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THE CONSTRUCTION SECTOR AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICA (REVISITED)

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Sub-saharan Africa ;Construction Sector, Economic Development

ABSTRACT

The relationship between a country's level of construction activity and its stage of economic development has been the subject of study at the macroeconomic level for the last forty years or so. This study follows an earlier research that investigated the relationship between investment in construction and economic development in Sub-saharan Africa (SSA), and found that the share of construction in national economy follows an inverted U-shaped pattern of development. That is, it firstly increases in the early stages of development and ultimately tend to decline in the latest stages of economic development. The research is based on data acquired on 22 of the countries in SSA over the period 1990-2017 and the sample is split into two groups according to the proportion of the construction sector in total value added in the period 1990-1999. The results of the analysis of the development pattern of the construction industry in the two categories of countries tend to corroborate the results of the earlier work in what regards the evolutionary pattern of the middle-income economies in SSA.

INTRODUCTION

One of the main areas in the construction macroeconomics literature deals with the relationship between the construction industry and economic development. According to this line, the role of construction is associated with changes in the economic development process due to changes in the structure of the construction industry and variations in levels of physical investment during the development process. The dominant paradigm that has emerged is that the share of construction in gross domestic product (GDP) tends to increase in the first stages of development, to stabilize in the middle-income range and to decrease in the latest stages of development (Bon, 1992). This argument about the role the construction sector runs counter the argument advanced in earlier seminal works (Turin, 1973; Wells, 1986; World Bank, 1986) that found a correlation between several measures of the construction output and the level of national income per capita. It should be noted, however, that a significant number of studies (De Long and Summers, 1991; Ganesan, 2000; Yiu *et al*., 2004; Lopes, 2012, Girardi and Mura, 2014 to name but a few) have not shared the generalised view on the positive role of construction investment, namely, at the magnitude of investment and the direction of causality between construction investment and economic growth.

Recognizing the important role infrastructure has in the process of economic development, the Group of Eight Summit at Gleneagles, in 2005, called for action by the major economies and multilateral institutions in the financing of the SSA infrastructure (Commission for Africa, 2005). One of the practical results of the summit was the publication of the report- Africa's Infrastructure: A Time for Transformation (Word Bank, 2009). This publication diagnosed the infrastructure needs of SSA, addressing the twin challenges of financing and sustainability. Thus, as pointed out in Lopes (2012), an important question should be the concern of the construction economics research community: how an efficient construction industry in SSA could contribute to a sustainable growth and development?

In an earlier work (Lopes, 1998) concerning the construction industry in developing countries in SSA, the development pattern of the construction industry was modelled. The study was based on data acquired on 15 of the countries in SSA over the period 1980-1992 and the sample was split into two groups: one in which GDP per capita had risen, the other in which GDP per capita had fallen. The study put forward evidence that there is a minimum required level of construction investment in developing countries (measured as a share of construction value added- CVA in percentage of gross domestic product- GDP) in order to achieve, in the long-term, sustainable growth in the economy. Put differently, there is a critical band (the share of CVA in GDP in the 4–5% band) below which a relative decrease in construction volume corresponds directly to a decreasing growth in GDP per capita. The converse is not true. Above that band, a sustained or increasing growth in GDP per capita may not correspond to a relative increase in construction volume (Lopes, 1998). It is worth noting that reference here is to a long-term trend rather than to annual fluctuations that characterise the short-term pattern of the construction industry.

The objective of the paper is to assess the role of past investment in built assets in the future development pattern of the construction industry in the middle income countries in SSA. As pointed out by Ruddock & Ruddock (2019), there is a strong link between changes in wealth and the sustainability of economic development and the question needs to be considered of how the resources expended on developing a country's built assets impact its economic and (social) success.

This study follows the approach adopted in the earlier work (Lopes, 1998). It analyses the development pattern of the construction industry in the middle-income economies in SSA over the period 1990-2017. The sample of study comprising twenty two countries was split in two groups according to the proportion of the construction sector in total value added in the period 1990-1999.

The remaining of this paper is organised as follows: the next section presents the statistical sources and the indicators of the construction industry and of national output used in the analyses of the two groups of countries; the following section presents a quantitative analysis of the relationship between the share of construction in GDP and GDP per capita- the model is described and the hypothesis is statistically tested, and an analysis of the results is undertaken. Finally, a concluding comment summarises the results of the study.

STATISTICAL SOURCES AND METHODOLOGICAL ISSUES

The main indicators of economic activity used in this anlaysis are CVA and GDP per capita. The choice of CVA as the main indicator of the construction industry activity rather than gross capital formation in construction (GFCFC) is that the production approach (value-added components) has generally been utilized by international bodies and national statistics offices as a more reliable way to compound a country's national aggregate, at least in the developing countries. The choice of GDP per capita instead of GDP is that the former introduces the variable population into the aggregate domestic product of a nation. In this sense, it appears to be a better indicator of a country's welfare than GDP.
The statistical sources used for the anlysis are the *National Accounts Statistics: Main Aggregates and Detailed Tables* (internet edition) from the United Nations and *Africa Development Indicators 2012-2013* from the World Bank (World Bank, 2013). The United Nations database present various sets of economics series detailing the evolution of GDP and its components (production, expenditure and income approaches) in different statistical formats, at current and 2010 constant prices, in this case, over the period 1990-2017. *Africa Development Indicators 2012-2013* presents a series of national and fiscal accounts for all African countries for the year 2010. In order to illustrate the countries' positions in the economic development arena, it is worth noting that *The World Development Report* of the World Bank classifies the economies into the following categories, according to their level of gross national income (GNI) per capita: Low income countries (LICs), Middle income countries (MICs) subdivided in Lower Middle income countries (LMICs) and Upper Middle income countries (UMICs); and High income countries (HICs). The figures for the bench mark year 2010 are GNI per capital of US$1,005 or less for LICs, GNI per capital higher than US$1,006 and less than US$3,975 for LMICs, GNI per capital higher than US$3,976 but less than US$12,275 for UMICs, and GNI per capita of US$12,276 or over for HICs. Thus, all the countries (see Table 1) in the sample belonged to the middle-income status category in 2010 except Equatorial Guinea, which could then in theory be considered a HIC.

The approach adopted here follows that of the earlier research (Lopes, 1998). However, what is investigated here is whether or not there is a development pattern of the construction industry in the middle-income countries of SSA, according to the proportion of construction in total value added in the period 1990-1999. To test the hypothesis statistically, two separate groups were established:

Group 1: corresponding to the group of countries in which the share of CVA in GDP (measured at 2010 constant prices) was equal or greater than 5% in the period 1990-1999 (average for the period).This group comprises: Angola, Botswana, Cabo Verde; Djibouti, Kingdom of eSwatini, Lesotho, Mauritius, Sao Tome and Principe, Sudan, and Zambia;
Group 2: corresponding to the group of countries in which the share of CVA in GDP (measured at 2010 constant prices) was less than 5% in the period 1990-1999 (average for the period). It comprises: Cameroon, Congo Republic, Côte d'Ivoire; Gabon, Ghana, Equatorial Guinea, Mauritania, Namibia, Nigeria, Senegal, Seychelles and South Africa.

THE RELATIONSHIP BETWEEN CONSTRUCTION AND GROSS DOMESTIC PRODUCT per capita

The Model

The model is tested using a statistical test for the equality of two correlations (Hogg *et al*, 2015).
Let i=1, 2 corresponding to the two groups whose correlations are being compared. Sample correlations R_{ij} were observed based on n_{ij} observations for i=1, 2 and j=1, . . ., n_i,

n_1 is 10 and n_2 is 12 so R_{11}………R_{110} and R_{21}………R_{212} can be bserved, and n_{ij} is tpycally about 18 (i.e time series for the period 2000-2017).

For each sample correlation it is necessary to evaluate

$$W_{ij} = \frac{1}{2} \ln \frac{1 + R_{ij}}{1 - R_{ij}} \qquad (1)$$

And let

$$W_i = \frac{1}{n_i} \sum_{j=1}^{n_i} W_{ij} \qquad (2)$$

be the averages of W_{ij} in the two groups.

Also, define

$$v = \frac{1}{{n_1}^2} \times \sum_{j=1}^{n_1} \frac{1}{n_{1j-3}} + \frac{1}{{n_2}^2} \times \sum_{j=1}^{n_2} \frac{1}{n_{2j-3}} \qquad (3)$$

Then, a $100_{\alpha\%}$ test of the null hypothesis H_0: $\rho_1 = \rho_2$ against the alternative hypothesis H_1: $\rho_1 \angle \rho_2$ is obtained by comparing theb test statistic

$$z = \frac{W_1 - W_2}{\sqrt{v}} \qquad (4)$$

with the lower *N* (0, 1) critical value -z_α e.g. for a 5% test, $z_\alpha = 1.645$.

Analysis of Results

In this analysis, the hypothesis H_0: $\rho_1 = \rho_2$ is tested against the alternative hypothesis H_1: $\rho_1 \angle \rho_2$ at an α=0.05 significance level. The groups corresponding to these correlation coeficients(groups 1 and 2) were defined above. The variables used in this model are $ICVA_{2010}$ (the share of construction value added in GDP at 2010 constant prices) and $GDPpc_{2010}$ (GDP per capita measured in US$, in 2010 constant prices).

The sample correlations R_{1j} and R_{2j} are based on n_{1j} and n_{2j} observations (time series data for the period 2000-2017) for groups 1 and 2 respectively. As referred to n_1 is 10 and n_2 is 12 and n_{1j} and n_{2j} are typically 18.

Thus, for Group 1:

$$W_{1j} = \frac{1}{2} \ln \frac{1 + R_{1j}}{1 - R_{2j}}, \qquad W_1 = \frac{1}{n_1} \sum_{j=1}^{n_1} W_{1j}$$

Angola: $R_{1_1} = 0.86128$
Botswana: $R_{1_2} = 0.58621$
Cabo Verde: $R_{1_3} = -21948$
Djibouti: $R_{1_4} = 0.24214$
Kingdom of eSwatini: $R_{1_5} = -0.74539$
Lesotho: $R_{1_6} = -0.26211$
Mauritius: $R_{1_7} = -0.55201211$
Sao Tome and Principe: $R_{1_8} = 0.39464$
Sudan: $R_{1_9} = 0.04792$
Zambia: $R_{1_{10}}$ =0.11945

$W_1 = 0.07272$

For Group 2:

$$W_{2j} = \frac{1}{2} \ln \frac{1 + R_{2j}}{1 - R_{2j}}, \qquad W_2 = \frac{1}{n_2} \sum_{j=1}^{n_2} W_{2j}$$

Cameroon: $R_{2_1} = 0.84249$
Congo: $R_{2_2} = 0.78046$
Côte d'Ivoire: $R_{2_3} = 0.85506$
Gabon: $R_{2_4} = 0.73498$
Ghana: $R_{2_5} = 0.90549$
Equatorial Guinea: $R_{2_6} = 0.67502$
Mauritania: $R_{2_7} = 0.90719$
Namibia: $R_{2_8} = 0.82483$
Nigeria: $R_{2_9} = 0.72073$
Senegal: $R_{2_{10}} = 0.94992$
Seychelles: $R_{2_{11}} = 0.41950$
South Africa: $R_{2_{12}} = 0.97007$

W_2 =1.156823

under H_0: $\rho_1 = \rho_2$, the null hypothesis

$$Z = \frac{W_1 - W_2}{\sqrt{v}} \dot{\sim} N(0,1)$$

and at an α= 0.05 significance level

$$Z = \frac{0.07272 - 1.156823}{0.113948} = -9.51402 \angle -1.645$$

Therefore, the null hypothesis H_0 is rejected in favour of the alternative hypothesis H_1

Table 1 presents GNI per capita for the benchmark year (2010) and GDP per capita for the years 2000 and 2017 in the two country groups. It shows that all the countries anlysed belonged to the middle-income category status in 2010 except Equatorial Ginea, which was considered by then a high income economy. It also shows that all countries, irrespective of the grouping, experienced a sustained economic growth (measured at 2010 constant prices) in the period 2000-2017, which is in contrast with the development pattern in most countries in SSA in 1980s and early 1990s.

Tabe 1: GNI per capita (2010) and GDP per capita (2000 and 2017) in Selected Countries in SSA

Group 1				Group 2			
Country	GNI p.c. (US$), 2010	GDP p.c. (2010 US$)		Country	GNI p.c. (US$), 2010	GDP p.c. (2010 US$)	
		2000	2017			2000	2017
Angola	3,960	2,193.6	3,333.2	Cameroon	1,160	657.8	1,451.9
Botswana	6,980	4,954.8	7.485.0	Congo Rep.	3,280	1,041.3	2,146.5
Cabo Verde	3,160	2,302.6	3,477.1	C. d’Ivoire	1,650	1,336.3	1,625.5
Djibouti	1,280	736.9	1,927.6	Gabon	7,760	4,611.1	7,220.9
K. of eSwatini	2,600	2,953.2	3,913.9	Ghana	1,600	1,294.3	2,323.7
Lesotho	1,080	876.8	1,313.8	E. Guinea	14,680	6,495.6	11,486.6
Mauritius	7,740	5,671.4	10,201.2	Mauritania	1,060	996.8	1293.1
S. Tome & P.	1,270	522.8	1,921.3	Namibia	4,650	3,790.9	5,854.8
Sudan*	1,270	-	2,967.1	Nigeria	1,180	1,326.8	2,412.4
Zambia	1,070	938.3	1,637.4	Senegal	1,050	1,132.7	1,454.9
				Seychelles	9,480	9,743.1	14,442.9
				S. Africa	6,100	5,838.7	7,525.5

**Note: Data for Sudan before 2008 refer to the former Sudan*

The evolution of the construction industry (measured as a share of CVA in GDP) illustraded in Figure.1 is in line with the results of the above statistical test that shows that the pattern of the construction industry in the two groups presents distinct developments from the period between 2000 and 2017. The evolution of the share of the CVA in GDP in the period of analysis reflects the underlying results of earlier calculations based on data from 1980 to 1992. Figure 1 indicates that in the countries in which the proportion of construction in GDP was equal or greater than 5% in the period 1990-1999 (Group 1), the share of CVA in GDP (both indicators measured at 2010 constant prices) remained, for the group average, practically constant during the period 2000-2017 (about 6.7% of GDP). However, a sligh trend of decline is observable in the late years of the period, falling to 6.2% of GDP in 2017 from 7,2% in 2009. The construction volume increased, in general, absolutely but not relatively.This pattern also holds for individual countries, disregarding annual fluctuations that characterise the construction industry.

The other side of the picture shows that in the group of countries in which the proportion of construction in GDP was less than 5% in the period 1990-1999 (Group 2), the share of CVA in GDP (2010 ICVA) increased remarkably during the period of anlysis. It increased from about 2.7% of GDP in 2000 to 6.1% in 2013. Again, a trend of decline is observable in the late years of the period, reaching 4.9% in 2017. The construction volume increased relatively, not only absolutely, accompanying the evolution of the general economy.

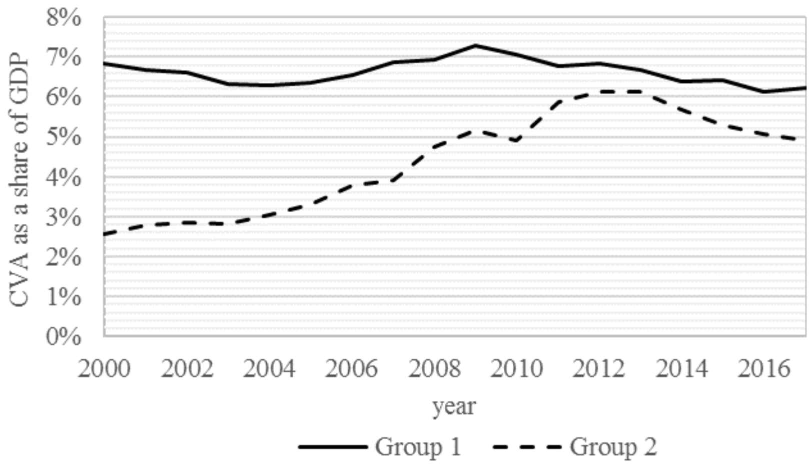

Figure 1: Evolution of the Share of CVA in GDP (2000-2017)

Regarding the aforementioned critical band (CVA/GDP), a consideration of the economic history (see for example, Kuznets, 1968) of today's advanced industrial countries and some middle-income economies looking from as far back as 1750 has referred to the average of 20% as the share of capital formation in a country's domestic expenditure, obviously with temporal and cross-sectional variations. More recently (from the Second World War), when international bodies, particularly the United Nations, started publishing data on the construction sector, there has been a remarkable uniformity across countries with 50% being the average contribution of capital formation in construction to a country's domestic investment. As construction value added is roughly one-half of the former, it appears that around 5% for the contribution of CVA to the national aggregate as a starting point for a good performance is reasonably constructed (Lopes, 1998). It is worth noting that the 5% value is consistent with Syrquin and Chenery's (1989) values pertaining to the construction sector, in their study of norms for structural change and per capita income.

CONCLUSIONS AND FURTHER RESEARCH

This study has analysed the development pattern of the construction industry in the middle-income economies in Sub-saharan Africa. The results provided here corroborate those of an earlier work, which is based on data in the period from 1980 to 1992. Thus, the evolutionary process of the construction industry in SSA suggests that the share of construction in the national economy tends to increase with the level of per capita income in the first stages of a country's development. When a certain level is achieved and countries enter into a path of sustainable economic growth and development, the construction output tends to grow with the same rate of growth as that of the general economy and, ultimately, tends to decreases relatively in the later stages of development.

The findings of the panel data approach used in this analysis are in line with the proposition that as countries reaches an advanced stage, the construction industry decreases relatively but not absolutely. The type of activity changes as countries develop, and those with an established building stock find that construction activity becomes more oriented towards repair and maintenance of its infrastructure and built and urban environment (Lopes *et al*, 2018; Ruddock and Ruddock, 2019). Built assets are a major component of a country's produced capital, particularly in developing countries. The total wealth of a country also comprises natural capital and intangible capital, the latter consisting of human and social capital (World Bank, 2018). Depending on the circumstances, the relative importance of each type of capital needs to be considered in any developing country's development strategy. Accorddingly, when addressing the link between the construction industry and the economic and social targets encapsulated in the Goal 9 “build resilient infrastructure, promote inclusive and sustainable industrialisation” and Goal 11 “make cities and human settlements inclusive, safe, resilient and sustainable” of the sustainable development goals, developing countries should focus on the planning and development of investment projects that have real impact and will be sustainable for the long term.

It is well known that statistical association does not teveal causation. What is offered here is not a prediction but a prospect of the development pattern of the construction industry in SSA for the near future. Thus, one implication for public policy, which is consistent with the results of the study, might be the following: the development pattern of the construction industry in SSA, in the near future, should follow rather than lead economic growth.

Some suggestions for further development are put forward:

to expand the sample of study by including the middle-income countries of other regions of the world. This approach would shed more light on the role of construction in the process of economic development;

to investigate the role of construction in the process of economic recovery, and the measures on the demand- and supply-side of the construction industry that helps to accelerate the path of economic recovery and, ultimately, to achieve the economic and social targets of the Sustainable Development Goals.

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