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The sustainability of the construction industry in Sub-saharan Africa: some new evidence from recent data

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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 a number of years. The dominant paradigm in the field is that the construction industry follows an inverted U shaped development pattern i.e. the share of construction in national economy first increases in the early stages of development and ultimately decline in the latest stages of development. An examination of construction indicators in two categories of countries in Sub-Saharan Africa is made and the link between construction investment and the economic and social targets of the sustainable development goals is considered.

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Keywords: Construction sector; economic development, Sub-saharan Africa, sustainable development goals

1. Introduction

There are three main strands in the construction economics literature on the role of the construction sector [1]. The first one deals with the relationship between construction and economic development. The second tries to assess whether investment in construction leads gross domestic product (GDP) growth or vice-versa [2, 3]. The third one employs input-output tables to study the pull and push effects of the construction sector within the national economy [4, 5]. As regards the first strand, 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 different stages of the development process [6]. The dominant paradigm that has emerged is that the relationship between the construction industry and economic development follows an inverted U- shaped pattern. The share of

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construction in GDP tends to increase in the first stages of development, to stabilize in the middle-income range and to decline in industrially advanced countries. This proposition is in line with the empirical finding that fixed capital formation tends to be larger in least developed countries and to decline in advanced economies. It is worth noting that this argument about the construction share runs counter the arguments advanced in earlier seminal works that found a positive correlation between several measures of the construction output and the level of income per capita [7, 8, 9].

The positive association between construction investment and economic growth (usually based on Keynesian philosophy) has been subject of debate for the part of the advocates of new institutional economics and international organisations such as The World Bank in the *Structural Adjustment Programmes for Africa* [10]. In the aftermath of the 1979-1980 oil –shock and the global financial crisis that followed in 1981, the majority of countries in Sub-saharan Africa (S.S.A.) did not just stand still in terms of per capita income level [10]. They generally fell backward until the mid-1990s despite heavy investment in construction and other physical infrastructure in the period 1970-1980. According to this reasoning, the main concern of countries in S.S.A. should be the quality rather than the quantity of infrastructure, and the prioritisation of investments that support scale economies (particularly in large urban centres) and foster an internationally competitive tradable sector.

In the early 2000s, international development agencies seemed to shift from their positions and started to become aware of the important role physical infrastructure would play for attaining the millennium development goals in S.S.A. An important question which should be the concern of the construction economics research community and national and international development agencies alike is: how an efficient construction industry could contribute to a sustainable growth and development; and how to implement this development policy without disregarding the weak and volatile global economic environment, including the implications of the region's continuum deterioration of commodity prices [11].

The remaining of this paper is organised as follows: the next section discusses the concept of developed and developing economies; the following section presents the description of the data sources and the indicators of the construction industry and national output used in the analysis of two groups of countries in S.S.A, according to their level of economic development; the subsequent section presents a quantitative analysis of the relationship between the construction industry and the national economy in those two groups for the period 1980-2010; the followed section explores the link between construction investment and the economic and social targets related to the sustainable development goals (SDGs); and a final section concludes the analysis.

2. Definitions of developed and developing economies

The classification of countries according to their development status does not have an institutional basis. There is no established convention for the designation of 'developed' or 'developing' countries in the United Nations (UN) system [12]. In common practice, Japan and South Korea in Asia, Canada and United States in Northern America, Western, Central and Southern Europe, Australia and New Zealand in Oceania are considered developed regions or areas. The 193 countries that report to the UN system of national accounts are distributed as follows: developed economies- 44 countries; transition economies in Eastern Europe, Caucasus and Central Asia (EECCA)-12 countries; and developing economies -137 countries. The latter is subdivided in 54 countries in Africa, 33 countries in Latin America and the Caribbean, 38 countries in Asia and 12 countries in Oceania [13]. As far as least developed countries are concerned, the UN General Assembly, on the recommendation of the Committee for Development Policy, decides on the countries included in the list of least developed countries [14].

The World Bank *World Development Report* is more straightforward. 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 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 LMICs, and GNI per capita of US$12,276 or over for HICs [15].

3. Data and statistical sources

The main statistical sources used in the analysis are the *Yearbook of National Accounts Statistics: Main Aggregates and Detailed Tables* (1993, 2003, 2010 and 2015 issues) from the United Nations [16] and *Africa Development Indicators 2012-2013* from the World Bank [15]. The UN yearbooks present various sets of economics series detailing the evolution of GDP and its components (production, expenditure and income approaches) in different statistical formats, in this case, over the period 1980-2014. *Africa Development Indicators* presents a series of national and fiscal accounts for all African countries for the period 1980-2010. Thus, in order to have comparability of data and place the two country groups in the economic development arena, GNI per capita for the bench mark year 2010 was taken.

The indicator of construction industry activity used for this analysis is construction value added (CVA). CVA is calculated the same way as in any sector, but includes only the activities of the construction activity proper. For example, it excludes the building materials industry which is accounted for in the manufacturing sector. In order to measure the weight of the construction sector in the national economy for the period 1980-2014, GDP rather than GNI is taken as a measure of the national aggregate. Data on GDP are more readily available in national account statistics and because construction industry activities mainly occur within national boundaries. Cross-matching sources, data are available for 34 countries and these countries can be split in two groups according to the level of GNI per capita in 2010: Group 1- LICs; and Group 2- MICs. Tables 2a and 2b present the list of countries in the two groups. Thus, Group 2 (MICs) comprises both LMICs and UMICs and only Equatorial Guinea could, in theory, be considered a HIC owing his high GNI per capita in 2010.

4. Quantification of the relationship between construction value added and gross domestic product in S.S.A.

Table I presents GDP, gross fixed capital formation (GFCF) and construction valued added for different areas of the world in 2005. It is shown that Africa has 2.3% of the world output despite having about 15% of the world population. The developed economies, the remaining developing economies and transition economies have, respectively, 73.5%, 24.3% and 2.3 % of the total world GDP. The weight of S.S.A. in the entire Africa region's total output is 69.7%. It is also shown that the weights of the major areas for GFCF and CVA are similar to that of the GDP, except for Africa and S.S.A. in which the figures are comparatively lower. The share of GFCF in GDP for transition economies, developing economies, developed economies and that of the world varies from 20.1 % to 25.7% and the share of CVA, for the same major areas, varies from 5.6% to 5.9 % of GDP. In contrast, the figures for GFCF in Africa and S.S.A. are, respectively, 17.8 % and 16.4% of GDP and those of CVA are 4.1% and 3.6 %, respectively, for the same region and sub region. The comparatively low values of SSA's GFCF and CVA are partly explained by the low values in these indicators for Nigeria and S. Africa (see Table 3), which together comprise just over 50% of SSA's GDP and about 30% of SSA's GFCF an CVA. However, the picture that emerges from S.S.A. development pattern is that there is much room for construction investment and other physical infrastructure in this sub region of the world.

Table 1. Weights of GDP, GFCF and CVA in major areas and regions in 2005

	GDP	GFCF		CVA	
Major area or region	Base year weights as % of total for world or region	Base year weights as % of total for world or region	Base year share as % of total GDP	Base year weights as % of total for world or region	Base year share as % of total GDP
World	100.0	100.0	23.2	100.0	5.6
Developed economies	73.5	71.0	22.2	74.1	5.6
Developing economies	24.2	26.9	25.7	23.7	5.5
Transition economies	2.3	2.1	20.1	2.2	5.9
Africa	2.3	1,8	17.8	1.7	4.1
S.S.A.	69.7	61.8	16.4	58.5	3.6

Tables 2a and 2b present the GNI per capita in 2010 for 34 countries in SSA grouped according to their stages of economic development, and the share of CVA in GDP for the years 1980, 1990, 2000 and most recent estimates (usually 2013 or 2014). It is shown that the share of CVA in GDP varies widely across countries. Looking at countries grouped according their development status, that variation is somewhat less pronounced in Group 2 than in Group 1. In the former, (allowing for the special case of Cape Verde) the share of CVA in GDP varied from 2.3 % in S. Africa in 2000 to 10.3% in Angola for the most recent estimates; in Group 2, the percentage of construction in GDP varied from 1% in Chad in 1980 to an impressive 10.6 % in Tanzania for the most recent estimates. Looking at the different years analysed, it is also shown that the share of CVA in GDP is generally lower in Group 1 than in Group 2 for the years 1980, 1990 and 2000, and the difference is particularly noticeable in 1980. For the most recent estimates, the values of the share of CVA in GDP in Group 1tend to, generally, match those of Group 2.

Taking into account temporal fluctuations, this behavior, both at group and country levels, tends to corroborate the observations made in an early work in 1973 [7] that the share of construction value added is generally between 3% and 8% of GDP, an important pattern of the construction industry activity that has remained from the 1960s onwards.

The pattern of the construction industry in S.S.A is better illustrated in Fig.1 that shows the evolution of the mean value of the share of CVA in GDP for the two groups of countries in the period 1980-2013. This evolution depicted in Fig.1 is one, which reflects the results of earlier calculations based on data from 1980-2006 [11]. Fig.1 shows that the share of construction in GDP in Group 1 (mean of the group) varied from 3.8% in 1980 to 5.2 % in 2013, an increase of 37%. It also shows that the share of CVA in GDP in Group 1 remained practically stagnant in the period 1980-2000 and increased remarkably in the period 2000-2013, in line with the spectacular growth in GDP in most Sub-Saharan African countries in the period 1995 -2013, and particularly from 2000 onwards. The share of CVA in GDP in Group 2 varied from 6% in 1980 to 4.5% in 1990 (mean of the group). It remained practically stagnant in 1990 – 2000, reaching 4.7 % in 2000. The share of CVA in GDP in Group 2 increased slowly from 2000 onwards, reaching 5.5 % of GDP in 2013, but a trend of stagnation is noticeable in the late years of the period. An observation worthy of note in Group 2 is that the share of construction value added in GDP (mean of the group) in 2013 is lower than that in 1980, despite a significant increase in GDP, and even GDP per capita, along the period 1995-2013, in line with the evolution of the S.S.A.'s national economy.

Table 2a. GNI per capita in 2010 and share of CVA in GDP (%) for selected years: Group 1

Country	GNI per capita (US$, 2010)	CVA/GDP (1980)	CVA/GDP (1990)	CVA/GDP (2000)	CVA/GDP (most recent)
Benin	780	3.7	3.1	3.6	6.3
Burkina Faso	550	2.9	4.7	5.1	7.4
Burundi	230	3.3	3.4	4.4	4.3
Chad	710	1.0	1.7	1.3	5.0
Congo, Dem. Rep.	180	3.7	5.0	3.3	4.3
Gambia, The	610	4.9	4.5	4.1	4.6
Kenia	810	3.7	2.9	2.7	5.0
Liberia	210	3.9	3.3	2.1	2.7
Madagascar	430	1.7	1.1	1.5	4.8
Malawi	330	6.8	5.0	3.8	3.0
Mali	600	2.0	2.9	5.1	3.9
Niger	360	2.6	2.5	2.3	2.6
Rwanda	520	6.8	6.8	8.0	7.8
Tanzania	530	3.6	4.8	6,8	10.6
Togo	550	5.8	5.1	4.4	6.0
Uganda	500	3.5	4.8	6.5	8.2
Zimbabwe	480	3.9	2.9	2.2	3.4

Table 2b. GNI per capita in 2010 and share of CVA in GDP (%) for selected years: Group 2

Country	GNI per capita (US$, 2010)	CVA/GDP (1980)	CVA/GDP (1990)	CVA/GDP (2000)	CVA/GDP (2013)
Angola	3,960	4.6	2.9	2.7	10.3
Botswana	4,190	9.1	7.3	5.9	7.3
Cameroon	1,200	6.9	4.6	3.6	3.2
Cape Verde	3,280	10.4	11.9	8.5	7.6
Congo	2,240	7.2	3.0	4.4	2.6
Côte d'Ivoire	1,170	3.6	1.8	4.1	6.2
Equatorial Guinea	13,720	7.3	4.5	6.1	7.5
Gabon	7,680	5.7	6.7	6.4	5.4
Ghana	1,250	3.3	3.3	3.5	8.6
Mauritania	1,000	3.4	4.8	6.3	7.3
Mauritius	7,780	5.7	5.6	5.9	4.5
Namibia	4,250	6.5	2.3	2.3	4.9
Nigeria	1,170	3.9	2.7	2.1	3.6
Senegal	1,080	2.8	3.3	3.9	5.2
Seychelles	10,460	9.3	4.8	8.5	5.0
South Africa	6,090	3.8	3.0	2.3	3.8
Swaziland	2,930	5.8	2.5	6.4	5.9

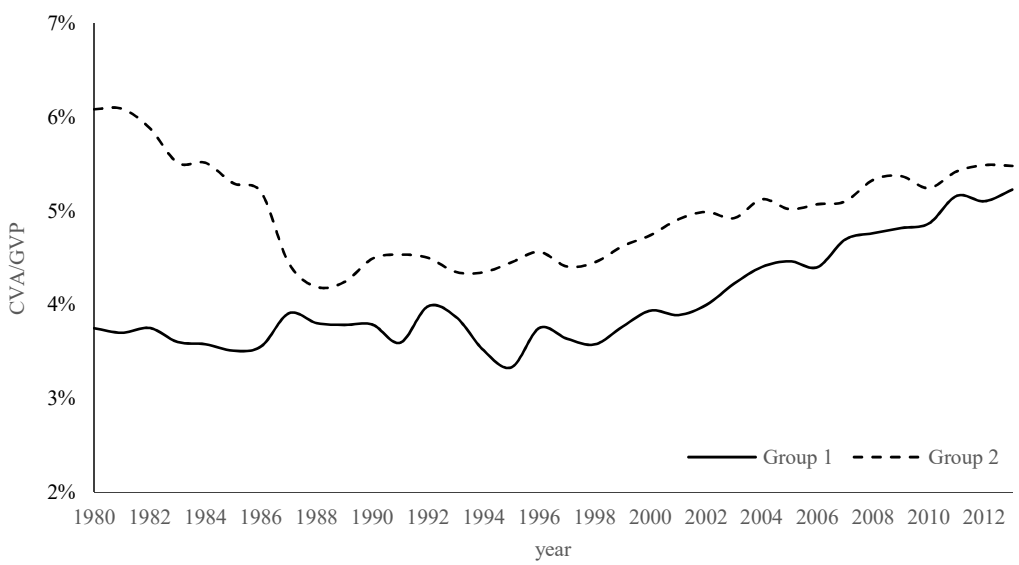

Fig. 1. Evolution of the share of CVA in GDP (1980-2013)

The evolution of the share of CVA in GDP in Fig.1, as above mentioned, refer to the mean value in the two groups of countries. This aspect somewhat limits the conclusions to be drawn from the analysis. Nevertheless, the pattern in

the two groups are markedly different during the period of analysis. The results presented here show that in the developing countries of S.S.A. that have middle income status and have achieved a certain level of the construction industry activity (say 5 to 6% of GDP, depends upon the year taken as basis), the relative level of the construction industry tends to remain stagnant, i.e. the construction volume follows *pari passu* the pattern of the general economy. In contrast, the countries that have low-income status, and are in a process of increasing economic growth, the construction industry activity increased not only absolutely but also relatively, i.e. the growth rate of construction is higher than that of the general economy.

5. Construction investment and the sustainable development goals

This section explores the link between investment in construction and the economic and social targets of the SDGs. Some of the material provided here is drawn from an earlier work [11] dealing with the link between construction investment and the millennium development goals (MDGs).

In the early 2000s, the physical infrastructure in S.S.A. was in a very poor state. External capital flows for African infrastructure had reached an historical low [11]. The Group of Eight Summit at Gleneagles in 2005 called for action by the major economies and multilateral institutions called for action in the financing of the S.S.A. infrastructure. This led to the formation of the *Infrastructure Consortium for Africa.* One of the practical results of this political arrangement was the publication of the report- *Africa's Infrastructure: A time for Transformation* [17]. This publication diagnosed the infrastructure needs of S.S.A, addressing the twin challenges of financing and sustainability for the period 2006-2015.

The SDGs are part of the post-2015 development agenda. The United Nations General Assembly in its sixty-ninth session, of 12 August 2015, decided to "transmit the outcome of the document entitled *Transforming our World*: *The 2030 Agenda for Sustainable Development* to the General Assembly at its seventieth session for action during the UN Summit for the adoption of the post 2015 development agenda, held from 25 to 24 September 2015".There are 17 SGDs associated with 169 targets that will aim to stimulate action in the following critical areas: people, planet, prosperity and peace [18]. Some of these goals and targets have to do particularly with construction investment in the developing world. These are: Goal 6 –ensure availability and sustainable management of water and sanitation for all; Goal 9- build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation; Goal 11- make cities and human settlements inclusive, safe, resilient and sustainable. Of particular relevance for construction infrastructure in S.S.A is target 9-1- develop quality, reliable and resilient infrastructure, including regional and transborder infrastructure to support economic development and human well-being.

Table 3 indicates that the estimate for the overall cost to build, maintain and operate S.S.A.' infrastructure is US$ 93 billion annually for the period 2006-2015, approximately 7.5 % of this sub region's GDP in 2010 [17]. Of this total, about two thirds are for investment and one third is for operation and maintenance. In sectoral terms, about 40% is allocated to the power sector. The second-largest is water supply and sanitation (WSS) - a key sector for meeting the SGS, with about 23% of the total, and the third largest share of the cost is associated with transport, which is approximately 20% of the overall spending needs. The lowest share is for information and communication technologies (ICT), 9% of the total needs.

Table 3. Overall spending needs for S.SA, 2006-2015 (US$ billion annually)

Sector	Capital expenditure	Operation and maintenance	Total needs	Funding gap
ICT	7.0	2.0	9.0	1.3
Irrigation	2.7	0.6	3.3	2.4
Power	26.7	14.1	40.8	23.2
Transport	8.8	9.4	18.2	(1.9)
WSS	14.9	7.0	21.9	11.4
Total	60.4	33.0	93.3	30.6

Table 3 also shows that the funding gap for infrastructure investment in S.SA is US$ 30.6 billion annually, or 2.5 % of SSA' total output in 2010, taking into account efficiency improvements. About US$ 23 billion a year, or over 70% of the funding gap, is for the power sector. The other significant component of the gap, representing a shortfall of US$ 11.4 billion is associated with WSS [17]. The funding gap in the latter sector in the low-income countries looks like an unattainable target in the foreseeable future in the light with the implications of the sub region's deterioration of commodity prices, and the challenges posed to development partners by the 2008 global financial crisis.

The WSS sector, besides its direct effect on the provision of water and sanitation services, has a pervasive effect on other social targets , namely the prevention of disease, improvement in education, and promotion of gender equality so that woman save time when they begin using an improved water source [11]. Transport fosters trade by reducing the cost for transporting goods and passengers, improves access to education and reduces child/maternal mortality. Electricity enhances productivity, eradicates poverty by fostering economic growth.

An efficient construction industry can contribute to the efforts to tackle the problems. For example, it can address the vulnerabilities of the slum dwellers by devising labour -intensive and cost-effective technologies, and by implement practical sustainable measures that mitigate the impact of climate change.

6. Conclusions

The picture that emerges from the analysis of the evolutionary process of the construction industry in S.S.A suggests that the share of construction in 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 (say the contribution of construction to about 5.5% to 6% of GDP) 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 decreases relatively in the later stages of development.

The results of the study also underlie that construction investment and other physical infrastructure lag behind other major areas and regions of the world. Thus, there is a need to tackle the twin challenges of finance and sustainability in the effort towards attaining the SDGs. Given the experience of the growth process in Sub-saharan Africa what should be the focus of growth-enhancing policies in the two groups of countries? For example, further investment in construction infrastructure might be recommended for countries in Group 1 but might not necessarily be a growth priority for countries in Group 2. For the low-income countries, the analysis suggests that most the effort should be directed at construction investment projects in order to achieve the level of, say, 5.5% to 6% of GDP, which is required for a reasonable functioning of the economy. The priority should be given to investment projects related to the transport sector and multi-purpose projects (power and water sector) and those that support scale economies in Africa's largest urban centres.

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