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Infrastructure and Economic Performance in sub-Saharan Africa

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Abstract: This study examined the impact of infrastructure on economic performance in SSA. By way of a departure from previous study, infrastructure was examined in aggregate and disaggregated terms (transport infrastructure, information communication technology infrastructure and water and sanitation infrastructure) for 39 sub-Saharan African countries. Also, to determine the influence/role of institutional quality (governance index) on the impact infrastructure has on economic performance, governance index was interacted with infrastructure index. The result from the system-Generalized Method of Moments estimation technique showed that infrastructure index (excluding electricity infrastructure), exerted a direct positive impact on economic performance. The negative impact of electricity infrastructure was rationalized on the basis of poor state of electricity infrastructure in most sub-Saharan African countries. The estimate from the interactive terms showed that variables (with the exclusion of information communication technology infrastructure) positively and significantly impacted on economic performance. This shows that governance index influences infrastructure and by extension economic performance in sub-Saharan African countries. In the light of the findings it was recommended that policy makers in sub-Saharan African countries should improve on existing infrastructure in the drive for sustainable economic performance.

Keywords: Infrastructure; Institutions; Economic Growth; Panel Data; Africa

JEL Classification: H54; O43; C33; O55; F43

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1. Introduction

There exist a sort of a consensus among developmental economists that infrastructure drives economic performance (hereafter captured by economic growth). The availability of infrastructure spurs real investment/growth (owing to the low cost of production it engenders) while inadequacy of it weakens or retard it. OECD (2016) corroborated with the assertion that investments in infrastructures such as energy, water, transportation and communication technologies promote economic growth, alleviate poverty and improve living conditions of citizen. This therefore implies that infrastructure development is also a key determinant of a country's growth and development. However, while there exist a high level of infrastructure development in advanced countries such as United Sate, France, Switzerland same cannot be said of most developing countries especially those in sub-Saharan Africa (SSA).

Though, International Energy Agency [IEA] (2017) showed that 43 per cent of the population in SSA has access to electricity with 26 million people gaining access annually since 2012 (almost a triple of the rate recorded between 2000 and 2012). This has however been uneven among countries in SSA. For example, in 2016, while few countries (Gabon, Mauritius, Reunion, Seychelles, Swaziland, South Africa, Cape Verde and Ghana) had electricity access rate above 80 per cent, the other countries within SSA had a rate below 50 per cent and 25 per cent. The low level of electricity infrastructure in SSA was also reported by World Bank (2019) with access to electricity put at about 35 percent of the population (with access rate in rural areas less than one-third of urban centers). More recently, McKinsey and Company (2020) reported that more than two-thirds of the global population without electricity are in SSA despite having similar population sizes, India expanded access to electricity to an additional 100 million people in 2018 compared to approximately 20 million persons recorded in SSA.

For transport infrastructure, Africa Union [AU] (2014) reported that road access rate in SSA is about 34 percent, compared to about 50 percent recorded in other developing economy outside Africa. World Bank (2018) corroborated by asserting that the low density of the railway network (less than 0.002 km per square km of surface area in 2014) has also been declining over the years. With respect to telecommunications infrastructure, there has been improve in quantity and quality in SSA. World Bank, (2017) specifically shows that there has been an improvement in telecommunication density over the past two decades from about 55 lines per 1,000 persons in 1990 to over 1,605 in 2014. Based on World Bank (2020) data, this has been further sustained and improved upon in recent times. Similarly, access to safe water also rose in SSA with 77 percent of the population having access to safe water in 2015 compared to about 51 percent recorded in 1990 (World Bank, 2017). This is an improvement compared to earlier reports such as UNICEF (2014) which shows that about 64 percent have access to safe drinking water in SSA. SSA however rank low in the area of sanitation when compared to other regions such as Latin America, South Asia. World Bank (2017) specifically reported that sanitation access rates in SSA was about 15 percent in 1990 and by 2015, it was about 30 percent. This is relatively low compared to about 55 percent recorded in South Asia and above 80 percent in Latin America and the Caribbean and East Asia for same period.

Though reports such as World Bank (2020, 2012, 2006 and 1994) shows that SSA has been recording positive economic growth over the last two decades, this study however seek to determine the contribution of infrastructure in this regards. Besides the existence of scanty studies such as Azolibe and Okonkwo (2020); Kodongo and Ojah, (2016), Estache, Speciale and Veredas (2006) on infrastructure and economic growth in SSA, a common feature with some of the cross-sectional studies is the employment of fewer countries to capture SSA. This may not truly represent or better still approximate SSA countries.

Also, owing to the seemingly high correlation among various infrastructure index such as telecommunications, electricity, transport, water and sanitation (Calderón and Servén 2004), some studies employ a single infrastructure index to capture all infrastructure in relation to economic growth. Examples in this light are studies by Roller and Waverman (2001) telecommunications infrastructure and industrial; Fernald (1999) transport infrastructure and output; Easterly (2001), telephone density and growth performance; Loayza, Fajnzylber and Caldeŕn (2003) telecommunications and economic growth; Lopez (2004) telephone density and growth. This may not truly present the impact aggregate infrastructure has on economic growth.

Thus with the intent of giving vigour to the analysis, the scope of coverage of this study extends to thirty nine (39) SSA countries with spread across the various regional economic groupings within SSA with infrastructure index examined in aggregate and specific terms (transport infrastructure; electricity infrastructure; information communication technology (ICT) infrastructure and water/sanitation infrastructure). More so, it has also be argued that institutional qualities (control of corruption, government effectiveness, political stability and absence of violence, regulatory quality, rule of law, voice of accountability and governance index) plays key role in infrastructure development and by extension growth and development of an economy (see Bannaga, Gangi, Abdrazak and Al-Fakhry 2013; United Nations Conference on Trade and Development [UNCTAD] (2019). This study therefore interact institutional quality (governance index) with infrastructure index in relation to economic growth in SSA. This is premised on the fact that governance index captures the way a country sets and manages its rules; policies and its implementation.

2. Review of Relevant Literature

Beginning with the seminal work of Aschauer (1989) which found that the stock of public infrastructure capital positively and significantly impact on aggregate output, most cross-sectional studies such as; Lopez (2004); Loayza, Fajnzylber and Caldern (2003); Roller and Waverman (2001); Demetriades and Mamuneas (2000) affirms that infrastructure is positively and significantly related to economic growth. These studies explained that existence of infrastructure spur economic activities which translate to improve growth performance over time.

Also, the investigation by Azolibe and Okonkwo (2020) on the impact of infrastructure on industrial productivity in SSA in a panel of 17 countries spanning the period 2003 to 2018 using panel least square estimation technique found that the quantity and quality of telecommunication infrastructure influences industrial sector productivity in SSA. The study also establishes that the relatively low level of industrial productivity in SSA is largely attributed to poor electricity, transport and water and sanitation infrastructure. Electricity infrastructure spurs economic social and industrial activities and in the long run translates to improve growth performance. Studies by Phiri and Bothwell (2015), Lean and Smyth (2014), Abbas and Choudhury (2013), Chandran et al. (2010) affirmed the positive relationship between electricity infrastructure and economic growth. Palei (2015) examine the influence of infrastructure on national competitiveness in a panel of a hundred and twenty-four (124) countries. The statistical regression analysis showed that development of infrastructure in the areas of transport and electricity influences national competitiveness.

A developed transport infrastructure creates room for market accessibility, employment, and lowered cost of production while its inadequacy usually result in economic loss and reduce economic profit amongst others (Rodrigue and Nottemboom 2013). Also, Jayme, da Silva and Martins (2009) examine the impact public expenditure on transportation infrastructure has on economic growth in Brazil. The result from the analysis covering the period 1986 and 2003 shows that public infrastructure expenditures on transportation positively and significantly impact on growth. This is similar to the earlier study by Kularatne (2006) which found that investment in infrastructure affects economic growth directly and indirectly in South Africa. Also, Boopen (2006) in a panel data of Africa countries covering the period 1985 and 2000 found that transport infrastructure impact positively on productivity and economic growth. Other studies that also affirmed that transport infrastructure impact positively on growth includes; Deng etal. (2014); Hong et al. (2011); Gafer and Saad (2009); Wing et al. (2008); Berechman et al. (2006), Cantos et al. (2005).

Studies such as Levendis and Lee (2013), Mehmood and Siddiqui (2013), Ahmed and Krishnasamy (2012), Chakraborty and Nandi (2011) Shiu and Lam (2008), Datta and Agarwal (2004) shows that telecommunication infrastructure impact positively on growth. Egert, Koźluk and Sutherland (2009) examined the relationship between infrastructure and growth in panel of 24 OECD countries for the period 1960-2005. The result from ordinary least square (OLS) and generalize method of moment (GMM) estimations shows that development of infrastructure impact positively on growth. The result specifically shows that telecommunications and electricity infrastructure exhibit a robust positive effect on growth compared to what obtain with transportation infrastructure. Sojoodi, Zonuzi and Nia (2012) examine the impact infrastructure has on economic growth in Iran for the period spanning 1985 to 2008 using autoregressive distributed lag (ARDL) framework. The result shows that transportation and telecommunication infrastructure positively and significantly impact on economic growth.

Traub, Vellutini and Warlters (2008) in a time series panel data for East Asia covering the period 1975 to 2005 found that development of infrastructure significantly and positive impact productivity and growth. Rodriguez (2007) using a time series data that span the period 1960 to 2000 employed a hundred and twenty-one (121) countries in the investigation of the impact infrastructure has productivity and growth. It was found that development of infrastructure has a positive and significant impact on productivity and economic growth. Also, Calderón and Servé (2004) examined the impact development of infrastructure has on economic growth and income distribution in a panel of over 100 countries for the period 1960 to 2000. The result from GMM estimators shows that development of infrastructure engenders a reduction in inequality and by extension impact positively on growth. Also, a study carried out by Sugolov, Dodonov and Hirschhausen (2003) using a panel data of 15 East European Transition Countries for the period 1993-2000 established a positive relationship between infrastructure and economic growth.

3. Methodology

3.1. Theory and Model Specification

The theory on which this study hinge on is endogenous growth 'AK' model (composite of physical and human capital) developed by Rebelo (1991) and advanced by Pagano (1993). Its basic form expresses output (Y) as a function of Capital (K) and Labour (L) with elasticity of output with respect to capital (α) and labour (β) while total factor productivity is represented by A. This can be algebraically represented as;

$$Y = AK^{\alpha} L^{\beta} \quad (1)$$

With the assumption of constant return to scale and that firms uses same level of capital and labour, if we divide through by labour (L), the growth function can be express in per capita terms as shown below;

$$Y = Ak^{\alpha} \quad (2)$$

Equation (2) above is a special case Cobb-Douglas Production function which expresses aggregate output as a linear function of the aggregate capital stock.

Though the work of Aschauer (1989) introduce infrastructure into the growth function as a third input alongside capital and labour, the eclectic features of infrastructure also provides the leverage for it to either be introduce as an input in the growth model as physical stocks or treated as a total factor productivity augmenting input (Egert, Koźluk and Sutherland (2009).

Thus, the based model for this study in compact form is specified as;

$$Y_{it} = \beta_o + \sum_{j=i}^{n} \beta_j Y_{i,t-j} + \beta_{it} X'_{it} + \mu_{it} \quad (3)$$

$Y_{it,}$ = real gross domestic product per capital (a proxy for economic performance), β_o = overall intercept term , $Y_{i,t-j}$ = lagged of real gross domestic product per capital, X'_{it} = vector of explanatory variables, μ= error term, i = country index, t= time in years here.

From the equation (3), the model that specifically captures the direct impact of infrastructure and its interaction with institutional quality (governance index) as it relates to economic performance is dynamically stated in equation (4) and (5);

$$RGPC_{it} = \beta_o + \beta_1 RGPC_{t-1} + \beta_2 AIFR_{it} + \beta_3 TIFR_{it} + \beta_4 EIFR_{it} + \beta_5 IIFR_{it} + \beta_6 WIFR_{it} + \beta_7 GOVI + \beta_8 GCFM_{it} + \beta_9 POPG_{it} + \mu_{it} \quad (4)$$

$$RGPC_{it} = \beta_o + \beta_1 RGPC_{t-1} + \beta_2 AIFR_{it} + \beta_3 TIFR_{it} + \beta_4 EIFR_{it} + \beta_5 IIFR_{it} + \beta_6 WIFR_{it} + \beta_7 GOVI_{it} + \beta_8 GCFM_{it} + \beta_9 POPG_{it} + \sum \alpha_1 GOVI_{it} * AIFR_{it} + \alpha_2 GOVI_{it} * TIFR_{it} + \alpha_3 GOVI_{it} * EIFR_{it} + \alpha_4 GOVI_{it} * IIFR_{it} + \alpha_5 GOVI_{it} * WIFR_{it} + \mu_{it} \quad (5)$$

Where; RGDP = real gross domestic product per capital; $RGPC_{t-1}$ = one period lag of real gross domestic product per capital. Key variables are represented by AIFR = aggregate infrastructure; TIFR = transport infrastructure; EIFR = electricity infrastructure; IIFR = information communication technology infrastructure; WIFR = water and sanitation infrastructure. Control variables comprises GOVI = governance index; GCFM = gross capital formation; POP= population growth.

The second segment of equation (5) captures the interaction of governance index with aggregate infrastructure; governance index with transport infrastructure; governance index with electricity infrastructure; governance index with information communication technology infrastructure; governance index with water/sanitation infrastructure. The coefficients β_1- β_9 and α_1 - α_5 are all indeterminate (they could either take positive or negative values).

3.2. Estimation Technique

The estimation technique employed system Generalized method of moment (s-GMM) advanced by Arellano and Bover (1995) and Blundell and Bond (1998). The strength of s-GMM estimator stem from the fact that it employ lagged first-differences of the variables as instruments for equations in levels and exploits assumption about the initial conditions to obtain moment conditions that are informative even for persistent series. Also, besides accounting for endogeneity, the necessary restrictions on the initial conditions in s-GMM estimator are potentially consistent with standard growth frameworks and appear to be both valid and highly informative in empirical studies.

Also, the consistency of s-GMM estimator depends on the validity of the instruments and the assumption that the error term does not exhibit serial correlation. Instrument variable must be correlated with the included endogenous variable(s) and orthogonal to the error process (Baum, Schaffer and Stillman, 2003). To this end, the standard Sargan-Hansen J-Statistics is employed. If the probability value of J-statistics is 0, it means that the over restricting conditions (choice of instrument and constraints) should be rejected. If the probability approaches 1, it indicates that the over restricting conditions (choice of instrument and constraints) should be accepted.

4. Empirical Evidence

The empirical analyses conducted are reported in the eschewing Tables.

Table 1. Summary Statistics

Variable	**Observations**	**Mean**	**Minimum**	**Maximum**	**Std. Dev.**
RGPC	663	2546.6	208.07	20532.95	3535.21
AIFR	663	18.29	2.23	94.97	15.89
TIFR	663	9.29	1.09	53.31	9.82
EIFR	663	7.54	0.03	82.38	15.48
IIFR	663	5.54	0	67.39	9.67
WIFR	663	55.04	2.91	99.79	19.46
CCOR	663	-0.67	-1.83	1.22	0.6
GEFF	663	-0.75	-1.85	1.06	0.62
PSAV	663	-0.51	-2.7	1.2	0.83
RGQL	663	-0.64	-2.24	1.13	0.58
RLLW	663	-0.7	-1.85	1.08	0.61
VOAC	663	-0.55	-2	0.94	0.67
GOVI	663	0	-3.92	5.81	2.2
GCFM	663	14.24	0.95	44.31	5.59
POPG	663	2.54	-2.63	4.65	0.9

Source: Authors' Computation

real GDP per capital (RGPC); aggregate infrastructure (AIFR); transport infrastructure (TIFR); electricity infrastructure (EIFR); information communication technology infrastructure (IIFR); water and sanitation infrastructure (WIFR); control of corruption (CCOR); government effectiveness (GEFF); political stability and absence of violence (PSAV); regulatory quality (RGQL); rule of law (RLLW); voice of accountability (VOAC); governance index (GOVI); gross capital formation (GCFM); population growth (POPG).

The summary statistics as shown in Table 1 reported the mean minimum, maximum and standard deviation for variables. From the Table, it can be observed that the dependent variable (real GDP per capital) was relatively high over 2500. As expected, the minimum value was low (about 208) compared to the maximum which approximate 20000. The high standard deviation value of about 3535 indicates that the observation is widely spread from the mean. Apart from water and sanitation infrastructure (WIFR) whose mean was relatively high to the tune of about 55 in values, the mean of the various infrastructural index such as aggregate infrastructure (AIFR), transport infrastructure (TIFR), electricity infrastructure (EIFR), information communication technology infrastructure (IIFR) average 10 in values.

Also as expected, the minimum values were all relatively low compared to the maximum values with a low standard deviation indicative that the observation are not widely disperse from the mean. For institutional qualities captured by control of corruption (CCOR), government effectiveness (GEFF), political stability and absence of violence (PSAV), regulatory quality (RGQL), rule of law (RLLW), voice of accountability (VOAC) and governance index (GOVI) mean values are extremely low (in negative). The minimum values are also in negative and lesser that the maximum values alongside relatively low standard deviation which approximate an average 0.9 in values. This attest to the fact that the observation are not widely disperse from the mean. Similar explanation holds for gross fixed capital formation [GFCM] (though with a relatively higher mean and standard deviation) and population growth rate (POPG).

Table 2. Direct Impact of Infrastructure on Economic Performance

Variable	Infrastructure Types				
	AIFR	TIFR	EIFR	IIFR	WIFR
	two-step system-GMM	*two-step system-GMM*	*two-step system-GMM*	*two-step system-GMM*	*two-step system-GMM*
$LRGPC_{t-1}$	0.85 *** (47.40)	0.89*** (174.60)	0.90*** (110.58)	0.85*** (64.41)	0.88*** -103.08
LIFRI⁺	0.02* (1.73)	0.05*** (6.76)	-0.01*** (-2.83)	0.01*** (3.50)	0.02*** (5.57)
GOVI	0.02*** (13.46)	0.01*** (8.94)	0.01*** (6.28)	0.02*** (17.33)	0.02*** (23.08)
LGCFM	-0.01*** (-4.63)	-0.01*** (-3.43)	-0.01*** (-4.39)	-0.02*** (-13.86)	-0.01 (-0.95)
POPG	0.01*** (16.64)	0.01*** (9.32)	0.01*** (6.26)	0.01*** (6.65)	0.01*** (13.78)
J- stat	33.86	35.66	34.24	35.63	36.99
AR(1)		0.49	0.49	0.47	0.5
AR(2)	0.47	0.16	0.17	0.14	0.14
Obs	585	585	585	585	585
Countries	39	39	39	39	39

Source: Authors' Computation

*Dependent variable: real GDP per capita; Values in parenthesis: t-test; ***, *statistical significance at 1 percent and 10 percent respectively*

+ log of infrastructure index; AR(1): first order autocorrelation; AR(2): Second order autocorrelation

Table 2 shows the direct impact of infrastructure on economic performance in SSA. From the result the lag value of real GDP per capita ($LRGPC_{t-1}$), impact positively and significantly (at one percent) on economic performance (real GDP per capital). A unit increase in the lag value of real GDP per capital result to about 0.85 unit increase in real GDP per capital. With respect to aggregate infrastructure (AIFR), it impact positively and significantly (at 10 percent) on real GDP per capital. A unit increase in aggregate infrastructure result to an increase in real GDP per capital to the tune of 0.02 units. Though a one percent statistical significance was established for governance index (GOVI), log of gross capital formation (LGCFM) and population growth (POPG), the impact of these variables on real GDP per capital was only positive for governance index and population growth while it was negative for log of gross capital formation. Based on the results in Table 2, similar explanations held for aggregate infrastructure (AIFR) also holds for each of the disaggregated infrastructure vis-à-vis transport infrastructure (TIFR), electricity infrastructure (EIFR), information communication technology infrastructure (IIFR) and water and sanitation infrastructure (WIFR). That is, for each infrastructure components, variables positively and significantly (at one percent) impacted on real GDP per capital with the exception of the duo of electricity infrastructure (though significant at one percent but exhibited negative impact on real GDP per capital) and log of gross capital formation which showed a negative relationship and statistically insignificant impact with respect to real GDP per capital. The negative impact of electricity infrastructure on real GDP per capital is indicative of the poor state of power and energy in SSA.

Hansen J-statistics test of over-identifying restriction for each of the estimates shows the acceptance of null hypothesis of validity of instruments employed in s-GMM analysis owing to the satisfaction of the conditions of over-identifying restriction test statistics of greater than 0.1. The results also affirmed the none existence of first order and second order serial correlation owing to relatively low values indicative of no statistical significance for each of the estimations.

Table 3. Interaction Augmented Infrastructure Impact on Economic Performance

Variables	Infrastructure Types				
	AIFR	TIFR	EIFR	IIFR	WIFR
	two-step system-GMM	*two-step system-GMM*	*two-step system-GMM*	*two-step system-GMM*	*two-step system-GMM*
$LRGPC_{t-1}$	0.83*** (152.00)	0.88*** (111.13)	0.91*** (59.04)	0.80*** (33.55)	0.83*** (54.04)
$LIFRI^{+}$	0.01*** (2.82)	0.03*** (4.03)	-0.01*** (-3.58)	0.02** (1.89)	0.03*** (7.25)
$GOVI*IFRI^{++}$	0.01*** (3.69)	0.01*** (6.50)	0.01*** (4.12)	-0.19 (-0.16)	0.01*** (9.27)
GOVI	0.01*** (8.25)	0.03*** (3.08)	0.01*** (3.06)	0.02*** (10.88)	-0.02*** (-3.77)
LGCFM	-0.01*** (-5.01)	-0.01*** (-5.77)	-0.01*** (-3.61)	-0.02*** (-5.57)	0.01*** (4.08)
POPG	0.01*** (13.64)	0.04*** (3.12)	0.04*** (5.77)	0.01*** (4.04)	0.08*** (17.42)
J-statistics	36.95	36.55	33.05	31.89	31.1
AR(1)	0.46	0.48	0.49	0.45	0.46
AR(2)	0.14	0.16	0.17	0.13	0.15
Obs	585	585	585	585	585
Countries	39	39	39	39	39

Source: Authors' Computation

Dependent variable: real GDP per capital; Values in parenthesis: t-test

****, **statistical significance at 1 percent and 5 percent respectively; +Log of infrastructure index; ++ Interaction of term; AR(1): first order autocorrelation; AR(2): Second order autocorrelation*

Table 3 shows the estimates of variables when interacted by institutional qualities captured by governance index (GOVI). The results as presented in Table 3 exhibited similar pattern in terms of relationship and statistical significance with Table 2. For example, lag value of real GDP per capita ($LRGPC_{t-1}$) also shows a positively and statistical significant impact (at one percent) on economic performance (real GDP per capital). A unit increase in the lag value of real GDP per capital result to about 0.83 unit increase in real GDP per capital. This is also the case with the infrastructure (aggregate infrastructure, transport infrastructure, electricity infrastructure, information communication technology infrastructure and water and sanitation infrastructure). The only exception being that with respect to water and sanitation infrastructure (WIFR); governance index (GOVI) exhibited a negative impact real GDP per capital while log of gross capital formation (GCFM) exhibited a positive impact on real GDP per capital.

With respect to the interaction of governance index with infrastructure, the result also exhibited a similar pattern. From Table 3, the interaction of governance index with aggregate infrastructure; transport infrastructure; electricity infrastructure; and water and sanitation infrastructure shows a positive and statistical significant (at one percent levels) impact on real GDP per capital. The result further shows that a unit increases in each of the aforementioned interactive terms (variables) result to a 0.01 unit rise in real GDP per capital. Though there was no remarkable improvement in the coefficients estimates of each of the interacted variables compared to direct impacts coefficient estimates, the positive and significant impact of each of the interacted variables (especially electricity infrastructure) implies that governance index influences the course of development of infrastructure and by extension economic performance in SSA. For the interaction of governance index with information communication infrastructure, the result shows a negative and statistical insignificant impact on real GDP per capital. This is indicative of a weak/poor policy direction with respect to the development of information communication technology in SSA.

Furthermore, Hansen J-statistics test of over-identifying restriction for each of the estimates also shows the acceptance of null hypothesis of validity of instruments employed owing to the satisfaction of the conditions of over-identifying restriction test statistics of greater than 0.1. Again, the none existence of first order (AR (1)) and second order (AR (2)) serial correlation is also established owing to their relatively low values indicative of no statistical significance for each of the estimations.

5. Conclusion

Infrastructure was examined in aggregate and components/disaggregated terms in relation to its direct impact on economic growth in SSA. Also, in an attempt to determine the influence of institutional quality (governance index) on the impact infrastructure has on economic performance, governance index was interacted with infrastructure index. The result from the analysis showed that virtually all the infrastructure index (aggregate infrastructure, transport infrastructure, information communication technology infrastructure and water and sanitation infrastructure) with the exclusion of electricity infrastructure, exhibited a direct positive impact on economic performance. The negative impact of electricity infrastructure attested to the poor state of electricity infrastructure in SSA. With interaction, coefficient estimates of most variables (inclusive of electricity infrastructure) exhibited positive and statistical significant impact on economic performance. An indication that governance index influences infrastructure and by extension economic performance. This was however not the case with information communication technology infrastructure (owing to its negative and statistical insignificant impact on economic performance), indicative of a weak institutional and policy direction with respect to information communication technology in SSA. In the light of the findings it was recommended that on the average that governments of the SSA should focus on building strong, virile and resilient infrastructure, and more attention should be directed towards reducing the deficits witnessed in the electricity infrastructure in order to drive greater economic performance.

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Appendix

Countries Employed: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroun, Central African Republic, Chad, Comoros, Congo Republic, Congo Democratic Republic, Cote D'Ivoire, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, Sierra Leone, South Africa, Eswatini, Tanzania, Togo, Uganda, Zimbabwe.