construction sector played in economic development and employment creation using regression analysis. He found that the role that the construction sector played varied according to the level of developmental trajectory for each economy. Turin (1978), building on the work of Strassmann, used time series analysis to examine the place of construction in the world economy. He found that

the share of construction in GDP and the value added in construction per capita grew as the economy developed. Building on the work of Turin and Strassmann, Bon (1992) used the input-output analysis to examine the changing role of the construction sector at the various stages of economic development. He suggested that the share of construction spending in GDP first grows, then peaks and declines as economies go through a growth cycle. All these studies emphasized the importance of the role that the construction sector plays in economic growth and job creation.

The construction sector satisfies a wide range of physical, economic and social needs of society (Strassman 1970, Turin 1978 and Bon 1992). Ofori (1988), building on the work of Turin, added the role that the construction sector plays in sustained socioeconomic development. Building on the work of Bon, Myers (2008) as did Tan (2002), argued that construction can be regarded as an engine for economic growth and job creation. Given such significance, it is of interest to understand why developing economies like SA are not utilising the construction sector to transform their economies and create the much needed jobs to curb unemployment.

In a majority of developing economies, construction activity is widely dispersed, as it takes place mainly in the informal sector. This means that construction output figures and labour statistics do not give an accurate picture of the performance of the construction sector as compared to developed economies. The heterogeneity of the construction sector, allied with the immobility, complexity, durability and costliness of its products varies throughout the various stages of growth (Strassman 1970).

Subsequent to Strassmann's seminal work, several studies ensued on the patterns of growth and labour intensity of the construction sector. It became a well-entrenched view in political economics that construction activity plays a dynamic role in the process of economic growth and job creation (Wells 1986). However, the fundamental dynamics of the construction sector that informed such views were less understood.

Using a case study of Sri Lanka, Ganesan (1982) established some concrete strategies necessary to eliminate supply and demand side constraints for the steady growth of construction output and employment. Ganesan took the understanding of the role of the construction sector on the economy and job creation further by focusing on the major activities that constitute construction output. He considered labour and locally available building material as less scarce resources. While this might be the case with most developing countries, the levels and categories of scarce resources remain unclear. It is likely that these will vary significantly from one country to the other.

Major authors on political economics such as Myers (2008), Hillebrandt (2000), Tan (2002), Bon (1992), Wells (1986), Turin (1978) and Strassmann (1970) all emphasized the importance of the role that the construction sector play in economic growth and job creation. However, they seemed to base their work purely on the power of their argument. It would appear that writers in this area, generally, start with the assumption that the construction sector drives economic growth and job creation. An in-depth understanding of the dynamics involved

would enable policy makers in government to make better use of the construction sector.

Construction employment

Skills development in the construction sector remains predominantly complex due to the continued existence of intricate multiple dynamic interrelationships between the education system and the economic system in which skills are utilized as a central input into production and supporting inclusive economic growth. According to Reddy et al. (2016) skills mismatch denotes the types of imbalances that occur between the types of skills developed and those needed in the world of work. Analysis of the imbalances and mismatches provides signals to inform an appropriate skills policy response. In the SA context, Reddy et al. (2016) points out that these mismatches can be categorized into three main types: demand mismatch, educational-supply mismatch and qualifications-job mismatch. This classification is used in trying to understand the skills mismatches that exist in the construction sector.

Despite the efforts of many international organisations to bring consistency in the definition and presentation of national statistics, considerable deviation from the standardised systems remains in the data of many countries. Thus all data relating to the construction sector in developing economies must be interpreted with caution. A discussion of how construction labour statistics covering the informal sector of the SA economy has been factored into the data used in this research is included in the research methods section.

The SA economy has been characterised by low economic growth rates, leading to poor employment growth (National Treasury, 2019). Employment growth in SA has not been sufficient to absorb the large numbers of youth coming onto the labour market for the first time (Reddy et al. 2016). The result of this is an escalating unemployment rate. A key constraint to sustainable job creation in the construction sector of SA is the structural mismatch between labour demand and supply. Under this mismatch the economic growth has favoured high-skilled workers, despite the fact that the majority of the employed and the unemployed have low level skills (Bhorat et al. 2014).

According to Tsele and Agumba (2014), skills shortages in SA are a consequence of the interplay of several complex socio-political and economic factors. Erasmus and Breier (2009) affirmed that skills shortage had been a persistent problem facing the SA construction sector. Three major categories of studies have been undertaken on the subject of skilled labour shortage in the construction sector. First, the identification and discussion of the various factors contributing to skilled labour shortages (Windapo 2016). Second, the impacts and consequences of skilled labour shortages (Rasool and Botha 2011). Third, the methods and means of dealing with the alleviation of skilled labour crisis (Awe 2004). The picture that emerged from these studies is a mixed one. The studies found that, among other things, key factors that influence skills shortage in SA included the construction sector's poor image, the role of government, the quality of the training received by artisans, the ageing workforce, the cyclical nature of construction demand and technological progress.

Technological progress in the construction sector has been shown to entail advances in scientific and technical knowledge such as the construction of energy efficient buildings. It also involves improvements in the methods of organisation and management of the workforce. It is regarded as a key determinant in the growth process. Ofori (1994) observed that in the construction sector, technological progress embraced advances in materials, plant and machinery, organisation, procedures and information systems used in planning, designing, constructing, maintaining, repairing, altering and demolishing buildings and infrastructure. Innovation and invention in the construction sector is achieved through R&D as well as on-the-job-practice.

Economic growth

A lot has been said about the significance of the construction sector in the economy. The United Nations Environment Programme (UNEP) has noted that about one-tenth of the global economy is dedicated to constructing and operating homes and offices. UNEP further observed that the sector consumes one-sixth to one-half of the world's wood, minerals, water and energy. The construction sector generates employment and income for a significant percentage of the population and covers a wide variety of technologies and practices on different scales (Mitullah and Wachira 2003).

Growth is concerned mainly with the increase in a country's real level of national output. It is measured by the increase in a country's GDP (World Bank 2003). Samuelson and Nordhaus (2001), as did Todaro (2009), raised some limitation on the way growth is measured. They argued that the measurement of economic growth does not take into account the size of the informal economy. Instead it is considered as the black economy which is unrecorded in most national statistics. This is a matter of concern, especially in the construction sector where a majority of the work is undertaken by the informal sector.

The accuracy of statistics in developing economies is a challenge. About 40% of construction work is undertaken by the informal sector (Ofori 2001). In a cointegration analysis of total construction output (TCO) and GDP of SA, Dlamini (2016) ascertained that more than 60% of construction work in the economy is undertaken in the informal sector. Building on the work of Hillebrandt (2000), Dlamini contended that informal sector statistics are omitted from national statistics or, if included, the methods of assessment are of necessity crude. He went on to assert that construction activity in developing economies was subject to wide fluctuations from year to year, and indeed from month to month due to its casual nature. As part of his major findings, Dlamini also found that as did TCO figures, employment figures also fluctuated even more widely in the construction sector.

Synthesis of construction output, employment & growth

The literature discussed here points to one or more of several contributing factors to the process of growth. The most important factors were identified to be capital accumulation, both physical and human, as well as technical progress. The endogenous growth theory suggests that a higher level of capital accumulation by the economy as a whole raises the productivity for all individual firms, which increases the rate of return from investment.

According to Hillebrandt (2000), construction products are wanted, not for their own sake, but on account of the goods and services which they can create or help to create. The construction sector also creates, builds and maintains the workplaces in which businesses operate. It builds the homes in which people live. It also builds schools and hospitals that provide the crucial services that society needs. Increased demand for construction inputs such as cement and steel influences investment in the manufacturing sector. Clearly, the provision of infrastructure is vital for any economy to prosper.

Construction activity is part of a unified system of production, consumption and distribution. The contribution of construction products to capital formation cannot be ignored. The endogenous growth theory provides the intellectual framework for much of the debate over public policy aimed at making better use of the construction sector, creating jobs and promoting long run economic growth. Therefore, the endogenous growth theory is considered relevant and appropriate for explaining the economic growth phenomenon as it relates to the construction sector. Thus, it will be applied in the analysis to explain the correlation of construction output, construction employment and economic growth.

RESEARCH DESIGN

The literature considered in the previous section revealed that the construction sector is considered as an investment sector. It is common cause that investment influences economic growth. The paper scrutinizes the trends in total construction output (TCO), construction employment (CE) and GDP growth to establish the correlation of these important variables. A time series statistical analysis is used to carry out this investigation.

Time series TCO, CE and GDP data for SA is reviewed and analyzed to arrive at the conclusion and inferences about the correlations. The sample consists of TCO, CE and GDP data covering the period 2009 to 2018. The secondary data collected mainly from Stats SA is computed into the Stata version 13 software for the cointegration analysis. Created in 1985 by StataCorp, Stata is a data analysis and statistical software package that specialises in econometric analyses (Hansen and Juselius 1995).

Cointegration analysis is used to establish the relationship of TCO, CE and GDP. Economic time series tend to be nonstationary and if they are, the ordinary least squares (OLS) method alone cannot be used to estimate relationships of the series because of autocorrelation and normality assumption (Greene and Misra 2003). According to Greene and Misra, where the OLS method is used in determining long run linear relationships there is the risk of spurious regression, a situation in which a statistically significant relationship between variables may appear to exist when in reality the variables are unrelated. Therefore, the technique of cointegration is used to obtain statistically and economically meaningful regression results.

RESEARCH FINDINGS

This chapter employs the time series statistical method to ascertain the correlation of construction output, construction employment and economic growth. As

reflected in the literature, the construction sector is considered as an investment sector. Investment influences economic growth. Given such arguments, it is of interest to understand how investment in infrastructure affects employment growth in construction.

Patterns of TCO, CE & GDP growth 2009-2018

TCO measures the volume of construction activity over time. The volume series is intended to measure the level of TCO, adjusting for price inflation, and allowing comparisons of activity to be made between periods. Annual change in TCO measures the year on year growth in the construction sector.

CE measures the volume of construction jobs created over time. The volume series is intended to measure the level of CE, adjusting for price inflation, and allowing comparisons of jobs created to be made between periods. Annual change in CE measures the year on year growth in construction employment.

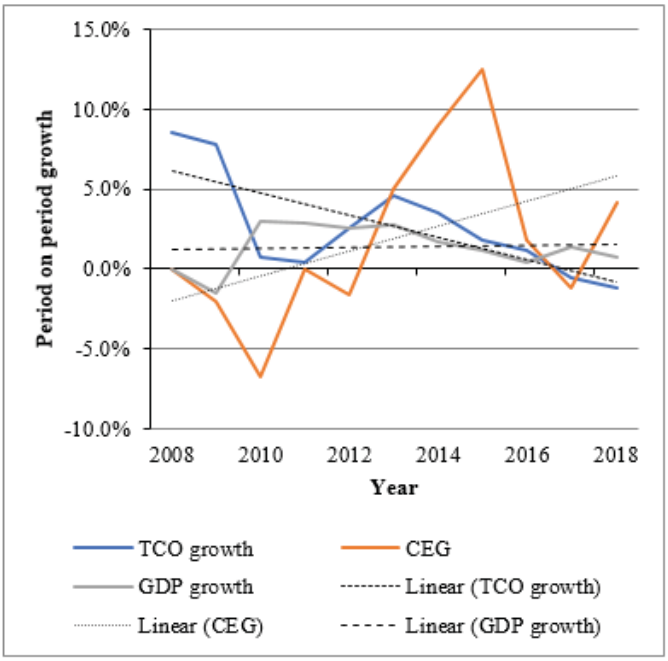

Figure 0.12: Annual change in GDP, TCO and CE, 2009-2018
Data source: Statistics South Africa

From an all-time high growth of 15% in TCO, which was reached in 2007, a declining trend started in 2008, as year on year growth in TCO went down from the 15% achieved in 2007 to 8.5% in 2008. It continued to drop in 2009 and 2010 to 7.8% and 0.7% respectively. The declining trend continued in 2011 as only 0.4% TCO growth was recorded. The growth in TCO increased from 0.4% in 2011 to 2.6% in 2012.

A declining trend can also be observed in CE growth from -2.1% in 2009 to -6.8 in 2010. In 2011, a 0% growth in CE was recorded. A negative growth of -1.6% in CE was also observed in 2012. From 2013 to 2015, growth in the construction employment was on the upswing, with annual change in CE increasing from 5% in 2013 to an all time high of 12.5% in 2015. A declining trend in CE followed, recording only 1.8% and -1.2% growth in 2016 and 2017 respectively. The year 2018 recorded a positive growth of 4.2% in construction employment.

The mixed picture that emerges suggests that there is no obvious link between TCO, CE and GDP growth. A link does exist though between TCO growth and CE growth. When there is growth in TCO, CE grows at a faster rate. When there is a decline in TCO growth, CE growth also declines and this tends to occur at a faster rate. While growth in the construction sector is shown to follow growth in the economy at some points in the time series, growth in the construction sector also happens despite a decrease in economic growth at certain points in the time series. Therefore, further statistical analysis is necessary to ascertain how investment in infrastructure influences the employment patterns in the construction sector.

Cointegration analysis

Cointegration is used to indicate the existence of a long-run equilibrium among economic time series (Engle and Granger 1987). If two or more series are themselves nonstationary, but a linear combination of them is stationary, then they are said to be cointegrated (Wei 2006). Cointegration is a means for testing hypotheses concerning the relationship between two or more variables having unit roots (i.e. integrated of at least order one). A series is said to be "integrated of order d" if one can obtain a stationary series by "differencing" the series d times.

When estimating a model that includes time series variables, the first thing you need to make sure of, is that either all time series variables in the model are stationary or they are cointegrated – meaning that they are integrated of the same order and errors are stationary, in which case the model defines a long run equilibrium relationship among the cointegrated variables. In this study, the concept of weak stationarity is adopted. According to Wei (2006), weak stationarity occurs when the mean, variance and covariance of a series are independent of time point, t. Nonstationarity happens when a time series does not have a constant mean, constant variance or both of these properties. This can originate from many sources but the most important one is the unit root (Ssekuma 2011).

Differencing the data set can solve the unit root problem to obtain a stationary time series (Wei, 2006). The analysis done is this research utilizes the Augmented Dickey-Fuller (ADF) method to test for nonstationarity. The basic idea behind the ADF unit root test for nonstationarity is to simply regress Yt on its (one period) lagged value Yt_1 and find out if the estimated coefficient is statistically equal to 1 or not. There are two main methods used for testing for cointegration, namely, the Engle-Granger two-step method and the Johansen Procedure (Ssekuma 2011). In this study, the Johansen Procedure is employed.

Autocorrelations

According to Wei (2006), this is a useful tool used to interpret a set of autocorrelation coefficients. It consists of a graph called a correlogram, and r_k is plotted against the lag(k), where r_k is the autocorrelation coefficient at lag(k). Wei provides that a correlogram can be used to get a general understanding on the following aspects of a time series:

A random series: if a time series is completely random for large (N), then the autocorrelation coefficient will be approximately zero for all non-zero values of (k).

Short-term correlation: stationary series often exhibit short-term correlation characterised by a fairly large value of 2 or 3 more correlation coefficients which, while significantly greater than zero, tend to get successively smaller.

Non-stationary series: if a time series contains a trend, then the values of r_k will not come to zero except for very large values of the lag.

Seasonal fluctuations: Common autoregressive models with seasonal fluctuations, of period s are:

X(t) = a + b X(t-s) + ϵt

and

X(t) = a + b X(t-s) + c X(t-2s) + ϵt , where ϵt is the random error.

Johansen cointegration test

With this test, variables must be non-stationary at level but when differenced, they must be stationary. We assume that the variables are non-stationary at level but when converted into for example, first differences, they will be stationary. A time series is said to be nonstationary when it has a mean or variance which varies over time. Cointegrated variables tend to wander together.

The test statistics we use are (1) trace statistic and maximum eigenvalue statistic.

Hypothesis:

The null hypothesis Ho: = 0 there is no cointegration among variables.

The alternative hypothesis Ha: There is cointegration.

We test whether the variables have a stable long-run relationship.

Cointegration means that, while many developments can have permanent changes in the individual variables (i.e., Xi,t), there is some long-run equilibrium relation tying the individual variables together represented by the same linear combination of the variables. We study long-run and short-run dynamics of cointegrated time series variables using (1) OLS regression and (2) error correction models. In spurious relationships, trend governs both. The results in Appendix 1 were obtained.

The test reveals that the cointegration between TCO, CE and GDP time series contain two cointegrating equations. Therefore, a vector error correction model (VECM) is fitted to investigate the cointegrating relations among the variables.

The presence of first-order autocorrelation is tested by utilising the table of the Durbin-Watson statistic at the 5% or 1% levels of significance for n observations and k independent variables. If the calculated value of d from the equation below is smaller than the tabular value of dL (lower limit), the hypothesis of positive first-order autocorrelation is accepted. The formula is:

$$d = \frac{\sum_{t=2}^{n}(e_t - e_{t-1})^2}{\sum_{t=1}^{n} e_t^2}$$

There are two cointegration equations as the null hypothesis was rejected at the 5% level of significance, but that for 2 ranks was not rejected (trace statistic = 3.1028<3.76). A vector error-correction model was therefore fitted, but before this was done, diagnostic tests were done.

Vector Error-Correction Model

According to the table in Appendix 9, the fitted models of D.CE, D.GDP and D.TCO are highly significant (at 1% level) and R-square figures of 0.51, 0.44 and 0.62 signify their causality. The second part of the result shows the regression equations by taking D.CE, D.GDP and D.TCO as dependent and lagged and differenced values of CE, GDP and TCO as independent variables. The interpretation is as follows:

"ce1" and "ce2" represent two cointegrating equations. In order to understand the long-term causality between the variables, the "ce1" and "ce2" must have to show a negative coefficient and a significant p-value. For the D.CE model, one equation, "ce1" has a negative coefficient and it is highly significant (p-value=0.000<.01). This shows that there is a long-term causality between CE and one of the other two variables, GDP and TCO.

To examine the short-term causality between variables, we look at the individual lag coefficients and their corresponding p-values. The results indicate that only the first lag TCO is significant (z=3.00, p-value=0.003<.01). This means that the only first lag of TCO has a short-term causality with CE. In the case of the D.GDP model, none of the two cointegrating equations show a long-term causality relationship between GDP and the other variables.

For the D.TCO model, like in the case of D.CE, it is only the "ce1" equation which has negative coefficient and is significant (p-value=0.029<.05). This means that there is a long-term relationship between TCO and one of the other variables, CE and GDP. The first lag of GDP is significant (z=-3.53, p-value=.000<.01). This means that the first lag of GDP has a short-term causality with TCO. In conclusion, the results indicate that TCO influences CE and GDP influences TCO, and hence, there is a long-term relationship between TCO and CE, and between GDP and TCO.

Overview of correlation of TCO, CE & GDP

The literature considered in this paper revealed that the construction sector is considered as an investment sector. The graphical presentations of the original TCO, CE and GDP time series data illustrate the general direction in which the variables are going, that is, whether they are increasing or decreasing over time. The cointegration analysis undertaken reveals the nature of the relationship of the 3 variables. TCO, CE and GDP data has been used in the analysis to estimate the quantitative effect of the causal variables upon the variable that they influence. The statistical significance of the hypothesized relationship has been assessed.

The regression equations for the variables show a positive relationship between TCO and CE as well as a GDP, that is, as GDP increases TCO is also increasing, other things being equal. Also as GDP increases, CE increases at a faster rate than that of TCO. In other words, as the economy grows, construction output and employment will also grow, subject to all things being equal. However, there is not enough evidence to support the hypothesized view that the construction sector is the driver of growth.

While construction output is considered an integral part of national output, the cointegration analysis of TCO, CE and GDP undertaken here reveal that in the main, expansion of construction activity is preceded by an increase in GDP. This could be construed to mean that construction activity does not influence economic growth. This finding corroborates a similar conclusion reached by Akintoye and Skitmore (1994), who tested the relationship between national output and construction demand. Their finding suggested that construction investment is a derived demand which is growth dependent.

The significance of the construction sector has also been shown in this study to be associated with the linkages that it has with other sectors of the economy. The existing knowledge of such linkages is to a great extent, imperfect. Clearly, there is a need for a wider and better understanding of the linkages. This would help ensure that policy makers can make their investment decisions based on broader considerations than the mere assumption that construction drives growth. There must be a better explanation of the relationship of the construction sector to economic growth and job creation.

It is equally important to note that the growth process per se is a complex phenomenon. The cointegration analysis undertaken here points to other factors that may influence economic outcomes. The endogenous growth theory considered in this study corroborated this view. While it identified certain factors that affect growth, such as human and physical capital, the endogenous theory also pointed to the existence of a whole host of other factors. Therefore, the impact of investment in infrastructure must not be considered in isolation.
The construction sector deals mainly with the provision of capital infrastructure, which has a remarkable impact on economic growth. The delivery of such infrastructure creates significant employment opportunities for the population, which generates further investment in other sectors of the economy through the multiplier effect. As consumption spending increases through salaries earned, investment in other sectors of the economy become necessary which stimulates further growth. However there is no evidence that the construction sector can be regarded as the determinant of such growth.

Like any other sector of the economy, the construction sector of SA is susceptible to problems of data collection that may distort the outcome of analyses. Many authors have stated the problems that affect the accuracy of construction output data, particularly in developing economies (Ofori 2003). The informal sector of construction exists, even though sometimes the public sector and its agents do not like to discuss its existence. According to the World Bank (2010), the informal sector of the economy is growing, being approximately 40% in most developing countries. While these issues are concerning, the fact that the data is official and major global institutions such as the IMF, UN and the African Development Bank continue to use it in their decision making processes, the findings of this research cannot be dismissed indiscriminately.

CONCLUSION

The aim of this study was to investigate the correlation of construction output, construction employment and economic growth. A positive short run relationship was found. Evidence in this paper provides grounds for the acceptance of the

hypothesis that there is a relationship between construction activity, construction employment and economic growth.

The graphical and trend analysis of the patterns of TCO, CE and GDP for SA suggested that growth in GDP was accompanied by faster growth in TCO. Growth in GDP was accompanied by growth in CE that was faster than that of TCO. The cointegration analysis suggested that TCO influences CE, while GDP influences TCO. Hence, there is a long-term relationship between TCO and CE, and between GDP and TCO. This means that investment in the construction sector can stimulate job creation in the long run. GDP growth has also been shown to be accompanied by growth in construction activity. It can also be inferred that investment in the construction sector can stimulate growth and job creation in the short run, subject to other factors being equal.

While investment in the construction sector can positively influence short run economic growth, there was no evidence to support the assumption that the construction sector drives growth. It may be argued that over time, short run growth distorts the 'natural' growth path. Increasing investment in construction stimulates economic activity only for a limited period of time. When such investments decrease, a bust is likely to occur. Also, economic growth is not just about investment. The endogenous growth theory showed that other conditions such as technological advance are also necessary prerequisites for economic growth and sustainable job creation to occur. Construction can thus be regarded as a component of investment programmes but not a driver for economic growth.

The cointegration analysis of TCO, CE and GDP showed that these three variables are closely correlated with each other. Despite this, it does not follow that providing incentives and increased spending on infrastructure projects necessarily leads to economic growth. In the Keynesian sense, like in any other sector of the economy, increased spending does stimulate economic activity.

The backward and forward linkages that the construction sector exhibits mean that other sectors of the economy are impacted positively. As demonstrated throughout this study, the construction sector deals mainly with the development of infrastructure. Infrastructure development creates significant employment opportunities for the population. As a result of the multiplier effect, further investment in other sectors of the economy has a positive impact on growth, other things being equal. However, such growth cannot necessarily be credited to the construction sector.

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