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Influence of Sector-Specific Components of Growth on Economic Freedom: Evidence from Sub-Saharan Africa

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ABSTRACT: Africa in general and precisely Sub-Saharan Africa (SSA) has been performing dismally in economic freedom determination parameters. This has substantially diminishes the probabilities of keeping up with other regions which have so far flourished in terms of sustainable economic and human development as highlighted through economic freedom index by the Heritage Foundation 2021. It is for this reason that this study purpose to investigate the influence of value added components of GDP on economic freedom. This is explored using a panel of 40 Sub-Saharan African (SSA) countries from 1995 to 2019. Using both conventional unit root and co-integration tests showed that all the series are stationary and co-integrated of order one I(1). Further estimations on the long-run relationship using dynamic panel econometric techniques key in accounting for panel data hiccups. Specifically, fixed effect and general method of moments which is adopted to discourse concerns of endogeneity and serial correlation commonly associated with panel data. Key significant results based on GMM indicate that both value added growth components of industry and service sectors positively and significantly influences economic freedom but the effect is negative regarding value added from agriculture sector. Inward FDI was equally found to positively influence for the overall score of economic freedom for SSA The practical implication is that for an increasing economic freedom, SSA economies or decision makers should gear for policies that improve industrial production by creating an enabling environment, encouraging the service sector through incentives and tax holidays, diversify agriculture and minimize wasteful FDI inflow. All these are critical in a bid to the realization of competitive economic freedom in SSA.

KEY WORDS: Economic freedom; value added components (VAC) of GDP; FDI, SSA, GMM

1. INTRODUCTION

The idea of economic freedom is no longer a new concept, it has previously been debated extensively by different economists applying diverse approaches since the proper documentation of economic theory from the time of Adam Smith; Corbi (2007); N. Ismail (2010). Modern economic growth theories highlighted economic freedom as an important factor of economic development and prosperity in a country Kacprzyk (2016) where most of these studies conducted investigation to check possible associations amid economic freedom and economic growth, it mainly depicted a positive and significant impact of economic freedom on growth Emini (2021); Brkić, Gradojević, and Ignjatijević (2020); Nadeem, Yang, Akhtar, Dong, and Niazi (2019); Xu (2019) and Acikgoz, Amoah, and Yılmazer (2016), Awan and Naeem (2020). All these study works in perspective have given less attention to the vice versa (i.e., the influence growth has on economic freedom). This idea of economic freedom which was for long abandoned, has nowadays become centerpiece of macroeconomic discussion for developmental economists. This move has been facilitated by the resurgence of indices for ranking various countries' on economic freedom scale mostly calibrated from least 'Free' to 'Freest'. Currently, two widely accepted indices of economic freedom exist; the Fraser Institute index[1] and also the Heritage Foundation index[2] that implore similar measurement techniques in calibrating economic freedom. This study adopted the Heritage foundation index in line with most studies of economic freedom literature; Singh and Gál (2020). Doran and Stratmann (2021).

[1] https://www.fraserinstitute.org/economic-freedom/dataset

[2] https://www.loc.gov/item/lcwaN0002695/.

According to the Heritage Foundation (2021), Miller, Terry, Anthony B. Kim, James M. Roberts, and Patrick Tyrrell. 2021[3] through their Highlights of the Index of Economic Freedom for the year 2021, the global average economic freedom score is 61.6, and this remained unchanged from that of the year 2020. This score is the highest score recorded in the 27-year history of the Index. Sub-Saharan Africa recorded a score of 55.7 which is below the world score by 5.9 points. As the world continues to recover from the coronavirus pandemic, economic freedom will be more important than ever in determining economic development of nations and forecasting the future state of these nations.

Sub-Saharan African countries' scores generally fall into the mostly unfree category of economic freedom, this category is associated with low incomes which is below the world average, systemic corruption instigated by respective governments and failure in implementation of developmental policies. Although the SSA's overall economic freedom climbed up from 55.0 to 55.7 in 2021. Average GDP per capita ($3,998) is the lowest compared to the five global Index regions. Although some progress was noted in recent years, Sub-Saharan Africa continues to have an Index of Economic Freedom, as measured by the Heritage Foundation, below 60 which is considered poor Miller, Kim, Roberts, and Tyrrell (2020). Among the 48 countries in the region, only Mauritius is mostly free (score of 70-79.9), while Botswana, Rwanda, Namibia, Tanzania, Seychelles, Cabo Verde and Cote d'Ivoire are moderately free (score of 60-69.9). Majority of the countries in SSA including South Africa are in the category of mostly unfree (50-59.9). Eight countries in the region are in the repressed (score of 0-49.9) category. This stances a threat because economic freedom is believed to bring about prosperity in an economy according to the Heritage Foundation (2021) report. Economies with more economic freedom stand a better chance of achieving higher wealth and enhanced living standards, which culminates to a better investment and business environment that allows an economy to thrive (economic growth) and to attract inward FDI. Over the years, academic studies have identified that economic freedom is an important prerequisite to economic growth leaving a gap for the specific sectors. However, there is still a lot of debate on whether and on to which extent does economic freedom increases the wealth of a country's poorest individuals through several factor players such as economic growth in terms of its sectoral approach and the inflow of foreign direct investment. Both theory and practice agree that economic freedom leads to economic growth of the country. Economic development, income equality, human development and environmental researchers could find this concept potential idea for their research. A review of relevant economic freedom literature supports a positive influence of economic freedom on the economy Sooreea-Bheemul, Rasool, and Sooreea (2020); Hall and Lawson (2014), Shahabadi and Bahari (2014). In addition, Ivanović and Stanišić (2017) found robustly positive relationship between trade freedom (a proxy of economic freedom) and economic growth with a significant effect of FDI on economic growth. Others evident that positive externalities of FDI are hardly achieved without both economic growth and economic freedom, which needs sound monetary policies and stable financial development (Satrovic and Muslija (2019) for robust economic freedom. The policies adopted provide through unwavering growth realization and foreign direct investment and positive externalities from FDI. Further intuition by Azman-Saini, Baharumshah, and Law (2010) earlier asserted that the influence FDI has on growth is contingent on the economic freedom level and further outlining the fact that economic freedom encourages individuals to face risks and to start up new business ventures in an enabled environment. Additionally, economic freedom stimulates foreign trade and tends to attract foreign direct investors. The effect of FDI on economic freedom has also been debated extensively in economic literature. Furthermore, the existing researches mainly use global and regional samples where a few countries that meet the data criteria were taken to represent Sub-Saharan Africa or included as a regional dummy. The assemblage of sub-Saharan African countries with other developed global regions such as those in Europe or America may result to sample selection bias as these regions are already developed and democratic Fofana (2014); Ciftci and Durusu-Ciftci (2021). We consequently restrict our sample to sub-Saharan Africa so that we can give an unbiased reflection of the effects of VACs of growth and FDI on economic freedom of this region. Evidence from several theoretical and empirical studies attests to the presence of a association between economic freedom and growth (Akin, Aytun, and Aktakas (2014); Pääkkönen (2010); Justesen (2008);). There is also a considerable number of other studies that examine the impact of economic freedom on FDI (Herrera-Echeverri, Haar, and Estévez-Bretón (2014); Iamsiraroj (2016), (Cung and Nhung (2020); Nguyen, Bui, & Vo, 2019). These works show that countries with lower levels of economic growth are likely to have restrictions on capital inflows and consequently a lack of economic freedom. Contrary to the findings above Sarıbaş (2009) and Santiago, Fuinhas, and Marques (2020) examined the relation of economic growth to economic freedom. Their results suggest that economic growth is negatively associated with economic freedom and a negative impact resulting from EFI on economic growth in the long run respectively. It is however less clear in the literature whether sector-specific value-added components of GDP amid the inflow foreign direct individually impacts on economic freedom especially for Sub-Saharan Africa region. This is why this paper aims to seal this gap by providing empirical evidence on this matter of interest by

[3] https://www.heritage.org/index/pdf/2021/book/2021_IndexofEconomicFreedom_Highlights.pdf.

theory, design and findings. In order to innovatively validate the theory through robust findings amid the five real variables, this study holistically aims to extensively explore this area of research despite the mixed findings.

This paper underwrites to the literature in two key ways. First, irrespective of its exceptionality of being among the few studies in this area, and side from impact of FDI and sector-specific value-added components of growth on economic freedom, it analyzes the full effects of the three proxies for GDP and FDI resulting to new relevant findings. Secondly, the paper has employed various specifications and most recommended panel data estimators including the fixed effect model and generalized method of moments (GMM) to gain an overall insight on the role of FDI in economic freedom with a large sample of 40 countries. The research intends to validate the existing literature on the impacts of value-added components of GDP and FDI and economic freedom using more current data and precisely large sample size. The study concentrated on Sub-Saharan Africa in order to give a comprehensive explanation relating to this region.

The remaining parts of this paper are structured as follows; ***Section 2*** does literature review regarding sector-specific value-added components of GDP growth, foreign direct investment and economic freedom, ***section 3*** describe the empirical methodology while *4* does analysis of results. ***Section 5*** does discussion of results while identifying with the relevant literature. S***ection 6*** concludes the study while forwarding policy recommendations.

2. LITERATURE REVIEW

The current section discusses the relationship economic freedom has with growth through its sector-specific components and the inflow of foreign direct investment as provided by a survey of theoretical and empirical literature linking the variables.

Numerous studies have attempted to uncover the nature of the relationship between economic freedom and economic growth. Using a variety of econometric methods and different indicators of economic freedom, scholars attempted to answer the same question: does economic freedom lead to economic growth? Moreover, a few studies have also attempted to determine which sector of growth contributes most to economic freedom. There is almost unanimous conclusion that economic freedom has positive effects on the economic growth and the influx of foreign direct investment of developed countries, but when it comes to developing countries like the Sub-Saharan Africa this relationship is not conclusive Kešeljević (2018), and Santhirasegaram (2007). Previous research by, Murphy and O'Reilly (2019), Bennett et al.2017, Faria et al. 2016; Doucouliagos and Ulubasoglu (2006) indicated that the variable of economic freedom is positively related to economic growth thus economic freedom has a robust positive effect on economic growth regardless of how it is measured.

A plethora of studies have continued to confirm the relationship between freedom and growth. These studies include the works of Ivana Brkić et al. (2020), who investigated the impact of economic freedom from the Heritage Foundation on growth for 43 developing and developed European economies for a period of 20 years using system GMM. The results indicate that, upsurge in economic freedom (not in levels) is related to economic growth his study was in line with works of Malanski and Póvoa (2021); Piątek, Szarzec, and Pilc (2013), Bayar (2017) who discovered that economic freedom was necessary to spur economic growth in an economy.

Further and in line with the current study, Sayari, Sari and Hammoudeh, (2018) investigate the influence between FDI and the value-added components of GDP on EF in 30 European countries Western Europe and Central and Eastern Europe. The result shows service value added and industry value added are positively related to EFI in the long run while a negatively relationship was noted for the agriculture value added. A slightly significant and negative association between EFI and FDI in the random effects model was documented. Further a positive long-run relation between EFI and FDI in the sub-regions of Western, Central, Eastern European countries was observed. While they separately analyze the subgroup of Eastern and Western European countries, FDI becomes insignificant for Central European countries and negatively significant for Western European countries.

The study by Moussa, Çaha, and Karagöz (2016) survey the impact of EFI on FDI inflows both regionally and globally. They include the ignored regions such as Sub Saharan, Post-Soviet and conflict-affected countries and utilized the panel data analysis. Results show FDI is largely affected EFI macro-economic variables in different regions with the fixed-effects model. The European region obtains the largest degree of EFI with all the 9 regions including Sub-Saharan Africa confirming a positive influence of EFI on FDI. Variables such as political stability, corruption level of the country, institutional rights, and financial market and employment regulations, account for more than 80-90% of variations in FDI. The cumulative effect of the EFI and FDI are having a positive and significant effect on economic growth, and distinct factors might affect the countries differently; some, factors are significant in one country compare to the other.

Equally, Țaran, Mironiuc, and Huian (2016) examined the determinants of FDI inflow at the multiregional level. The study took the 75 countries' research utilized the data from the Heritage Foundation as used in this study. They presented in European regions, EFI does not have any significant impact on FDI in the said region. However, the overall EFI for other regions leads to the increment in FDI. The long established economic theories according to Voyer and Beamish (2004) and Singh and Gál (2020) suggest that

macroeconomic determinant of EFI create the economic conditions to attract the FDI inflows in host countries as it reduces the decisive effect and uncertainties. The research explored by Makwana (2021); Korle, Amoah, Hughes, Pomeyie, and Ahiabor (2020) in their works observed the positive significant impact of economic freedom on FDI where a unit change in economic freedom rises FDI inflows up to 0.0835 units for the Indian and for selected African economies respectively. Additionally, Onyeiwu (2004) shows that the Sub-Saharan Africa region has to maintain price stability reduced the taxes and control corruption so as to enhance the FDI inflow.

In conclusion to this section the reviews of relevant literature have been very informative in explaining the stronger relationship that exists between economic freedom, the different sectors of growth and foreign direct investment. The authors successfully presented the empirical literature for Sub Saharan Africa and temporarily draws three conclusions. *Firstly* the impact of the various factors under study on economic freedom could be positive or negative sign. *Secondly*, there are still a few studies that have addressed the impacts of sector-specific VACs of GDP and FDI inflow in general case but no particular case noted for Sub-Saharan Africa. This study also deals with inverse of the impact of economic freedom on various macroeconomic variables such as economic growth and the FDI where most researches elude. This makes this research unique in addressing this gap that exist in literature especially for Sub-Saharan Africa, employing the linear static panel data estimators; fixed effects as well as linear dynamic panel data estimator GMM model to explore the influence of sector-specific VACs of GDP and the FDI inflow on EFI in the said region.

3. METHODOLOGY

3.1 Data

This study used annual panel data for the period 1995–2019, including 44 Sub-Saharan Africa from Eastern, Southern, Central, and Western Africa excluding those countries on the northern part.[4] The period used has been chosen based on the availability of data; the previous years have a lot of missing data to warrant analysis. However, some countries[5] were dropped from the sample as they all have an impermissible amount of randomly missing data. Other missing values on respective countries are filled in with values of five-year moving averages Fölster and Henrekson (2001).

Our dataset has been obtained from Heritage Foundation for economic freedom while the data for the remaining variables were obtained from the World Development Indicators database (WDI)[6] published by the World Bank (2021). All data used in these indexes are from government sources and have been verified with independent, credible third-party sources.

3.2 Variables description

The dataset consist of the variables listed below. These variable are in constant US dollars; Ozcan, Aslan, and Nazlioglu (2017) indicate that the Index of Economic Freedom (EFI) published by The Heritage Foundation is a suitable proxy for economic freedom, while Industry value added (IND), Service value added (SER) and Agriculture value added (AGR) are proxy variables for economic growth and Foreign direct investment net inflows (FDI). All the variables were taken in their natural logs so as to control their different variations in the data set.

Industry value added (IND), service value added (SER) and agriculture value-added (AGR) are proxies of growth (GDP) Sayari et al., 2018. In order to take into full consideration of issues relating to variable omission bias, the current study adopted one control variable in the conditioning information set, notably: inflow of foreign direct investment. The control variables which are consistent with economic development literature (Asongu, 2018b) is restricted to one because upon preliminary empirical examination, it was ostensible that application of more than one control variable generates concerns of instrument proliferation and over-identification for this study. This procedure of adopting limited control variables in the Generalized Method of Moments (GMM) approach (aimed to avoid invalid models that do not pass post-estimation diagnostic tests) is common in the empirical literature. In essence, there is an abundant supply of GMM literature that has used limited control variables, notably: (i) zero control variable (Asongu and Nwachukwu, 2017b) (ii) one control variable (Yameogo, Omojolaibi, and Dauda (2021)) and (ii) two control variables Asongu and Odhiambo (2020)

3.2.1 Economic freedom index

The economic freedom index was first developed by the Fraser Institute 1974 and later by the Heritage Foundation in 1995. Both the Fraser Institute and the Heritage foundation indexes have been used widely by researchers in determination of economic trajectories of various economies including, (Graafland, 2020; Nikolaev and Bennett (2017)); Graafland and Lous, 2017; Panahi et al., 2014; Young and Makhija, 2014; Justesen, 2008; Baughn et al., 2007; Doucouliagos and Ulubasoglu, 2005; and many others).The two indexes in practical terms yield similar results in economic freedom. However, the Heritage Foundation index was

[4] These are the list of countries found on the southern part of Sahara desert excluding 5 countries in North Africa including: Algeria, Egypt, Libya, Morocco and Tunisia

[5] Sudan, South Sudan, Somalia, Sao Tome Principle, Comoros, DRC, Liberia and Seychelles

[6] https://databank.worldbank.org/reports.aspx?source=world-development-indicators.

employed in this study since its coverage in terms of variables, countries and years assessed is greater. According to heritage foundation 2020, this index includes 12 quantitative and qualitative factors, which are grouped into four broad categories: Rule of law which include property right, judicial effectiveness and freedom from corruption, Government size which covers tax burden, fiscal freedom, and government spending Regulatory efficiency, which includes business freedom, labor freedom, and monetary freedom and finally Open markets, which includes trade freedom, investment freedom, and financial freedom

Each component is considered to be equally important for economic freedom, and the 12 factors are rated on a scale from 0 to 100 and each country's overall score is calculated by taking the average of these 12 factors. Judicial effectiveness and fiscal health components are available from 2017, and the labor freedom component since 2005, thus tested for a short period of time (2005 – 2018). Judicial effectiveness and fiscal health have been excluded from the analysis due to limited data availability.

3.2.2 Foreign direct investment

Foreign direct Investment is the influx of external investment in home economies. FDI is usually the net inflows of investment divided by GDP, including the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as always shown in the balance of payments. It is considered as a tool of both transfer and introduction of new technology. FDI can be reflected as one of the key transmissions of innovative expertise from influential to evolving economies (Zandile and Phiri (2019)). Even though all the other variables are in natural log, FDI has some negative values in its data set thus it was not transmuted into natural log, instead it was used as a percentage of GDP this was helpful in dealing with the problem of heteroscedasticity in the results. Generally it is contended that FDI has positive influence on economic performance of host countries by providing them new skills, technology and employment bases as postulated by Adegboye, Osabohien, Olokoyo, and Matthew (2020) Bosede Adegboye, Femi Adesina, Aanu Ojeka, Abosede Akinjare, and Omowunmi Olokoyo (2020) and Amoo 2018

3.2.3 Value added components of GDP

These variables include; industry, service and agriculture sector-specific components of GDP, hence are the proxies of gross domestic product (GDP). The Industry value added (IND) comprises the value added in mining, manufacturing, construction, electricity, water, and gas. It is calculated without making deductions for the depreciation of fabricated assets or depletion and degradation of natural resources. Service value added (SER) includes the value-added in the wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional and personal services such as education, healthcare, and real estate services. SER also includes imputed bank service charges, import duties and any statistical discrepancies by the national compiler as well as discrepancies arising from scaling. Agricultural value added (AGR) includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value-added encompasses the net output of a sector after adding up all outputs and subtracting intermediate inputs. Both economic freedom index and all the three value-added components of GDP used in the study are expressed in natural logarithms, FDI net inflow as a percentage of GDP because it has negative values and EFI is used as the overall score of the 12 factors. Finally, we choose the 25-year period spanning from 1995 to 2019.

3.3 Descriptive statistics

A comparative analysis of the various variables for this study were presented in Table 1. The results revealed the following with regards to; EFI, with A=3.994, SD=07072. The results indicate that the EFI for the SSA is relatively low. Further, FDI has A= 3.697, SD=3.3857, indicating an averagely low FDI and higher standard deviation for the region. The three value added components of GDP; Agri. A=22.04, SD= 0.72745, Serv. A=23.05, SD=1.0292 and Ind. A= 22.65, SD= 1.00024, the average values for the three components are moderately large and slightly vary; this indicates that SSA countries do not have much different economies of scale per sector.

The normality assumptions for the variables were specified in the values of kurtosis and skewness. A variable said to be normally distributed if the value of skewness and kurtosis is 0 and 3 respectively. The result in Table 4 below revealed that, Agri., Serv., Ind., and FDI are tailed to the right (right skewed) meaning that these variables are flattening to the left, while the EFI is negatively skewed, thus flattening to the right. For peakness (Kurtosis) of the distribution, Serv. and Ind. have a platykurtic distribution (value of kurtosis below "3"), whereas EFI, Agri. and FDI had a leptokurtic distribution (value of kurtosis greater than "3"). It is therefore confirmed that none of the variables satisfied the kurtosis and skewness conditions of normality, thus no variable is normally distributed. The logs were therefore applied to normalize the results in most variables (MUSLIJA (2018)) The Jarque-Bera (JB) normality test was used to confirm the rejection of the normality test for the kurtosis and skewness. The JB test, with the null hypothesis that a variable is normally distributed, was rejected with a probability value less than 0.05.

Table 1: **Descriptive Statistics**

Variable	Average(A)	SD	Skewness	Kurtosis	JB test
LnEFI	3.994	0.071	-0.580	3.301	59.85***
LnAgri.	22.04	0.727	0.521	3.123	45.94***
LnServ.	23.05	1.029	0.141	2.082	38.41***
LnInd.	22.65	1.000	0.056	1.718	69.046***
FDI	3.697	3.386	3.742	26.942	26217.4***

Source: Authors' own computations

*Note: *, **, *** indicate level of significance at 10 percent, 5 percent and 1 percent respectively. The usage of Jarque–bera test was to determine if the variables conform the normal distribution.*

4. EMPIRICAL RESULTS

4.1. Cross-sectional dependence

A cross-sectional dependence test comes in handy especially when deciding on whether to use first or second-generation panel unit root tests. The following two tests were performed: the Breusch-Pagan LM and the Pesaran CD. Evidence from Table 2 below suggests rejection of the null hypothesis of no cross-sectional dependence, i.e., there is cross-section dependence among the regressors at 1% level of significance for the Breusch-Pagan LM test. This means that there is a certain level of dependence among Sub-Saharan Africa countries, thereby confirming the appropriateness of the application of first-generation panel unit root tests for this study.

Table 2: Cross-sectional dependence

Tests	**Breusch-Pagan LM**	**Pesaran CD**
LnEFI	0.0048***	22.11***
LnAgri	0.5588***	111.47***
LnInd	1.0203***	94.92***
LnServ	1.044***	116.74***
FDI	12.13***	22.54***

LM – Lagrange Multiplier, CD – Cross-sectional Dependence

Table 3: Spearman's rank correlation

	LnEFI	LnAgri	LnInd	LnServ	FDI
LnEFI	1.000				
LnAgri	-0.0982***	1.000			
	(0.0019)				
LnInd	-0.0509	0.7771***	1.000		
	(0.1074)	(0.000)			
LnServ	0.0836***	0.7900***	0.9266***	1.000	
	(0.0082)	(0.000)	(0.000)		
FDI	0.1304***	0.2032***	0.0737***	0.1502	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	

From the correlation matrix it was evident that the value added components of GDP are strongly correlated to each other. This implies that industry adds to both the service sector and the agriculture sector and the vice versa is also true i.e., 0.93, 0.79 and

0.78 respectively. The economic freedom proved to have a negative significant correlation with the agriculture sector though significant and positively correlated to both the service sector and FDI. For the FDI, a slightly low positively significant correlation was portrayed for the value added components of GDP with the industrial sector registering the lowest correlation of 0.074 with

4.2 Unit root test

Usually, the panel data model needs to test the stationarity of the data before carrying out any regression (Wang et al., 2015). The essence of the test is carried out in order to avoid spurious analysis and to check if the data are not integrated of order 2. The determination of the order of integration among the variables for setting up the econometric model and to show whether certain variables are integrated or a random walk and check whether variables are integrated of the same order so as to undertake panel unit root test using three first generation unit root test as guided by the cross-dependence tests, including Levin Lin and Chu 2002, Im, Pesaran and Shin 2003 and Breitung 2000. In this regard therefore, these tests are basically used as descriptive tools to classify the series as stationary and non-stationary. If there is a stationary linear combination of the non-stationary random variables, the combined variables are said to be cointegrated. The panel unit root tests, displayed in Table 4, shows that each variable is integrated of order one on the overall sample. The panel unit root results sanction the likely presence of panel cointegration, which was perform next.

Table 4: Panel unit root test

Series	Lean, Lin & Chu (LLC)		Im, Pesaran & Shin (Phillips & Perron)		Breitung	
	Level	1st diff.	Level	1st diff.	Level	1st diff.
LnEFI	-13.44***	-31.98***	-0.9167***	-27.95***	-15.18***	-4.306***
LnInd	1.618*	-.6482***	2.0583*	-6.337***	1.860*	-3.793***
LnAgri	-0.055**	-5.592***	1.580*	-8.15***	1.983*	-1.630*
LnServ	1.491*	-5.995***	1.147*	-7.920***	3.858*	0.2792*
FDI	-2.716***	-13.47***	-4.537***	-18.78***	-4.126***	-10.58***

Source: Authors' computation

The results of the three panel unit root tests are shown in the table 2 above. The variables of economic freedom and foreign direct investment are found to be stationary at their log levels within the three tests conducted, rejecting the null hypothesis of non-stationarity at 1% significance level. For LLC test agriculture is stationary at 5% level of significance at level. The rest of the variables are stationary given the 10% level of significance at level. In the first difference the variables of economic freedom, industry and FDI becomes stationary at 1% level of significance level for all the three unit root tests. Moreover, for Breitung test, the variables of agriculture and service become significance only given the 10% level of significance. Therefore, the relationship between economic freedom and the other variables can be further identified by the co-integration test.

4.3. Cointegration tests

Panel co-integration tests can examine the long-term equilibrium between variables. The study has noted the order of integration to be a mixture of I(1) and I(0). Therefore, the study further conducts cointegration test by Pedroni (1999) and Kao, Chiang, and Chen (1999) tests. The co-integration relation of Pedroni test is described by the inner scale and the group scale according to different test strength of each statistic, so it presents 7 statistics. The Pedroni test is based on the overall panel fixed effects model:

$$y_{it} = \alpha_i + \delta_i t + x_{it}\beta_i + \mu_{it} (i = 1, 2, ...N; t = 1, 2, ...T) \quad (3)$$

Where y_{it} and x_{it} are integrated of order one in levels, β_i represents the coefficients, μ_{it} denotes the estimated panel residuals. α_i *and* δ_i are the cross-section fixed effect and period fixed effect, respectively. The auto-regressive test for the estimated panel residuals is as follows:

$$\widehat{e}_{it} = \rho_i \mu_{i,t-1} + v_{it} \quad (4)$$

Where v_{it} represents the random error term and ρ_i the autoregressive term of the estimated residuals. Pedroni's framework provides co-integration tests based on seven residual-based statistics Pedroni (1999). For the seven statistics, the panel v-statistic, panel rho-statistic, panel PP-statistic and panel ADF-statistic are based on the within-dimension. The remaining three statistics; Group rho-Statistic, Group PP-Statistic and Group ADF-Statistic are based on the between-dimension. (Morshed (2010)
For the within-dimension statistics, the null hypothesis of no cointegration for the panel cointegration test

$$H_0 : \rho_i = 1 \, for \, all \, i \quad (5)$$

$$H_0 : \rho_i = \rho < 1 \; for \; all \; i \tag{6}$$

For the between-dimension statistics the null hypothesis of no cointegration for the panel cointegration test is

$$H_0 : \rho_i = \rho < 1 \; for \; all \; i \tag{7}$$

$$H_0 : \rho_i = \rho < 1 \; for \; all \; i \tag{8}$$

After the stationarity test which had shed greenlight for the study to proceed with cointegration test, the current study employs Pedroni and Kao cointegration tests to test for long-run relationship among the variables and the results are displayed in table 3. The two cointegration tests are similar in hypothesis testing. Panel A which is Pedroni test was further sub-divided in two main tests: the first test consist of four sub-tests, i.e., panel-v, panel-rho, panel PP, and panel ADF statistics. In these tests the regression residuals are pooled along the within dimensions of the panel whereas the second test which comprises of three sub-tests, i.e., group rho, group PP, and group, has its' sub-tests based on drawing together the residuals of the regression along the between dimension of the panel. All the seven sub-tests from panel A have the same null hypothesis of no cointegration. The current results have revealed that at least four out the seven statistics are significant. (Lee and Chang (2008); Narayan, Smyth, & Prasad, 2007) maintained that if at least four statistics are significant, the null hypothesis of no cointegration could be rejected and hence cointegration exists.

Consequently, (Kao et al., 1999; Pedroni, 1999) suggested that for a reliable conclusion about the existence of cointegration, panel ADF and group ADF have to be considered as they have better small sample properties and as such their statistics provide reliable estimates. Following these authors, it can be concluded that long-run relationship exists among the variables. Further, Ã-Rsal (2008), also asserts that the Panel ADF-statistic is known to have a better performance than other statistics. In this study it was found that at least four out of the seven statistics for Pedroni test and the ADF statistic from panel B i.e., Kao test are significant. These include panel ADF and group ADF are significant. Based on the results of this tests, this paper comes to a general conclusion that there exist long-term relationship among the variables for SSA.

Table 5: Results for Pedroni and Kao cointegration tests

	Statistic (No trend)
Panel A:	
Within Dimension	
Panel v-Statistic	-0.339910
Panel rho-Statistic	1.136331
Panel PP-Statistic	-2.889083***
Panel ADF-Statistic	-1.803390**
Between Dimension	
Group rho-Statistic	3.036288
Group PP-Statistic	-4.510990***
Group ADF-Statistic	-2.177282**
Panel B:	
ADF	-6.9554***

***Note**: All reported values are distributed as a typical normal distribution [i.e., N (0, 1)] under the null of unit root or no co-integration. Panel statistics are weighted by long-run variances. The probability shows the rejection of the null hypothesis of no cointegration at the 1 percent significance level.*

4.4 Estimation Results

As shown in table 6-9, we estimate the impact of value added components of GDP and the inflow of foreign direct investment of economic freedom in Sub-Saharan Africa region using a number of regression analysis. These include the fixed effect model and the generalized method of moments.

4.4.1 Hausman test

Table 6: Correlated random effects – The Hausman Specification Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	131.16	4	0.0000
Cross section random effects comparisons:			
Variable	Fixed	Random	Var.(Diff.)	Prob.

LnAgri.	0.06080	0.04152	0.01928	0.0265**
LnInd.	0.03324	0.01598	0.02327	0.0019***
LnServ.	– 0.03266	– 0.012134	– 0.02053	0.0013***
FDI	0.00242	0.002216	0.000203	.

*Notes: ** and *** represent significance at 10%, 5% and 1% levels*

Initially for the random and the fixed effects models, the Hausman test was used to decide on the most appropriate model between them. Table 6 exemplifies the comparison between the two models i.e., the fixed and random effects models. It shows significant differences between the variance of the two models for agriculture, industry and service value added variables at the 5% level for agriculture and 1% significance levels for each of the last two named variables. The variance difference of the FDI variable was estimated though its probability was not displayed by STATA 15.0, however based on the outcome of the majority of variables, employing the random effect model would not be appropriate.

Consequently, the null hypothesis was rejected at 1% level and conclude that the fixed effects model is more efficient than the random effects model. Hence, the fixed effects estimator was adopted to evaluate the influence of the explanatory variables on economic freedom for SSA.

4.4.2 The fixed effect model

In table 7, the dependent variable is economic freedom and the independent variables are three value added components of GDP (i.e., agriculture, service and industry) and foreign direct investment. The results projected clearly shows that the agriculture, industry and service value added variables are significant at the 1% level, indicating that these sectors have clear yet divergent relationships with economic freedom for the 40 countries of SSA. In terms of sector estimates, the results reveals that agriculture value added has a positive and statistically significant influence on economic freedom. The quantitative interpretation of this results specifies that 1 unit increase in agriculture value added spur economic freedom to increase by 6.1 percent. Equally, positive and statistically significant influence on economic freedom was noted for industrial sector and for foreign direct investment. Their coefficients describe that 1 percentage point increase in industry value added and foreign direct investment consequently lead to 4% and 0.2 % increase in economic freedom respectively. On the other hand, the service sector was found to have a negative though significant influence to economic freedom for SSA. The coefficient estimates of at least two of GDP value added components meanwhile proved to have a positive relationship between them and the economic freedom for SSA countries, probably due to governments supporting the sectors, the strength of farmers' lobbies, mushrooming of industries due to enabling environment, sophistication of respective establishments and institutions Sayari, Sari, and Hammoudeh (2018)

R square value shows how much is the variability in outcome is explored by the predictors' agriculture, service and industry value added and foreign direct investment with the dependent variable economic freedom.

Table 7: The fixed effect model

Independent variables	Coefficients
C	2.509***
	(23.06)
LnAgi	0.0608***
	(8.02
LnServ	-0.0327***
	(-5.40)
LnInd	0.03924***
	(5.87)
FDI	0.002419***
	(5.58)
R-squared	0.20
Adjusted R-squared	0.17
N	1000

***Source**: Authors' own computations*

*Note: *, **, *** indicate level of significance at 10 percent, 5 percent and 1 percent respectively. The t values are in parenthesis.*

Results for the two-step system GMM

Flowing a study by Ahmed and Ahmad (2020) in this literature current study applied linear dynamic panel estimator which solve the problem of endogeneity associated with linear static panel data models was necessary at this point. This problem could result measurement error and probable omission of some key variables, this therefore encouraged the model to be estimated with Generalized Method of moments Arellano and Bond (1991).This method has been a dominant technique in panel data study Holtz-Eakin, Newey, and Rosen (1988). It has been used as one of the general estimators designed for circumstances where explanatory variables are not rigorously exogenous and where there exist the problems of heteroskedasticity and autocorrelation within entity Arellano and Bover (1995). For GMM estimators, their application was based on panel data with certain conditions which must be considered before its application. These conditions include: first the number of cross-sections must be greater than the number of time periods in the panel (N>T); secondly the explained or dependent variable should be used as lagged dependent variable; thirdly the explanatory variables are usually correlated with previous values or the current realizations of the error term; fourthly the assumption of the individual fixed effects; and lastly heteroskedasticity and autocorrelation within entities but not across them. GMM usually provides efficient and consistent estimates especially in the presence of heteroskedasticity. This method has developed into a very predominant instrument among empirical academics due to its wide range of application Blundell and Bond (1998). The GMM estimators are usually applied to correct the biasness affected by endogenous variables.

To be furthers specific on application, this section begins with Bond, Hoeffler, and Temple (2001) procedure of determining the most appropriate model between difference GMM and system GMM. A series of model estimation techniques were conducted including; determination of the OLS estimate of the model, fixed effect estimate of the model and its one-step and two-step of the difference GMM. In the entire three models estimation techniques, the value of ϕ which is the constant of the lag of the dependent variable was noted down for comparison. For decision making; the first estimate of the pooled OLS was considered the upper bound estimate while the second estimate the fixed effect was considered the lower bound estimate. The final decision was finally arrived at if the difference GMM estimate obtained was below or close to the fixed effect estimate it suggest that the estimate downward biased because of weak instrumentation. In this stage, the system GMM is preferred and vice versa.

To avoid picking of any GMM method randomly, the authors decided apply a scientific approach that is most efficient, robust and sufficient, this application help in a voiding bias associated with individual judgement. Although Roodman (2009) proved the supremacy of system GMM compare to difference GMM, this study further considered conducting the check on the most suitable model. Following Blundell and Bond (1998), it was revealed that system GMM was considered appropriate, more precisely the two-step system GMM.

Table 8: Deciding between Difference and System GMM

Estimators	Coefficients
Pooled OLS	0.8737
Fixed effects	0.6494
One-step Difference GMM	0.0854
Two-step difference GMM	0.0867

Table 8: The table above shows that the estimates of the first lag of the dependent variable of one-step and the two-step difference GMM estimator as 0.0854 and 0.0867 respectively. These results are well below the fixed effect estimate 0.6494 which is the lower bound, thus it is far below the pooled OLS 0.8737 which is the upper bound. This suggests that the difference GMM estimate is downward biased thus system GMM estimator may be preferred. System GMM was therefore applied in the current and more precisely two-step system GMM which is more efficient and robust compared to the one-step GMM, Blundell and Bond (1998)

Table 9: Panel estimation results (two step system GMM results)

Variable	Coefficient	Std. Error	t-Statistics
1.lnEFI	0.7250***	0.06519	11.12
LnAgri	-0.0533***	0.01848	-2.88
LnInd	0.0246**	0.01111	2.21
LnServ	0.0248**	0.01189	2. 08
FDI	0.0047***	0.01470	3.22
Cons	1.1267***	0.2373	4.75

AR1 – 0.000	AR2 – 0.555	F(5,43) = 46.29	P-value – 0.000
Sargan test – 0.000		Instruments = 41	Groups = 44
Hansen test - 0.148			

Source: *Authors' computations*

Note: *1.LnEFI is the lagged dependent variable; economic freedom index, ** Significance level at 5%, *** Significance level at 1%,*

Finally, we employed a further robust technique of estimation, the two-step system generalized method of moments (GMM) estimator to generate internal instruments for economic freedom and other endogenous explanatory variables. Arellano and Bover (1995) and Blundell and Bond (1998) was specifically applied. This result display a myriad of similarities with both the fixed effect and the ARDL methods. However, as shown on table 4 and 5 the service sector have negative impact for the fixed effect and in the long run for the ARDL method, agriculture sector on the other hand project a negative effect for economic freedom on the GMM and on the short run for the ARDL estimation. The system GMM estimator combines the regressions in differences and levels in a system of equations using the lagged differences instruments for the level series, and the lagged levels of instruments for the differenced series. The two-step system GMM provides more efficient estimators over the one-step system GMM. However, the associated asymptotic standard errors may be biased downwards in the finite sample Bond et al. (2001). It, therefore, applies that Windmeijer (2005) finite-sample correction for the variance of the linear efficient two-step system GMM estimator. This estimator therefore provides further evidence beyond our previous application and the general panel data analysis. The two-step system GMM results indicate that the Hansen and serial-correlation tests do no reject the null hypothesis of correct specification (that p-value of Hansen test and p-value of AR (2) test of Arellano and Bond are larger than 5%), providing support for our estimation results. The p-value of the Hansen test of over-identifying restrictions is equal to 14.8% which is higher than 5%. Hence, we confirm the overall validity of the instruments. Also, the p-value of AR (U.-F. F. Ismail & Nyarko) is equal to 56% (more than 5%) which implies that there is no second order serial correlation. The Sargan test on the other hand fully support this results outcome.

The study demonstrates that, industry and service sector specific value-added variables are significantly and positively related to economic freedom, while the agriculture value added is negatively related but statistically significant to this index for Sub-Saharan Africa. Foreign direct investment equally has a positive and statistically significant impact. Our GMM findings are well supported by previous works of Sayari et al. (2018) who suggested that the negative impact of the agriculture value added component of GDP on economic freedom could arise from several factors. Such as, the agricultural sector which is usually supported by government subsidies and purchases of agricultural product surpluses, and protected by quotas and tariffs that may stoke graft and corruption. As a result, this sector's dependency on the government is likely to have a negative effect on institutions and economic freedom. Further, this sector is usually less sophisticated than the other sectors and vulnerable to the impulses of natural conditions. The agricultural sector may not also contribute much to free trade because of some countries being land-locked, lack of a common language, adequate education and the presence of preferential trade agreements. Finally, since the agricultural sector is usually characterized by monopolistic elements and regulatory constraints, it triggers monopolistic behavior in agricultural production, thereby leading to deterioration in the economic freedom of countries. Natos, Botonaki, and Mattas (2008) on the other hand observed that the effect of the economic freedom of exporters on the agricultural sector is greater than that of importers, while this relationship is completely opposite for the other sectors (i.e., machinery, chemicals and other manufacturing). The opposite relationship between the agricultural and other sectors results from different policies that the agricultural sector faces, which in turn affect a country's institutional environment when agricultural activities dominate. The negative impact of FDI though in line with Sethi, Guisinger, Phelan, and Berg (2003) which shows that this resulted from the changing trends in the flow and determinants of FDI in the last decade due to global macro-economic and strategic considerations, this is an area that is crucial to growth of economies and therefore requires more exploration. We suggest that future research should focus more the effect of other institutional factors on economic freedom index, using more advanced methods of estimation and different regions to ascertain these claims. We also suggest for the comparison of the difference in the impact of agriculture value added on economic freedom between developing and developed economies so as demystify the misery of regional information and approaches on the sector.

Consequently, the results indicate that agriculture loses its primacy even in the developing economies such as SSA, giving way to a moderate growth in the industry sector and that of service sector. To sum up, the results indicate that although the overall economic growth has a positive effect on economic freedom, countries that have agriculture-dominated economies are likely to lose their economic freedom due to underdeveloped industries and services sectors. As a consequence, the economic transformation from agricultural to industrial development has important implications due to changing labor as well as capital distributions. Therefore industrialization, production techniques become more capital intensive, which results in decreasing labor

requirements. In this respect, Sub-Saharan African countries should decide on sector-specific value-added distribution according to their social costs and the social benefits for the economy Singer (1971). Hence, countries that could not find an appropriate balance between agriculture as a sector and other sectors are subject to decline in their economic muscle as well as economic freedom.

5 SUMMARY, CONCLUSION AND RECOMMENDATION

In conclusion of the study, it has been noted that a few scholars have focused on the influence of value-added components of GDP growth and inflow of foreign direct investment on economic freedom. However, the vice versa (positive impact of economic freedom on both GDP and FDI) was unanimously agreed. This application therefore makes this study unique and one of its kind in bridging this loophole that existed in literature more specifically for the Sub-Saharan Africa. As evident on table 8 (on the GMM estimates), two of the three value added components of GDP and FDI projected positive and significant influence on economic freedom, except for the agriculture value-added which gives negative and significant results. Hence, the FDI and the value-added components of GDP were expected to foster EFI.

In order to determine the direction of relationship between the variables of interest, we use the panel data framework due to the well-known fact that panel data methods increase the power of the tests. The relevance of value-added components of GDP growth and foreign direct investments on economic freedom is explored in the panel of 40 Sub-Saran African countries. The observed period ranges between 1995 and 2019. The authors aimed to include the most recent dataset. The models applied are initially estimated using linear static panel data estimators. Results of Hausman test suggest fixed effects. Coefficients of industry and service value added are reported to be significant and positive indicating that promotion of industries and the service sector in an economy is like to spur economic freedom in the observed countries. However, improvement of the agriculture is likely to contract (influence negatively) the economic freedom of a country. Agricultural sector is known to be supported by government through subsidies, purchases of its product surpluses, and protected by quotas and tariffs that may encourage graft and corruption. This resulted the sector's dependency on the government to have a negative effect on economic freedom index, this sector is less sophisticated in relation to other sectors, as a consequence vulnerable to the vagaries of natural conditions (N. Sayari et al. 2018). The inflow of FDI for Sub-Saharan Africa has been hampered by several factors such as political instability, tribal clashes amidst economic sanctions imposed by economic giants resulting to the exodus of profitable MNCs or stall of their operations. In addition, changing trends and determination of FDI in the recent past due to global macro-economic and strategic considerations Sethi et al. (2003); (Tripathi, Seth, and Bhandari (2015)) have also immensely contributed to the stated phenomena. All this incorporated still leads to positive impact on EFI. It is therefore paramount to state that FDI is an unavoidable variable that spur EFI for SSA countries. The robustness tests on the other hand, indicate that the assumptions on no autocorrelation and homoscedasticity are satisfied.

On recommendation of the future research therefore, even though the regression control for factors and results carried out in the current study are robust, more research is clearly warranted. First the necessity is to take into account other variables such as education, endowment of natural resources, culture etc. as control variables in place of inward FDI which were noted to be key variables for EFI in Sub-Saharan Africa countries, would shed more light on the present findings on the region and could be more useful in generalization and for policy makers Secondly there was need test the influence of sector-specific components of growth on the 12 sub-indices of economic freedom separately so as demystify their individual impact. Likewise, further research could test our main hypotheses on world countries, regional grouping based on their level of development or any other criteria. Finally, the future research should wholesomely cover more countries in the region under study for more recent years, especially when higher frequency data becomes available, using different methodological framework such as panel-ARDL, GARCH and many more. Our results suggest that by enhancing economic freedom, policy makers would need to uphold robust policies that spur economic growth in relation to all its sectors and to encourage inward foreign direct investment.

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Appendix

See Tables 10, and 11.

Table 10: Countries in the sample

Angola	Ethiopia	Niger
Benin	Gabon	Nigeria
Botswana	Ghana	Rwanda
Burkina Faso	Guinea	Senegal
Burundi	Guinea-Bissau	Sierra Leone
Cabo Verde	Kenya	South Africa
Cameroon	Lesotho	Tanzania
CAR	Madagascar	The Gambia
Chad	Malawi	Togo
Congo, Rep.	Mali	Uganda
Cote d'Ivoire	Mauritania	Zambia
DRC	Mauritius	Zimbabwe
Eq. Guinea	Mozambique	
Eswatini	Namibia	

Table 11: Data Description and Sources

Variable	Description	Source
Heritage Freedom Score	An Index that measures economic freedom based on 12 quantitative and qualitative factors, grouped into four broad categories: i) regulatory efficiency (monetary freedom labour freedom and business freedom) ii) government size (fiscal health, government spending and tax burden) iii) rule and law (government integrity, judicial effectiveness and property rights) iv) market openness (financial freedom, in-vestment freedom and trade freedom).	Heritage Foundation
Agriculture value added	Agriculture corresponds to ISIC divisions 1-5 and includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. It is the net output of agriculture sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The data are in constant 2010 U.S. dollars.	World bank
Industry value added	Industry corresponds to ISIC divisions 10-45 and includes manufacturing (ISIC divisions 15-37). It comprises value added in mining, manufacturing (also reported as a separate subgroup), construction, electricity, water, and gas. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. This data are in constant 2010 U.S. dollars.	World bank
Service value added	Services correspond to ISIC divisions 50-99. They include value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, health care, and real estate services. Also included are imputed bank service charges, import duties, and any statistical discrepancies noted by national compilers as well as discrepancies arising from rescaling. Value added is the net output of a sector after adding up all	World bank

	outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. Data are in constant 2010 U.S. dollars. NB: The value added sectors of GDP are calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources and are determined by the International Standard Industrial Classification (ISIC), revision 3.	
Foreign direct investment	Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP.	World bank

*Collected from the World Bank Website

ISIC stand for **International Standard Industrial Classification**

Source: World Bank

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