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Public sector corruption and unemployment in Sub-Saharan Africa: An empirical investigation

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Abstract

In order to contribute to the debate on corruptionunemployment nexus, we use annual panel data for the period 2005-2019 for Thirty-Three Sub-Saharan African countries to investigate the impact of corruption in public sector on unemployment. We utilise the one step system Generalised Method of Moments (GMM) and two step system Generalised Method of Moments (GMM). Our findings reveal that corruption in public sector exerts positive, however, not statistically significant impact on unemployment. In addition, our empirical evidence reveals that unemployment is persistent in Sub-Saharan Africa. Based on our findings, we conclude that even though unemployment is persistent in Sub-Saharan African countries, there is no strong evidence to contend that corruption in the public sector is a strong driver of unemployment in these countries.

Keywords: One Step System GMM, Public Sector Corruption, Sub-Saharan Africa, Two Step System GMM, Unemployment

1. Introduction

Corruption has attracted unprecedented attention around the world due to its economic and social consequences and the attention has increased in recent years probably because the phenomenon has increased in the late decades, its scope has expanded, its negative consequences have increased of late, people are more aware of its consequences and have increasingly seen the need to reduce it to the least level possible, since it could not be eradicated. Various governments across the world have, at one time or the other, launched aggressive campaign against corruption and have intensified efforts in their fight against the phenomenon. It is very difficult to tell exactly when corruption began in the history of human existences, however, literature suggests that corruption has existed for time immemorial. The phenomenon cuts across all countries; the small and large, developed and developing, as well as market-driven, transition, mixed and centrally planned economies. This phenomenon affects social, economic and spiritual life of people. Besides, it impacts the long-run economic growth and sustainable development of a country.

There are two hypotheses that explain the effect of corruption on economic growth, viz: the "grease the wheels" and the "sand the wheels" hypotheses. The "grease the wheel" hypothesis posits that corruption promotes economic growth, that is it "greases the economy's wheels". Proponents of this hypothesis argue that corruption enhances efficiency thereby removing rigidities imposed by the government which interfere with economic decision and impede investment (see Leff, 1964; Huntington, 1986; Leys, 1965) ^[35, 31, 37]. Beck and Maker (1986) ^[11] and Lien (1986) ^[38] in their model demonstrate that in bidding competitions for a contract, those competitors that are highly efficient are those who afford to give the highest bribe which enables them to secure the contract, thus, bribe which is a form of corruption can promote efficiency since it allows assigning project to those firms that are the most efficient. In his opinion, Lui (1985)^[40] argues that corruption particularly bribe, minimises the time people spend in queues, since bribes offered to bureaucrats give them the incentive to speed up administrative process that is otherwise slow. In other words, by speeding up the activities and processes of bureaucracy, corruption may reduce costs caused by delays in the process of administration, thus, enhancing economic growth. Supporting this view, Grundler and Potrafke (2019) ^[24] contend that when regulations on setting up new businesses are tight, bribing politicians and bureaucrats is likely to result in vibrant economic activities. The other hypothesis - the "sand the wheels" hypothesis postulates that corruption deteriorates economic growth, i.e., it "sands a country's wheels". The sand the wheel hypothesis is simply a situation in which one distortion in an economy adds up to other distortions instead of compensating them (Meon and Sekkat, 2006)^[42], thereby reducing investment and economic growth. Proponents of this hypothesis, argue that corruption does not guarantee efficiency in production and innovation, particularly in countries where investment is low and governance quality is poor (Grundler and Potrafke, 2019) [24],

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hence, impacting negatively on economic growth. Besides, corruption enables increased diversion of public spending to investments that are not productive (Mauro, 1998)^[41] and civil servants that are corrupt in order to have the opportunity to extract a bribe may cause delays (Myrdal, 1968)^[44]. All else equal, these result in inefficiency, as a result, economic growth suffers and this aggravates employment.

Our search of the literature reveals that empirical evidence on the impact of corruption on economic growth supports the sand the wheel hypothesis, i.e., corruption deteriorates economic growth. For instance, Oureshi, et al. (2021)^[50]; Del Monte and Pagagni (2001)^[16]; Erum and Hussain (2019)^[20]; Farooq, et al. (2013) ^[22]; Huang (2015) ^[30]; Alfada (2019) ^[3]; Chris (2015) ^[15]; Potrafke (2019) ^[24]; Mo (2001) and Meon and Sekkat (2005) [42] report that corruption has negative impact on economic growth. Corruption also has negative influence on governance. Klitgaard (1988) [34] describes it as the great disease of government and Ashforth, Gioia, Robinson and Trevino (2008) describe it as virus like infection. It is a cancer in the society (see Orjuela, 2014)^[46]. The phenomenon was declared national disaster in Kenya and was termed "untamable beast" by Uhuru Kenyatta when he formed anti-corruption graft committee in 2015 (Onchari, 2019)^[45]. Dell'Anno and Teobaldelli (2015)^[17] describe it as tax which reduces the level of investment, capital accumulation and economic growth, since in corrupt countries entrepreneurs are to pay bribes in order to get permits and licenses to operate. Corruption, particularly bribe, makes leaders to pervert justice (see 1 Samuel 8:3, proverbs 17:23); it blinds the eyes and twists the words of a leader and or those who collect it (see Deuteronomy 16:19, Exodus 23:8 and 1 Samuel 12:3): thus affecting the effectiveness and efficiency of leaders in discharging their duties; the overall effect of which is reduction in the growth of an economy and increase in unemployment.

The negative impact of corruption on economic growth is more in developing countries with poor institutions and high levels of corruption (Lim, 2018)^[39]. A country with poor institutions and high level of corruption is likely to have low investment quality. All else constant, low investment quality discourages private, capital and physical investments, which as a result, economic growth is discouraged and this does not only worsen, but also perpetuates unemployment in a country. In another way, in a country where corruption, particularly, in the public sector is high, government employment is given to job seekers who are related in one way or the other, either directly or indirectly, to people in the government who offer employment while job seekers who are not, in any way, related to those public officials who offer employment give bribe to the officials in order to get employed with the public sector. In such a situation, job seekers who are not related to people who offer government employment and who cannot afford to pay a bribe to secure a job with the public sector remain unemployed thereby aggravating and perpetuating unemployment in a country. Thus, in this study we investigate the impact of corruption on unemployment in Sub-Saharan African countries. We however, concentrate on the impact of public sector corruption on unemployment in these countries.

Sub-Saharan African countries are our target for some reasons. Firstly, a survey conducted by transparency

International in 2019 reports that corruption in the public sector is on the increase in Sub-Saharan Africa¹. According to the report, corruption is high in the public sector of Sub-Saharan countries and the citizens of these countries are not satisfied with the efforts of their governments at fight against it (the corruption). The report documents that corruption has permeated the public sector of these countries - the police, government officials and politicians (most or all government officials and parliamentarians are corruption). In 2019 the average score of public sector corruption in Sub-Saharan Africa on Corruption Perception Index was 32, a performance which paints a bleak picture of inaction against corruption in these countries (Transparency International, 2019). Secondly, Lim (2018) ^[39] points out that many Sub-Saharan African countries are faced with a weakened economy with large gaps in infrastructure, lack of skills and poor public service delivery, thus, the goals of fighting corruption and tackling unemployment has been one of the policy priorities of these countries. In these countries, unemployment is rising despite the efforts of political and economic decision makers - several institutions, through economic, institutional and social policies, have made efforts to reduce unemployment level, without success (Adjor and Kebalo, 2018)^[2]. Available information reveals that in the recent years, unemployment rate, particularly among youths in Africa has been more than one digit. For instance, youth unemployment rate in Africa stood at 10.9, 10.8, 10.7 in 2018, 2019, 2020 and is expected to be at 10.6 in 2021². Thus, faced with increase in public sector corruption as well as high level of unemployment on one hand and the goal of reducing unemployment on the other hand, it is important to examine the effect of corruption in the public sector on unemployment in these countries. Achieving the goal of tackling unemployment in sub-Saharan African countries may hardly be possible unless various governments of these countries, policy makers and institutions have the understanding of the impact of corruption in the public sector on unemployment in their region.

Corruption in public sector include receipt and giving of bribe, extortion, public fraud, embezzlement, rent-seeking, bias selection of people for employment and or nepotism, favouritism, greediness, mismanagement of national or public resources, prejudice, giving and receipt of quid pro quo, among others. Generally, corruption is caused by both direct and indirect factors. The direct factors are regulations and authorisations, taxation, spending decisions, provision of goods and services at below market price, other discretionary decisions while the indirect causes are the quality of bureaucracy, level of public sector wage, penalty systems, institutional controls, transparency of rules, laws and processes, example by leadership (see Tanzi, 1998)^[53]. Other causes of corruption are a corrupt society, i.e., it is a product of a corrupt society (Aburime, 2009), illegally accumulated wealth, presence of a set of incentives, if corrupt individuals are in power, illegal wealth accumulation, if the fear of punishment does not exist (see Saha and Ali, 2017) [51]; weakness of legislative system, lack of consistency in governance, lack of transparency and responsibility of governors (Pulido, et al. 2020)^{49]}. Type of government practiced by a country, abundance of natural resources and political institutions cause corruption (Holcombe and Boudreaux, 2015) [29].

¹ Transparency International (2019). Global Corruption Barometer (Africa 2019): Citizens Views and Experiences of Corruption.

 $^{^2}$ International Labour Organization (2020). Global Employment Trends for Youth 2020: Africa. https://www.ilo.org.

Corruption is unethical to the society and religion. No country of the world has launched a campaign for corruption, neither has any country supported corruption, but many countries have at one time or the other, launched one form of campaign or the other against the phenomenon. In the political discourse, corruption has been labelled evil (Orjuela, 2014) ^[46]. Bribery and intercession acts which are a manifestation of petty corruption are considered morally wrong (Khan, 2020)^[33]. Today, it is a crime in nearly all countries of the world for individuals, government officials included, to be involved in corrupt practice of any form. From the religion stance, Christianity in particular, the Holy Bible says that he who is corrupt, i.e., collects bribe will not dwell in the sanctuary of God neither will he live in God's holy hill (see Psalm 15:5); bribe is a sin against God (see Amos 5:12). A major hinderance to the fight against corruption by a government is corruption in the government fighting the corruption. Corruption in the public sector of a country makes corruption in the country very dangerous and very difficult to fight. In fact, the most dangerous and most anti-growth corruption is one in which people who are in the forefront of the campaign against it (the corruption) are highly corrupt. In this study, we provide empirical relationship between public sector corruption and unemployment in Sub-Saharan Africa. We structure the remaining part of our work thus: section two provides literature review, section three is our methodology, section four presents our results and discussion of the results and section five is summary and conclusion.

2. Empirical Review

First, we review literature on corruption and economic thereafter. literature on corruption growth. and unemployment. On corruption and economic growth, Del Monte and Papagni (2001)^[16] examine the consequences of corruption in public expenditure on economic growth in Italy using dynamic panel data model and annual data covering the period 1963-1991 and report that corruption in the public expenditure affects long run economic growth negatively. Podobnik et al. (2008) ^[47] investigate whether government regulations against corruption can affect world's economic growth using annual data spanning 1999-2005 and find that reducing corruption level leads to economic growth significantly. In their work, Erum and Hussain (2019) ^[20] analyse the impact of corruption and natural resources on economic growth by incorporating the role of per capita income and information technology using annual crosscountry data for Organization of Islamic Cooperation (OIC) covering 1984-2016 and Cross-Sectional countries Autoregressive Distributed Lag (CS-ARDL) model. They report that corruption impedes economic growth. Farooq et al. (2013)^[22] examine the impact of corruption on economic growth in Pakistan by including financial development and trade openness using annual data. Findings from the ARDL estimator indicate that corruption impedes economic growth. Besides, the Granger causality test result reveals presence of feedback causality between corruption and economic growth. Huang (2015)^[30] investigates whether corruption impacts economic growth negatively in thirteen Asia-Pacific countries over the period 1997-2013 using Bootstrap panel Granger causality test. He reports a significant positive causality from corruption to economic growth for South Korea and from economic growth to corruption for China while no significant causality was reported between these variables for the other countries. In their work Qureshi et al.

(2021) ^[50] revisited the impact of corruption and foreign direct investment on economic growth in 54 developing and developed countries. They apply panel Autoregressive (PVAR) model to annual data spanning 1960-2018 and find that control of corruption affects economic growth. In addition, they report that economic growth and corruption have positive bidirectional causality for developing countries and negative unidirectional association for developed countries. Using Two-Stage Least Squares (2SLS) and annual data for the period 2004-2015, Alfada (2019)^[3] assesses the effect of corruption on economic growth in Indonesia and reveals that corruption deteriorates economic growth of provinces with corruption level below the threshold of 1.75 points, with the deteriorating effect being stronger for the provinces that have corruption level above the threshold. Chris (2015) ^[15] examine the relationship that exists between graduate unemployment and economic growth in Nigeria. He applies the Ordinary Least Squares (OLS) to annual data covering 1999-2013 and the result reveals inverse association between graduate unemployment and economic growth.

Grundler et al. (2019) ^[24], re-examine the nexus between corruption and economic growth using annual data spanning 2012-2018 and system GMM and Instrumental Variable (IV) estimators. They cover 175 countries and their findings show that in the long run, corruption reduces economic growth. Meon and Sekkat (2005)^[42] investigate the relationship between the impact of corruption on growth and investment and the quality of governance in 163-171 countries during the period 1970-1998. They report that corruption has negative effect on both growth and investment. Mo (2001) investigates the impact of corruption on growth as well as assess importance of the transmission channel through which corruption impact economic growth. He utilises the OLS and reports that increase in corruption reduces economic growth and share of investment. Besides, he establishes that political instability is the channel through which corruption affects economic growth.

On corruption and unemployment, Emmanuel (2018) [2] investigates the extent to which unemployment and poverty contribute to corruption in Nigeria. The Ordinary Least Squares (OLS) and annual data covering 2006-2016 are utilized and shows that unemployment contributes positively to corruption. Similarly, Adjor and Kebalo (2018)^[2] use Panel Autoregressive (PVAR) estimator and yearly data spanning 2007-2016 and report that a better control of corruption reduces unemployment in southern African Development Community (SADC) countries, with the effect more pronounced for youth unemployment. Their aim is to propose policies that could enable decision makers reduce unemployment. Lim (2018) ^[39] studies the dynamics of endogenous corruption and unemployment using policy experiments and find that large-scale public infrastructure push has no effect on raising growth in an economy with high corruption, but if large scale-scale infrastructural push is preceded by social change and anti-corruption policies that successfully induces a structural change, it will then be effective in raising growth. Onchari (2019) ^[45] examines the relationship between corruption and unemployment in Kenya based on annual data for the period 2000-2017 and Vector Error Correction Model (VECM) and establishes that in the short run corruption and unemployment do not have any relationship, in the long run, however, increase in corruption leads to increase in unemployment. Similarly, Bouzid (2016)

^[13] assesses the causal relationship between corruption and vouth unemployment using system-GMM estimator. He finds that increase in corrupt practices tends to increase unemployment rate among youths and educated job seekers. After searching the earlier literature deeply, we discover that the relationship between corruption and unemployment, particularly the impact of corruption on unemployment has been given less attention by researchers. This has left researchers, governments, organisations and policy makers with limited empirical evidence on how corruption affects unemployment. We therefore contribute to the empirical literature on corruption-unemployment nexus, hence, adding to the previous body of knowledge in the following ways. Firstly, unlike other studies that examine the effect of corruption in general on unemployment, we examine the effect of corruption in the public sector on unemployment. Secondly, no study had investigated the impact of public sector corruption on unemployment for a group of countries or a region. We fill this gap by investigating the impact of corruption in the public sector on unemployment for a group of countries (Sub-Saharan Africa countries). Thirdly, we control for the influence of some important factors on the effect of public sector corruption on unemployment in Sub-Saharan Africa, hence, avoiding the problem of omitted variable bias. These factors are international factors, growth of the Sub-Saharan African economy, literacy level, population, general and persistent rise in the prices of goods and services and capital accumulation.

3. Methodology

3.1 Data and description of data

Annul panel data for the period 2005-2019 for thirty-three Sub-Saharan African countries are used in order to achieve our objective³. Available data on our variables determine our choice of the period and the countries covered. Our key variables are public sector corruption in which we use the Country Policy and Institutional Assessment (CPIA) transparency, accountability, and corruption in the public sector rating (from 1 to 6, where 1 rating denotes low corruption while 6 rating denotes high corruption) 4 , unemployment in which we use total percentage of labour force that are unemployed based on Interinstitutional Labour Organization (ILO) estimates. Besides our key variables of interest, we include a number of other variables in order to control for their impact on the relationship between unemployment and corruption in Sub-Saharan Africa. Specifically, we include exchange rate and trade openness to control for the impact of international factors, economic growth to control for the role of growth of the economy of Sub-Saharan Africa, literacy level to capture the influence of literacy, population to control for the influence of population of people in these countries, inflation to capture the effect of general and persistent rise in the prices of goods and services and capital formation to controls for investment in new productive assets. We generate trade openness by taking the ratio of sum of imports and exports of goods and services in local currency to nominal Gross Domestic Product (GDP) in local currency, economic growth is proxied with nominal GDP in local currency, population is measured in terms of total number of people in a country in a year, inflation measured as annul percentage increase in the general prices of goods and services in a year and capital formation is proxied with gross fixed capital formation measured in nominal local currency. Our source of data on all the variables is the World Bank's 2020 World Development Indicators (WDI).

3.2 Model Specification

In order to achieve our objective of assessing the impact of public sector corruption on unemployment in Sub-Saharan Africa, the dynamic panel data model of Arellano and Bover (1995)^[4] and Blundell and Bond (1998) is employed. Equation 1 is our dynamic panel model.

$$\ln u_{i,t} = \varphi \ln u_{i,t-1} + \phi \ln c_{i,t} + \sum_{f=1}^{r} \rho_f \ln k_{fi,t} + \varepsilon_{i,t}$$
(1)
 $i = 1, 2, \dots, N$ $t = 1, 2, \dots, T, f = 1, 2, \dots, F.$

In Equation 1, $\ln u_{i,t}$ denotes log of unemployment for country i at time t, $\ln u_{i,t-1}$ is one-year lag unemployment for country i at time t, $\ln c_{i,t}$ is log of public sector corruption for country i at time t, $k_{fi,t}$ is a vector of our control variables at time t, while $\varepsilon_{i,t}$ is the error correction term. Similarly, φ , ϕ and ρ_f are respective, parameters on the log of first lag of unemployment, log of public sector corruption and a vector of our control variables. Note that the error correction term in Equation 1 ($\varepsilon_{i,t}$) incorporates country specific fixed effect, thus, we define it as follows:

$$\mathcal{E}_{i,t} = \mathcal{V}_i + \mu_{i,t} \tag{2}$$

Where V_i denotes the country specific fixed effect, which is

time invariant whereas $\mu_{i,t}$ denotes the white noise error term which has zero mean and constant variance both across countries and over time. From Equations 1 and 2, we have Equation 3.

$$\ln u_{i,t} = \varphi \ln u_{i,t-1} + \phi \ln c_{i,t} + \sum_{f=1}^{F} \rho_{f} \ln k_{fi,t} + v_{i} + \mu_{i,t}$$
(3)

It is instructive to state that the inclusion of a lagged dependent variable in Equation 3 gives rise to correlation between the lag dependent variable and the disturbance term ($\varepsilon_{i,t} = v_i + \mu_{i,t}$), since the fixed effects (v_i) correlates with regressors of the model due to the inclusion of one year lag of dependent variable $(\ln u_{i,t-1})$ as a regressor. Thus, the model suffers from bias, which vanishes only when t approaches infinity. We eliminate this problem by taking the first difference of Equation 3, thus:

$$\Delta \ln u_{i,t} = \varphi \Delta \ln u_{i,t-1} + \phi \Delta \ln c_{i,t} + \sum_{f=1}^{F} \rho_f \Delta \ln k_{fi,t} + \Delta \mu_{i,t}$$
(4)

Estimating Equation 4 with Ordinary Least Squares (OLS) and the Fixed Effects (FE) produces inconsistent estimates,

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 $^{^{3}}$ The appendix provides a complete list of the countries considered for the study.

⁴ See www.transparency.org/cpi for details.

since the equation incorporates lagged dependent variable as a regressor. We therefore use the system GMM estimator of Arenallo and Bond (1991) which solves the endogeneity problem to estimate Equation 4. In addition to solving the problem of endogeneity, the system GMM is appropriate when the number of cross-sections ^(N) is greater than the number of periods ^(T). Also, when compared to difference GMM, system GMM produces efficient and precise estimates, because it improves precision and reduces bias associated with finite sample (Baltagi, 2008) ^[9]. Furthermore, system GMM estimator has advantage over the difference GMM in the variables that are or close to random walk (Arellano, 2003; Bauna *et al.* 2007) ^[5, 10].

4. Results and Discussion

Table 1 is descriptive statistics for all our variables. It is evident that the mean value of each series falls between the respective minimum and maximum values of the series; suggesting that all the series are consistent. Inflation with a standard deviation value of 24.5856 is the variable that has the highest variability. It is followed by literacy level, log of exchange rate, log of capital accumulation, log of population, log of economic growth, log of trade openness, log of unemployment and log of public sector corruption in that sequence. Table 1 demonstrates that our panel data is strongly balanced.

Variable	Mean	Min.	Max.	Std. Dev.	Obs
ln <i>u</i>	1.3765	-1.1489	3.4270	0.7816	495
$\ln c$	0.9647	0.0000	1.3863	0.2298	495
ln g	28.2781	20.6709	32.5085	2.6606	495
$\ln f$	26.8309	18.5616	31.3721	2.7335	495
π	9.2812	-8.9747	379.8480	24.5856	495
ln p	15.8645	2.1320	19.0930	2.6706	495
l	53.8473	0.9811	94.3679	20.2865	495
ln e	6.06160	0984	22.6288	3.1112	495
$\ln o$	-0.2486	-1.5739	5.8753	1.1217	495

Table 1: Descriptive Statistics

Note: $\ln g = \log$ of economic growth, $\ln f = \log$ of capital accumulation, $\pi = \inf[\operatorname{and} n, \ln p] = \log$ of population, $l = \operatorname{literacy level}$, $\ln e = \log$ of exchange rate and $\ln o = \log$ of trade openness.

Presence of serious multicollinearity between regressors will result in estimates that contradict the stance of theory (Hamsal, 2006) ^[25]. Most researchers consider correlation value of 0.9 to be a threshold beyond which autocorrelation is problematic (Asteriou and Hull, 2006) ^[8]. We ascertain that our estimates of system GMM do not suffer from serious autocorrelation problem by assessing the correlation between

the regressors of our model. Table 2 is our result of the correlation analysis. It is evident from the result of the correlation analysis that all correlation coefficients between our explanatory variables are far less than 0.9. This does not only suggest absence of problematic correlation between all our explanatory variables but also proves that our estimates from system GMM estimators are reliable.

	ln u	$\ln c$	ln g	$\ln f$	π	ln p	l	ln e	ln o
ln u	1.000								
$\ln c$	-0.0566	1.0000							
ln g	-0.2987	0.1286	1.0000						
$\ln f$	-0.2062	0.0947	0.9439	1.0000					
π	0.1351	-0.2270	-0.1277	0.0194	1.0000				
$\ln p$	-0.3186	0.1723	0.1881	0.1172	0.0553	1.0000			
l	0.2836	-0.2683	-0.1514	-0.0503	0.1735	-0.1640	1.0000		
ln e	-0.2174	-0.3292	0.1861	0.0845	-0.0908	0.0339	0.0921	1.0000	
ln o	0.0323	0.0915	0.0878	0.1381	-0.0140	-0.0233	0.2274	0.0040	1.0000

Table 2: Correlation Matrix

We observe positive correlation between economic growth and public sector corruption, capital accumulation, population, exchange rate and trade openness; between capital accumulation and public sector corruption, inflation, population, exchange rate and trade openness; between inflation and unemployment, population and level of literacy; between population and public sector corruption and exchange rate; between exchange rate and level of literacy and trade openness; between trade openness and unemployment, public sector corruption and literacy level and between literacy level and unemployment. On the other hand, we detect negative correlation between public sector corruption and unemployment, inflation, exchange rate and level of literacy; between economic growth and unemployment, inflation and level of literacy; between capital accumulation and unemployment; between population and unemployment, literacy rate and trade openness; between exchange rate and unemployment and inflation and between inflation and trade openness.

If series have a unit root, the tendency is that estimates produced using the series are biased. Thus, in order not to have bias estimates, we employ Choi (2001) ^[14] (Fisher type) and Levin, Lin and Chu (2002) unit roost tests to test for presence of a unit root in all our series. We report results of the unit root test in Table 3.

	Levin, Lin & Chu		ADF Fisher Chi-square		
Variable	Level	First difference	Level	First difference	
ln u	-6.7500***	-	212.9280***	-	
ln c	0.0897	-3.4691*** ^d	68.4337	121.7172***	
$\ln g$	-9.5453***	-	123.7485***	-	
$\ln f$	-9.2755***	-	75.7147	254.7555***	
π	-6.8045***	-	184.8819***	-	
ln p	-5.0696***	-	173.8652***	-	
l	-6.1e+03***	-	25.8258	200.0058***	
ln e	-2.5690***	-	163.1493***	-	
ln o	-4.5231***	-	18.2971	160.5735***	

Table 3: Unit Root Test Result

Note that **** denotes statistically significant at 1%.

Our unit root test result proves that all series are stationary. In particular, in the Choi (2001) ^[14] unit root test, all our variables except log of public sector corruption, log of capital accumulation and literacy level are stationary at level while in the Levin, Lin and Chu (2002) test, we find that all our series, but log of public sector corruption are stationary at level. For both the two tests, no series is found to be stationary at second difference.

Table 4: One and Two Step System GMM Estimates

	One- Step		Two Step		
Variable	Coefficient	Std. Er	Coefficient	Std. Er.	
$\ln u_{i,t-1}$	0.9425***	0.2402	0.9420***	0.2396	
$\ln c$	0.1470	0.2757	0.1468	0.2782	
$\ln g$	-0.4373**	0.2220	-0.4416**	0.1892	
$\ln f$	0.3655**	0.1565	0.3671***	0.14971	
π	-0.3484*	0.1865	-0.3520**	0.1601	
ln p	0.0302	0.0280	0.0307	0.0250	
l	-0.4238*	0.2230	-0.4238*	0.2235	
ln e	0.0399	0.0360	0.0402	0.0357	
$\ln o$	-0.0234	0.0365	-0.0231	0.0357	
AR(1)	-2.06 [0.039]		-2.05 [0.041]		
AR(2)	-1.36 [0.175]		-1.34 [0.180]		
Sargan	0.00 [0.979]				
Hansen	0.00 [0.970]				

Not that *, ** and *** respectively denote statistically significant at 10%, 5% and 1%. [.] denotes p-value.

Table 4 is our one and two step system GMM results. We observe that the impact of all our regressors on unemployment in terms of sign and level of significance remains the same for both the one step and two step system GMM estimates. Coefficient of a year lag unemployment for the two estimators is positive and statistically significant at 1%; implying that unemployment is highly persistent in Sub-Saharan Africa. We obtain an insignificant impact of

corruption in the public sector on unemployment for both the two estimators, with the sign of coefficient of corruption in public sector being positive. This suggests lack of strong evidence to conclude that corruption in the public sector is a strong determinant of unemployment in Sub-Saharan Africa. We hypothesise that grease the wheel effect is the reason for the weak impact of public sector corruption on unemployment in these countries. As we have pointed out earlier, grease the wheel hypothesis posits that corruption among other things, speeds up activities and processes of bureaucracy, as a result, reduces costs caused by delays in the process of administration and this enhances economic growth and employment of labour. Just like the coefficient of public sector corruption, coefficients of population and exchange rate for the one and two step system GMM estimates are positive, but statistically insignificant. All other things constant, sign of the coefficients of population and exchange rate are natural particularly for developing countries. Though the coefficients of these variables for both the estimators are not statistically significant, coefficient on population suggests that if there are more people in Sub-Saharan Africa, all else equal, there will be somewhat high unemployment in these countries. This finding corroborates Sadikova et al. (2017) who report that population has long run positive influence on unemployment in Russia. With regard to exchange rate, its coefficient suggests that weakening of Subcurrencies Saharan African countries' increases unemployment slightly in the continent. We suppose that the inability of firms in these countries to import much raw materials used for production when the value of their currency against other currencies falls is the reason for the positive impact of exchange rate on unemployment in these countries. Most firms and or producers in Sub-Saharan African countries rely heavily on imported raw materials for their production. A fall in the value of currency of these countries therefore, makes importation of these raw materials expensive⁵. All other things constant, producers and or firms in these counties will import less of these key raw materials,

⁵A fall in value of the currency of these countries means more units of their currencies is required by firms and or producer in order to import a given quantity of an input, making importation of the input expensive.

thus, are forced to reduce their production capacity, maintain small workforce, the result of which is increase in unemployment. We also observe a direct significant association capital accumulation between and unemployment; indicating that investment in new equipment strongly boosts unemployment. This finding does not support Heimberger (2019)^[28] who find a negative and strong association between unemployment and capital accumulation for OECD countries. We suppose that non accumulation of capital in sectors that are capable of reducing unemployment such as the export sector in sub-Saharan Africa is the reason for the positive effect of capital formation on unemployment. Kee and Hoon (2005) ^[32] show that increase in capital stock in export sector reduces unemployment. They argue that if capital stock in export sector increases, demand wage that firms can afford to pay relative to worker's fallback income rises thereby lowering equilibrium unemployment.

Coefficients of economic growth for both the estimators is negative and statistically significant. This is a strong evidence that economic growth is a main determinant of unemployment in Sub-Saharan Africa. The coefficients further suggest that growth in the economy of Sub-Saharan Africa is necessary for success of the fight against unemployment in these countries. Likewise, in both the one and two step system GMM estimates, we observe negative significant impact of inflation and literacy rate on unemployment. This implies that inflation and literacy level are strong factors that reduce unemployment. Our observed relationship between literacy rate and unemployment is expected, since people who are literate have the basic requisites for employment and therefore, have a high chance to secure a job. Besides, the literates are aware of the negative consequences of unemployment for them in particular and for the society in general, thus, since they have the knowledge and skills necessary for self-employment, they instead of waiting to get employed by someone else, government or an organisation, employ themselves by engaging in one form of economic activity or the other. Ceteris paribus, this reduces unemployment in these countries. With respect to the effect of inflation on unemployment, our evidence supports the short run Philips curve of inverse association between inflation and unemployment⁶. It is also consistent with Dritsaki and Dritsaki (2012)^[18] who also establish that shocks to inflation cause a reduction in unemployment in Greece during the first period considered for the study. This finding however, runs contrary to Haug and King (2014) [27] who report that inflation leads unemployment by three to three and half years in circles that last from eight to twentyfive or fifty years in the US. Also, the findng does not confirm Heimberger (2019)^[28] for OECD countries. The impact of trade openness on unemployment is negative, but insignificant. It suggests that more involvement of Sub-Saharan African countries in trade with the rest of the world does improve unemployment in the continent, however, weakly. Our established relationship between trade openness and unemployment is in line with Hasan et al. (2012) [26] that find that trade liberalisation has negative effect on unemployment in India and Dutt et al. (2009)^[19] who observe strong evidence of negative effect of trade openness on unemployment for countries that are labour-abundant and Felbermays et al. (2011) that shows inverse relationship

between trade openness and unemployment for 20 OECD countries.

We present results of two postestimation tests - the Aellano and Bond test for autocorrelation in residuals of our estimated models and the Hansen and Sargan tests for correct model specification and valid overidentified restrictions (validity of instruments) in Table 4. For the autocorrelation test, it is expected that residuals of the system GMM estimates should contain first order autocorrelation (R[1]), i.e., we reject null hypothesis of the test but there should not be second order autocorrelation (R[2]), i.e., we accept null hypothesis of the test while the model specification and valid overidentified restrictions test requires that null hypothesis of both the Hansen and Sargan tests be accepted. Table 4 shows that null hypothesis of our R(1) test for both the one and two step system GMM is rejected at 5%, however, it is accepted for R(2). This is an indication that there is no second order autocorrelation. Table 4 as reveals that null hypothesis of our Sargan and Hansen tests is rejected, i.e., is not statistically significant; affirming that the instruments that we use for both the two estimators are valid.

5. Summary and Conclusion

We apply one and two step system GMM estimators to investigate the impact of corruption in the public sector on unemployment in Sub-Saharan Africa. A total number of thirty-three Sub-Saharan African countries were selected purely on the basis of available data on our variables of interest over the period 2005-2019. Our results reveal negative insignificant association between public sector and unemployment. Besides, corruption we find unemployment to be persistent in Sub-Saharan African countries. We control for the following factors: international factors captured by exchange rate and trade openness, economic growth, level of literacy, population, inflation and capital accumulation in which we use gross capital formation to capture. Our findings demonstrate that capital accumulation exerts positive significant impact on unemployment. Likewise, we establish that population and exchange rate have positive, but infinitesimal effect on unemployment; their coefficients are positive but not statistically significant. In contrast, we find that growth in the economy of Sub-Saharan African countries inflation and literacy level are requisites for the success of fight against unemployment in these countries. Similarly, the impact of trade openness on unemployment is negative by not statistically significant. Based on our observe association between corruption in the public sector and unemployment, we conclude that even though corruption is persistent in these countries there is no strong evidence to contend that corruption in the public sector is a strong factor that engenders unemployment in Sub-Saharan Africa. There is however, strong evidence to contend that other factors economic growth, inflation, level of literacy and capital accumulation are factors that strongly determine unemployment.

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