



FDI, EXPORT AND GDP PER CAPITAL IN AFRICAN COUNTRIES: A GMM ESTIMATION

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Abstract

This study seeks to investigate empirically the effect of FDI and Export on GDP per capital using sample of 40 African countries for the period 2005 to 2019 applying the GMM technique of estimation. The result of the study revealed that FDI posits a negative and statistical significance effect on GDP per capital in the short run. Export has a positive and statistical significant effect on GDP per capital in the short run. In the long run, FDI has a negative and significant long run effect on GDP per capital and export has a positive and significant effect on GDP per capital. There is also a long run causality effect among export, FDI and GDP per capital in African countries. This implies that FDI and Export granger causes GDP per capital in the long run.

Keywords: Export, Foreign Direct Investment, Generalized Method of Moment

1. Introduction

The economic situation in Africa remains overwhelming amid the slowdown in the global economic crisis, lingering effects resulting from the collapse in commodity prices though situations are widely divergent across sub regions. East Africa and North Africa are improving, but growth in West, Central and Southern Africa remains inadequate to meet mounting development challenges. GDP growth for the region as a whole is projected to increase moderately from 2.9 per cent in 2019 to 3.2 per cent in 2020. Africa continues to face difficulties in achieving the more robust and sustained growth path that is needed to enhance living standards across the continent. GDP per capita growth is unlikely to reach much above 1 per cent in the near term. More broadly, this decade is ending with average GDP per capita growth of only 0.5 per cent—well below the average growth of the previous decade and only marginally higher than average per capita growth in the 1980s and 1990s (see United Nation, 2020). However, GDP per capital in the period 1972–1979 stood at 1.4%, in the period 1980–1989, it fell as low as -0.4%. Subsequently, in 1990–1999, it pegged at -0.1%. GDP per capital witnessed a significant increase in 2000–2009 where it rose to about 2.7%, similarly, in 2010–2019 GDP per capital fell as low as 0.5% United Nation (2020). The low export diversification is one index reducing GDP growth and per capital increase in Africa (African Economic Outlook, 2020). On FDI inflow, Africa witnessed the fastest growth globally compared to developed economies in 2018 despite economic rigidities and shocks in the market. For instance, Africa received 11



percent of global FDI compared with negative global flows (-13 percent) and flows to developed economies (-27 percent) and Asia (+4 percent African Economic Outlook 2020). Several studies have reported mixed evidences on the relationship between FDI, Export and GDP per capital, most studies are on single country analysis and cointegration test are used. To the best of researchers' knowledge, relatively few studies exist on export, FDI and GDP per capital on African countries (see Foster 2006; Asfaw 2014). These studies employ the GLS technique although such technique does not account for endogeneity problem. While few studies have empirically estimated FDI Export nexus, they are limited to developed economies. In addition, studies which specifically employed GMM (see Zakarias, 2016) on 14 eastern African. It is on this background that the study of African countries is pertinent and the use of generalized method of moment cannot be underscored. Despite several policy reforms to improve growth and per capital growth through deepening structural reforms to diversify Africa's productive base and revive growth, chances of Africa to sustain growth and development is slim especially in the current macroeconomic crisis and structural economic rigidities that have overwhelmed global economy. To fill the gaps in the existing literature and estimate the factors that constrain FDI inflow into Africa, it is important that this study investigates the relationship between export, FDI and GDP per capital in African countries. This paper is structured into five sections including this introduction, section two explores the literature review, section three of the study looks at methodology, section four explores the data presentation and analysis and section five considers the summary, conclusion and policy recommendations.

2. Literature Review

There are growing bodies of literature on the index influencing fast growth of GDP per capital in Africa with mixed findings. For instance, Asfaw (2014) used 47 Sub-Saharan Africa countries for the period 2000 to 2008 to investigate empirically the effect of trade policy on GDP per capital applying the generalized least square (GLS) technique, the result of the study depicts a negative effect relationship between import weighted tariff and GDP per capital.

Agrawal and Khan (2011) in their study employed the ordinary least square regression technique to compare the impact of FDI on India and China for the sample period 1993 to 2009. The result of the study indicates that 1% increase in FDI increases GDP at 0.07% in China, so also, a 0.02% increase in GDP of India is as a result of 1% increases in FDI. Thus, china has more positive outcome compared to India. Zakarias (2016) examined the impact of FDI on GDP per capital using data on 14 eastern African countries for the period 1980 to 2013 and applying the GMM technique of estimation. The result of the study indicates a positive and significant relationship between FDI and GDP per capital in eastern African countries. Labour force has a positive and significant effect on GDP per capital. Amoateng and Amoako-Adu (2014) in their study examined the causality effect between external debt service, export and economic growth in African countries for 35 African countries for the period 1971 to 1990. The authors employed the Granger's (1969)



causality and the result of the study shows that a bi directional causality relationship exists between export and GDP.

Ahmad, Alam and Butt (2003) examined Export-led-growth hypothesis using the Granger's (1969) to test the relationship between trade, FDI and domestic output time series data for Pakistan. The authors also employed the Augmented Dickey Fuller (ADF) and vector autoregressive (VAR) system. Result of the study shows that export-led hypothesis holds a big significance but there is also the existence of FDI growth nexus. This implies that there is a significant spillover effect from FDI to domestic output. Foster (2006) used data from 43 African countries spanning 1960 to 99 to empirically investigate the relationship between export and GDP per capital using the threshold techniques of Hansen (1996, 1999 and 2000). The result of the study depicts a positive relationship between GDP per capital and export. For the threshold based on initial GDP per capita, the results suggest that it is for the countries with the lowest levels of initial GDP per capita that a positive and significant relationship between exports and growth exists, with a marginally significant negative relationship between exports and growth found for the richest countries. For the level of exports, again it is for the countries in the low regime that a significant positive relationship between exports and growth exists, with a positive but insignificant coefficient found in the high regime. Hussain and Haque (2016), in their study, estimated the relationship between foreign direct investments, trade, and growth rate of per capita GDP for Bangladesh for the period 1973 to 2014 applying the Johansen procedure and the associated Error Correction Model (ECM). Result of the study shows that trade and foreign investment variables have a significant impact on the growth rate of GDP per capita

3. Methodology

This study employed the panel data set sourced from WDI for the period 2005 to 2019. A panel of 40 African countries is obtained as sample countries for observation and the rationale for using the secondary data source is due to availability of data in form of non-probability sampling technique. Sampled countries include Angola, Algeria Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Cote d'Ivoire, Congo Dem Republic, Djibouti, Egypt, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Morocco, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Togo, Tunisia, Uganda, and Zambia.

GDP per capital is measured as gross domestic product divided by midyear population WDI (2019). Import tariff rate simple mean applied tariff is the unweighted average of effectively applied rates for all products subject to tariffs calculated for all traded goods WDI (2019). Labour force: This comprises people aged 15 and older who supply labour for the production of goods and services during a specified period. It includes people who are



currently employed and people who are unemployed but seeking work as well as first-time job-seekers WDI (2019)

Taxes: Total tax rate measures the amount of taxes and mandatory contributions payable by businesses after accounting for allowable deductions and exemptions as a share of commercial profits. Taxes withheld (such as personal income tax) or collected and remitted to tax authorities (such as value added taxes, sales taxes or goods and service taxes) are excluded WDI (2019).

Inflation: Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly WDI (2019).

Export: The variable export is measured as exports of goods and services as a percentage of gross domestic products (GDP) WDI (2019). FDI: it is defined as inflows (% of GDP). 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 WDI (2019)

Basically, the regressors in the GMM are categorized into three namely: predetermined, endogenous and exogenous variables. In the classification, the regressors representing predetermined variable would be those that are correlated with past errors but not with the current and future errors, the endogenous variables are regressors which are correlated with current and past errors while the exogenous regressors are defined as those not correlated with temporal periods. The outcome expected of endogenous regressors is to solve for endogeneity which is seemingly practicable in GMM estimation; thus the lag value of the past regressors can be used as additional instrument in the model. The dynamic panel estimations are differenced GMM and system GMM although the differenced GMM has its drawback. The system GMM is robust to heteroscedasticity and autocorrelation (see Roodman, 2009). This will require that in each simulation applying several prefix and options, the instrument lags must be less than the number of groups, thus the AR(1) may be significant. However, the AR (2) must not be significant; otherwise, it shows that the lag value of the dependent variable cannot be used as instrument in the equation. Hansen statistics must not be significant as well. Essentially, the GMM estimation is as short run estimation, thus the long run estimation can be generated using the significant coefficients of GMM and the causality relationship can be inferred from the long run estimation.

Model specification

$$\text{GDP PERC} = \beta_0 + \beta_1 \text{infla} + \beta_2 \text{taxes} + \beta_3 \text{average import weighted tariff} + \beta_4 \text{FDI} + \beta_5 \text{export} + \beta_6 \text{labour force} + \mu$$

Thus, this study follows the Beck, Levine and Loayza (2000) and Calderón and Servén (2004) which allows the use of lag value of the dependent variable to be used to solve for endogeneity and unobserved country specific effect commonly associated with panel data estimation. This study employs the GMM estimation.



To specify the dynamic model, we have

$$\ln Y_{it} = \phi \ln Y_{it-1} + \gamma Z'_{it} + \beta X'_{it} + d_t + \varepsilon_{it} \dots \dots \dots 1$$

Z' Implies control variables, X' implies explanatory variables $\ln Y_{it-1}$ is lagged value of dependent variable.

The differenced GMM is expressed as:

$$\ln Y_{it} = \phi \ln Y_{it-1} + \gamma Z'_{it} + \beta X'_{it} + d_t + \varepsilon_{it} \dots \dots \dots 2$$

$$i = 1, 2, \dots, N; t = 1, 2, \dots, T.$$

The implication of the above differenced GMM model is the if the dependent variable is close to random walk for instance ($\Phi > 1$) that is the lagged dependent variable is moving toward one (1). The Difference GMM estimation will not yield a robust estimate rather a biased and inefficient estimate and consequently could be acute when the time panel is short Blundell and Bond (1998).

The significant coefficients in the GMM estimations are important tool for determining long run equilibrium. The long-run coefficient will be generated through short-run coefficients which are significant coefficient of ECM. Thus, the long-run effects for the K^{th} parameter is computed as

$$\beta_k + (1 - \Phi) \dots \dots \dots 3$$

4. Results

This section of the study shows an economic interpretation of the coefficients in the models. In addition to that, the statistical fit and appropriateness of the estimated models are extensively discussed in this section of the study.

In Table 1 of differenced GMM, the result of the study shows that the lag value of GDP per capital is positive and statistically significant at 1% level across all models. By interpretation, the lag value has implication on the current period and the lag value of the dependent variable is instrument to be included in the model as repressors.

Table 1: Differenced GMM

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
gdpperc LI	0.6954*** (0.02)	0.6649*** (0.04)	0.6605*** (0.04)	0.6954*** (0.02)	0.6605*** (0.07)
Taxes	-2.0974** (1.94)		-2.1629* (5.57)	-2.0974** (1.94)	-2.1629* (3.35)
Fdii	-45.404** (28.4)	-210.86*** (75.75)	-224.25*** (66.05)	-45.40** (28.48)	-224.25*** (82.55)
Imweight	-3.7647* (20.43)	0.3414* (12.41)	-0.4267* (12.23)	-3.764* (20.43)	-0.426* (40.54)
Sslabo	0.0038**	0.0398*	0.0337*	0.0383**	0.00003*



Variables	Model 1	Model 2	Model 3	Model 4	Model 5
	(0.0522)	(.89)	(0.090)	(0.052)	(0.081)
Exporti	36.980** (22.29)	65.263*** (29.17)	66.931*** (27.45)	36.980* (22.29)	66.931*** (16.72)
No. of Obs	520	520	520	520	520
Time	YES	YES	YES	YES	YES
Dummies					
Number of Instruments	96	18	18	96	18
No of groups	40	40	40	40	40
F Statistic	300.52	66.39	64.28	300.52	124.53
GMM	1	1	1	1	1
Instrument					
Lag					
AR(1)	0.166	0.048	0.029	0.166	0.019
AR(2)	0.209	0.958	0.981	0.209	0.969
Hansen test	1.000	0.583	0.508	1.000	0.464

Source: Authors computation using STATA

Notes: *** ** denotes 1% 5% 10% statistical significance. Z statistics (in parenthesis)

The coefficient FDI has a negative and statistical significance on GDP per capital in model 2, 3, and 5. However, the coefficient export also posits a positive and statistical significant impact on GDP per capital in model 2, 3 and 5. Notably, import weighted tariff has a negative effect on GDP per capital (-.4267).

Considering the choice of lag length at lag 1, the specification test of AR(2) shows that our model does not suffer from second order serial correlation because it is non-significant using the collapse option and other options. Similarly, the Hansen test statistics is significant which is expected; thus, it indicates that instrument used in the model are not over-identified. It is worthy to note that some attributes are associated with this result particularly the insignificance of some coefficients. For instance, taxes indicate negative but insignificant as a result of several tax regimes and reforms in the tax system in SSA. The negative insignificant unweighted tariff rates for all products are also as a result of underdeveloped nature of tariff system in SSA; Foreign Direct Investment (FDI) strong drivers and catalyst to increasing GDP per capital in SSA countries.



Table 2: System GMM Lag 1

Variable	1	2	3	4	5	6	7	8	9
Constant	286*** 14425.3	1472.561* 28480.98	4817.081* 24263.7	1154.305* 37762.7	-3301.042* 36451.37		7534.766* 39014.83	10484.96 38794.09	-718.7107 34150.16
Gdpperc LI	0.9285*** (0.03)	0.6377*** (0.04)	0.659*** (0.04)	0.696*** (0.06)	0.681*** (0.06)	0.934*** (0.03)	0.690*** (0.06)	0.692*** (0.06)	0.689*** (0.06)
Inflai									-4.19** (5.77)
Taxes	-0.513** .5226263	-.9701469** 1.290917	-.8851981** 1.099978	-1.61098** 2.18366	-1.663881* 1.917427	-.356473* 2 .5901817	-1.983705** 1.512619	-1.751931** 1.623172	-1.512686* 2.249056
Fdii	-50.11967** 30.80494	-190.4501*** 60.76333	-158.5213*** 44.52375	-198.5289*** 67.23648	-208.8482*** 84.98492	-32.44439*** 17.49349	-193.9218*** 69.38062	-193.4482*** 66.44694	-205.1815*** 64.78722
Imweight	-.0911791* 10.66439	-7.95971* 28.22485	-2.018327* 21.39764	-6.522434* 32.23996	-3.327106* 37.57674	-.7264011* 8.234185	5.055425* 35.06867	1.618968* 28.97903	-6.669544* 33.70701
Sslabo	-9.70e-07* 3.05e-06	-5.17e-06* 7.65e-06	-4.52e-06* 7.98e-06	-.0000111** .0000125	-.0000108** .0000128	-3.00e-07* 1.84e-06	-.0000118** .0000121	-.0000138** .0000126	-.0000117** .000013
Exporti	15.43785** 9.149323	50.70108*** 17.10455	42.42622*** 16.41106	45.24292*** 17.31228	50.8834*** 18.4148	12.715*** 7.497406	47.92269*** 18.31655	42.99689*** 18.96202	45.39031*** 17.14102
No. of Obs	560	560	560	560	560	560	560	560	560
Time Dummies	Yes	Yes	yes	yes	Yes	yes	yes	yes	Yes
Number of Instruments	111	21	21	36	36	229	36	36	36
No of groups	40	40	40	40	40	40	40	40	40
F Statistic	6098.10	189.26	207.56	88.35	120.90	3282.19	184.90	857.40	80.41
GMM Instrument Lag	1	1	1	1	1	1	1	1	1
AR(1)	0.182	0.019	0.022	0.038	0.044	0.192	0.023	0.022	0.038
AR(2)	0.204	0.811	0.607	0.760	0.852	0.195	0.748	0.700	0.793
Hansen test	1.000	0.486	0.410	0.463	0.479	0.839	0.632	0.320	0.419

Source: Authors computation using STATA

Notes: *** ** * denotes 1% 5% 10% statistical significance. Z statistics (in parenthesis



Table 2. System GMM Lag 1

Variabl	1	2	3	4	5	6	7	8	9
Gdpperc LI	0.92*** (0.03)	0.63*** (0.04)	0.65*** (0.04)	0.696*** (0.06)	0.681*** (0.06)	0.93*** (0.03)	0.69*** (0.06)	0.69*** (0.06)	0.68*** (0.06)
Inflai									-4.19** (5.77)
Taxes	-0.51** (0.52)	-0.97** (1.29)	-0.88** (1.09)	-1.61** (2.18)	-1.66* (1.91)	-.35* (2.59)	-1.98** (1.51)	-1.75** (1.62)	-1.51* (2.24)
Fdii	-50.1** (30.80)	-190.45*** (60.76)	-158.52*** (44.52)	-198.52*** (67.23)	-208.84*** (84.98)	-32.4*** (17.49)	-193.92*** (69.38)	-193.44*** (66.44)	-205.18*** (64.78)
imweight	-0.091* (10.66)	-7.95* (28.22)	-2.01* (21.39)	-6.52* (32.23)	-3.32* (37.57)	-0.72* (8.23)	5.05* (35.06)	1.61* (28.97)	-6.66* (33.70)
Sslabo	-9.70* (3.05)	-5.17* (7.65)	-4.52* (7.98)	-0.00** (0.00)	-0.00** (0.00)	-3.00* (1.84)	-0.00** (0.00)	-0.00** (0.00)	-0.00** (0.00)
Exporti	15.43** (9.14)	50.70*** (17.10)	42.42*** (16.41)	45.24*** (17.31)	50.88*** (18.41)	12.71*** (7.49)	47.92*** (18.31)	42.99*** (18.96)	45.39*** (17.14)
No. of Obs	560	560	560	560	560	560	560	560	560
Time Dummies	Yes	yes	yes	Yes	yes	yes	Yes	yes	Yes
Number of Instruments	111	21	21	36	36	229	36	36	36
No of groups	40	40	40	40	40	40	40	40	40
F Statistic	6098.10	189.26	207.56	88.35	120.90	3282.19	184.90	857.40	80.41
GMM Instrument Lag	1	1	1	1	1	1	1	1	1
AR(1)	0.18	0.01	0.02	0.03	0.04	0.19	0.02	0.02	0.03
AR(2)	0.20	0.81	0.60	0.76	0.85	0.19	0.74	0.70	0.79
Hansen test	1.00	0.48	0.41	0.46	0.47	0.83	0.63	0.32	0.41

Source: Authors computation using STATA

Notes: *** ** * denotes 1% 5% 10% statistical significance. Z statistics (in parenthesis)

In Table 2, the result of System GMM indicates that previous GDP per capital has a positive and statistical significant impact on current GDP per capital. The coefficient taxes have a negative effect on GDP per capital at 5% (-.8851). FDI has a negative effect on GDP per capital and statistical significant at 1% level across all model. The parameter unweighted import tariff and supply of labour have a negative effect on GDP per capital although not significant. However, the coefficient export posits a positive and statistical significant relationship with GDP per capital in SSA during the period of study.

Table 3: Robust Estimation System GMM Lag 2

variables	1	2	3	4	5	6	7	8
Gdpperc	.96***	.80***	.93***	.75***	.79***	.77***	.77***	.77***
LI	.03	.10	.04	.12	.11	.11	.11	.11
L2	-.04*** (0.02)	-.11*** (0.03)	-.0263** (0.02)	-.2317*** (0.10)	-.2093*** (0.10)	-.18*** (0.10)	.1881*** (0.10)	-.18*** (0.09)
Taxes	-.67** (0.48)	-1.70** (1.57)	-.7267** (0.61)	-.8704* (2.11)	-2.467** (3.18)	-2.32** (2.81)	-3.074** (2.42)	-3.02** (2.36)
Fdii	-52.08** (32.47)	-202.2*** (0.19)	-63.928** (39.4)	315.53*** (146.0)	301.62*** (159.9)	286.66*** (157.6)	278.35*** (154.71)	272.82*** (141.9)
imweight	-1.80* (12.0)	-.34* (31.05)	-2.436* (13.3)	-3.561* (34.2)	-2.905* (39.8)	-3.22* (47.3)	3.72* (47.9)	3.72* (47.36)
Sslabo	-1.34* (3.05)	-.0135** (.01)	-2.39* (3.65)	-4.63* (.11)	-.0159** (.02)	-.00* (.0199)	-.01** (.0198)	-.01** (.018)
exporti	16.01822** 9.74	40.11*** 23.5	17.91*** 10.5	58.75*** 27.09	65.80*** 32.9	69.55*** 32.6	64.25*** 30.2	63.25*** 28.7
No. of Obs	520	520	520	520	520	520	520	520



variables	1	2	3	4	5	6	7	8
Time	Yes	Yes	yes	Yes	yes	yes	Yes	yes
Dummies								
Number of Instruments	110	21	97	20	35	35	35	35
No of groups	40	40	40	40	40	40	40	40
F Statistic	5482.31	97.98	3689.00	21.57	25.76	35.78	62.91	65.52
GMM Instrument	2	2	2	2	2	2	2	2
Lag								
AR(1)	0.18	0.02	0.18	0.07	0.099	0.09	0.08	0.06
AR(2)	0.20	0.99	0.21	0.68	0.703	0.70	0.65	0.66
Hansen test	1.00	0.60	1.00	0.73	0.286	0.32	0.58	0.45

Source: Authors computation using STATA

Notes: *** ** * denotes 1% 5% 10% statistical significance. Z statistics (in parenthesis)

In Table 3, we also employed the robust estimation to ensure reliability and consistency of estimate using the lag 2 prefix and the result shows that the lag value of GDP per capital at the second lag is consistent to the system GMM at lag 1 where all estimated models show significant.

Table 4: Long run estimates

Variables	Coef and Std. Err
Exporti	229.54*** (131.00)
FDI	-791.62*** (339.60)

Source: Authors computation using STATA

Notes: *** ** * denotes 1% 5% 10% statistical significance. Z statistics (in parenthesis)

In Table 4, we generate the long run coefficients from the significant coefficients as indicated in table 3. The GMM estimation is a short run analysis. Thus the long run estimation could be generated from the significant short run coefficients. The result of long run estimates shows that export has a positive and statistical significant relationship with GDP per capital at 1%. FDI also posit a negative effect relationship with GDP per capital. This also shows that there is a long run causality relationship among export FDI and GDP per capital.

5. Conclusion and Recommendation

Given the sparse body of literature in the factors affecting GDP per capital in Africa with mixed evidences, this study empirically investigated the effect of FDI and Export on GDP per capital in 40 African countries for the period 2005 to 2019. The justification for time period is the shocks and structural economic rigidities that overwhelmed the growth GDP per capital across African countries. This study employed the System GMM technique to solve for endogeneity and country specific issues related to panel data estimation. From the findings, result revealed that the lag value of GDP per capital at first lag and second lag are additional instrument to be used in the model and have a positive effect on the current GDP



per capital. FDI posits a negative and statistical significance effect on GDP per capital in the short run. Export has a positive and statistical significant effect on GDP per capital in the short run. In the long run, FDI has a long run relationship with GDP per capital and export has a positive and significant relationship with GDP per capital. There is also a long run causality effect among export, FDI and GDP per capital in African countries. This implies that FDI and Export granger causes GDP per capital in the long run.

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