An empirical analysis of the impact of economic institutions on poverty levels in Sub-Saharan Africa regions

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ABSTRACT

The main objective of this study is to investigate the relative effect of ten different indicators of economic institutions on three measures of poverty: poverty headcount, extreme poverty measured as a poverty gap below $2.15 per day, and moderate poverty captured as a poverty gap below $3.65. A panel data from forty-one Sub-Saharan African (SSA) countries over a period of 2007 to 2021 is analyzed using the two-step System-Generalised Method of Moments (system-GMM) technique. The Sargan test for overidentification restrictions and the Arellano-Bond test for second-order serial correlation were conducted. The findings revealed that improvements in government integrity, business freedom, investment freedom, and financial freedom are crucial to reducing poverty in SSA. It is also revealed that a rise in tax burden would significantly result in an increase in poverty. Similarly, more trade freedom would lead to increase in moderate poverty and poverty headcount, though it would significantly reduce extreme poverty. To win the war against poverty in SSA, it is recommended that efforts be directed towards improving the integrity of government by making government decisions and activities more transparent. The process of starting and operating a business should also be made easy, while the financial system should be made more open and fairly accessible to all. On the other hand, a high tax burden in terms of multiple taxes, a high tax rate, high public debt, and unproductive public spending should be avoided. Trade openness should be done with caution so as not to hurt infant industries.

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1.   Introduction

Over the past two decades, developing countries have experienced remarkable economic growth. This growth has led to a significant reduction in poverty of many developing countries. For instance, in the 2023 Global Multidimensional Poverty Index (UNDP, 2023) report, it is stated that 25 countries have halved their Global MPI scores in the past 15 years before COVID-19. Unfortunately, most countries in Sub-Saharan Africa (SSA) have not witnessed this progress. Instead, many countries in the SSA witnessed a rise in poverty. Out of the 1.1 billion people experiencing poverty across 110 countries, 534 million (47.8%) live in the SSA. This implies that nearly half of the total poor people in the world live in SSA. It is even more disturbing to note that the intensity of poverty is highest in places where the incidence of poverty is highest. It is stated in the 2023 Global MPI report that 10 million people out of 12 million poor people who experience between 90 and 100% deprivation live in SSA. Hence, SSA is not only home to the highest number of poor people but also home to the poorest of the poor.

However, the story varies across countries in the SSA sub-region. For example, in countries like the Seychelles and South Africa, less than 1 in 10 people live in poverty. On the other hand, in countries such as South Sudan and Niger, 9 out of every 10 people live in poverty. This story is similar in Burkina Faso, Chad, the Central African Republic, Comoros, Togo, and Kenya, where more than 8 out of every 10 people are poor. This huge variation is also observed at the subnational level, with 30 subnational regions having a poverty incidence of less than 10 percent and 33 regions having an incidence of over 90 percent (Alkire et al., 2021). Also, children tend to bear more of the brunt of poverty in sub-Saharan Africa. About 321 million out of the total 556 million poor people in SSA are children under the age of 18, meaning that over half of the poor people in SSA are children. Almost 6 out of every 10 (59 percent) children are poor, compared with 47 percent of adults in SSA.

Institutions are the humanly devised constraints that structure political, economic, and social interaction (North, 1990). They consist of the structures that humans impose on their dealings with each other. Specifically, economic institutions are laws, policies, and regulations that govern the interaction of agents in market transactions, including the buying and selling of goods and services and the use of property. They establish the constraints and determine the costs and benefits under which individuals make economic decisions. They shape the incentives of key economic actors in society; in particular, they influence investments in physical and human capital, technology, as well as the organisation of production.

Good and efficient economic institutions feature secure private property rights for the majority of people, an unbiased system of law, and public services (such as education, health care, energy, transport, and communication infrastructure) that provide a level playing field in which people can exchange and contract; they also must permit the entry of new businesses and provide economic opportunities not just for the elite but for a broad cross-section of society. Hence, effective institutions allow as well as encourage participation by the great mass of people in economic activities that make best use of their talents and skills and that enable individuals to make the choices they wish (Acemoglu & Robinson, 2012). These institutions thus empower individuals to pursue their desired occupations. They also facilitate efficient resource allocation through voluntary transactions, promote innovation and productivity through competition, and create a secure environment for investment. Hence, good institutions attract investment from both national and international entrepreneurs. Collectively, these factors contribute to job creation, enhance the production of goods and services, and foster overall economic progress. By providing individuals with decent jobs and fair wages, poverty is reduced in society. Therefore, it is imperative to study the nexus between institutions and poverty.

Though the importance of institutions in the development process is well established in the literature, it is not clear which category of institutions is most relevant, particularly in eradicating poverty. This paper aims at investigating the impact of different categories of institutions as computed by the Heritage

Foundation. The Foundation measures economic institutions in terms of economic freedom, which are grouped into four categories: viz rule of law, limited government, regulatory efficiency, and open market. These four dimensions are derived from ten indicators. The rule of law consists of two indicators: property rights and government integrity, while limited government consists of fiscal freedom and government spending. Regulatory efficiency is made up of business freedom, labour freedom, and monetary freedom. Finally, the open market consists of three indicators: which are trade freedom, investment freedom, and financial freedom.

Thus, this paper contributes to the literature by examining the impact of these ten different categories of economic institutions on poverty. Also, the paper examines the impacts of these institutions on three different levels of poverty. Therefore, the objective of this study is to investigate the separate effect of ten indicators of economic institutions on poverty head count, with extreme poverty measured as a poverty gap below $2.15 per day and moderate poverty captured as poverty gap below $3.65 in the Sub-Saharan Africa region. The rest of the paper is organised as follows: Section 2 presents a review of relevant literature. Section 3 discusses the model and method of analysis, while Section 4 presents the results and discusses the results. Finally, Section 5 concludes the paper.

2.   Brief review of literature

A number of studies showed that there is significant link between strong institutions and low levels of poverty. Institutions generally provide the incentive individuals need to undertake income earning economic activities. Thus, as more and more people are incentivized to engage in productive activities, poverty is expected to decline in society. Doran and Stratmann (2020) confirm that improvement in economic institutions is associated with lower poverty rates. Koyuncu and Ünal (2020) equally show that increase in the quality of economic institutions would yield significant reduction in poverty headcount ratio, poverty gap and poverty index. In a similar vein, Fritsch et al. (2021) examined the relationship between economic institutions and well-being of workers. They found that institutions which foster entrepreneurial activities enhance the welfare of both the self-employed and paid employees in Europe. Acemoglu and Robinson (2010), Asongu (2013), reported a close association of low incidence of poverty with strong economic institutions in Africa. Thus, they concluded the to achieve significant reduction in poverty in Africa, there must be sufficient improvement in quality of institutions.

The literature has established that secure property rights are fundamental to poverty reduction. This is because protection of private property including intellectual property is a vital feature of a functioning market system. Before people would decide to invest their resources in any venture, they need assurance that their capital and profit are secured from unfair expropriation and theft. Hence, protection of property rights via availability of effective rule of law backup by an impartial and efficient judicial system give individuals the confidence to undertake entrepreneurial activities, accumulate wealth and make long term economic decisions. Hasan et al. (2003) show that institutions such as property rights and rule of law contribute significantly to poverty reduction. Singh and Huang (2015) show that property rights play an important role in fighting poverty in Sub-Saharan Africa. Their results suggest that without strong protection of property rights, reforms such as financial deepening cannot reduce income inequality and poverty. Hence, the effect of financial development on poverty and income inequality depends on the quality and strength of economic institutions, particularly institutions of property rights protection as well as institutions that promote access to credit.

Literature has also shown that low poverty is associated with more economic freedom. In an economically free society, opportunities and empowerment are provided to everyone without discrimination, so as to create level playing ground for all. Gwartney and Connors (2010) studied the connection between economic freedom and global poverty. The study revealed that there is a strong positive relationship between economic freedom and poverty reduction. Connors (2013) in his analysis of the effect

of institutions on achievement in Millennium Development Goals (MDGs) shows that countries that experienced improvement in economic freedom had larger reductions in the extreme poverty rate. In a related study, Okunlola and Akinlo (2021) examine the role of economic institutions in promoting quality of life in Africa. Their results indicate that the level of economic freedom has positive effect on the quality of life.

Tebaldi and Mohan (2010) develop an institution-augmented Solow model and show that poor institutions decrease the efficacy of technology and reduce both labour and capital productivity. Their model suggests that poor institutions may create poverty traps and the only way to escape is through improvements in institutions. Eric (2017) investigated the role of institutions on the impact of gross fixed capital formation (GFCF) in SSA and found that though GFCF reduces poverty, institutions reinforce the link between GFCF and poverty. Rashid and Intartaglia (2017) showed that financial development led to more reduction in poverty where there are effective institutions.

There is also abundant literature supporting the effect of other factors such as education, and trade openness. Hofmarcher (2021) confirmed that education has large poverty reducing effects among the ages of 30 to 80 year in Europe. In a household study by Citak and Duffy (2020) in Turkey, they showed that higher level of education of household head is associated with higher household per capita income, thus, low poverty. In the case of the impact of trade on poverty Le Goff and Singh (2014) showed that trade led to poverty reduction only in countries where institutions are strong, financial sector is deepened and there is high educational attainment. Onakoya et al. (2019) find that trade significantly reduce poverty in Sub-Sahara Africa. Anetor et al. (2020) also confirmed that there is significant negative relationship between trade and poverty in Sub-Saharan African countries.

3.   Methodology

This section provides the empirical model in sub-section 3.1, describes the nature and source of data in 3.2 and estimation techniques in 3.3 respectively.

3.1   Model specification

Following the empirical strategy proposed by Doran and Stratmann (2020), the model for this study is specified as:

$$Pov_{it} = \beta EInst_{it} + X'_{it}\gamma + \mu_i + \varepsilon_{it} \qquad (1)$$

Where Pov denotes measures of poverty, $EInst$ is the vector of indicators of economic institutions, X' stands for control variables which include employment, education and per capita income, μ_i is an error component consisting of the individual country unobservable specific effects, ε is the Gauss Markov error term, i represents countries, and t denotes time. Base on the principle of the vicious cycle of poverty a dynamic panel model is specified where lag of poverty is introduced as one of the regressors. More specifically, the baseline model is given as:

$$PV_{it} = \alpha_0 + \alpha_1 PV_{it-1} + \alpha_2 EInst_{it} + \alpha_3 EMPT_{it} + \alpha_4 EDUC_{it} + \alpha_5 PCI_{it} + \mu_i + \varepsilon_{it} \qquad (2)$$

Where $EMPT$ is employment, $EDUC$ is education, and PCI is per capita income, while other variables are as defined previously. However, $EInst$ consists of eleven (11) different measures of economic institutions, these are overall economic freedom (OEF); property right (PR), government integrity (GINT), business freedom (BF), investment freedom (IF), financial freedom (FF), government size (GS), tax burden (TB), fiscal health (FH), labour freedom (LF) and trade freedom (TF). The baseline model is then re-

specified by introducing each of the measures of economic institutions one after the other as express in equations (3) to (13) below:

$$PV_{it} = \alpha_0 + \alpha_1 PV_{it-1} + \alpha_2 OEF_{it} + \alpha_3 EMPT_{it} + \alpha_4 EDUC_{it} + \alpha_5 PCI_{it} + \mu_i + \varepsilon_{it} \qquad (3)$$
$$PV_{it} = \alpha_0 + \alpha_1 PV_{it-1} + \alpha_2 PR_{it} + \alpha_3 EMPT_{it} + \alpha_4 EDUC_{it} + \alpha_5 PCI_{it} + \mu_i + \varepsilon_{it} \qquad (4)$$
$$PV_{it} = \alpha_0 + \alpha_1 PV_{it-1} + \alpha_2 GINT_{it} + \alpha_3 EMPT_{it} + \alpha_4 EDUC_{it} + \alpha_5 PCI_{it} + \mu_i + \varepsilon_{it} \qquad (5)$$
$$PV_{it} = \alpha_0 + \alpha_1 PV_{it-1} + \alpha_2 BF_{it} + \alpha_3 EMPT_{it} + \alpha_4 EDUC_{it} + \alpha_5 PCI_{it} + \mu_i + \varepsilon_{it} \qquad (6)$$
$$PV_{it} = \alpha_0 + \alpha_1 PV_{it-1} + \alpha_2 IF_{it} + \alpha_3 EMPT_{it} + \alpha_4 EDUC_{it} + \alpha_5 PCI_{it} + \mu_i + \varepsilon_{it} \qquad (7)$$
$$PV_{it} = \alpha_0 + \alpha_1 PV_{it-1} + \alpha_2 FF_{it} + \alpha_3 EMPT_{it} + \alpha_4 EDUC_{it} + \alpha_5 PCI_{it} + \mu_i + \varepsilon_{it} \qquad (8)$$
$$PV_{it} = \alpha_0 + \alpha_1 PV_{it-1} + \alpha_2 GS_{it} + \alpha_3 EMPT_{it} + \alpha_4 EDUC_{it} + \alpha_5 PCI_{it} + \mu_i + \varepsilon_{it} \qquad (9)$$
$$PV_{it} = \alpha_0 + \alpha_1 PV_{it-1} + \alpha_2 TB_{it} + \alpha_3 EMPT_{it} + \alpha_4 EDUC_{it} + \alpha_5 PCI_{it} + \mu_i + \varepsilon_{it} \qquad (10)$$
$$PV_{it} = \alpha_0 + \alpha_1 PV_{it-1} + \alpha_2 FH_{it} + \alpha_3 EMPT_{it} + \alpha_4 EDUC_{it} + \alpha_5 PCI_{it} + \mu_i + \varepsilon_{it} \qquad (11)$$
$$PV_{it} = \alpha_0 + \alpha_1 PV_{it-1} + \alpha_2 LF_{it} + \alpha_3 EMPT_{it} + \alpha_4 EDUC_{it} + \alpha_5 PCI_{it} + \mu_i + \varepsilon_{it} \qquad (12)$$
$$PV_{it} = \alpha_0 + \alpha_1 PV_{it-1} + \alpha_2 TF_{it} + \alpha_3 EMPT_{it} + \alpha_4 EDUC_{it} + \alpha_5 PCI_{it} + \mu_i + \varepsilon_{it} \qquad (13)$$

3.2 Nature and sources of data

Three different indicators are used to measure poverty, which are poverty head count (PHC), poverty gap at \$2.15 per day (PG2.15) and poverty gap at \$3.65 per day (PG3.65). The Heritage Foundation's Index of Economic Freedom is used as a measure for economic institutions. The index describes economic freedom as "the fundamental right of every human to control his or her own labour and property". The index consists of ten indexes which are computed from a number of indicators. The overall index and the ten indexes are scaled from 0 to 100, the closer to 0, the weaker institutions are, and closer to 100 means strong institutions. Employment is measured as proportion of people employed as percentage of total population, secondary school enrolment rate is used for education, and GDP per capita is used as measure for per capita income. Data for these three measures of poverty plus the three control variables are sourced from the World Development Indicators (WDI). While the data on economic institutions are taken from the Heritage Foundation. The data covered forty-one (41) Sub-Sahara African countries over the period 2007 to 2021.

3.3 Estimation technique

The major issue with the specifications above is that the presence of lag of the dependent variable (〚PV〛_(it-1)) which might correlate with the error term (ε _it), consequently leading to the problem of endogeneity. To deal with this, there are two options, that is, either to use Instrumental Variable (IV) estimator, or use Generalized Method of Moment (GMM) estimator. The latter method is used here since IV approach is reported to lead to consistent but not necessarily efficient estimates of the parameters (Baltagi, 2005). Thus, the dynamic model specified in equations (3) to (13) are estimated using the Arrellano and Bover (1995) and Blundell and Bond (1998) system GMM estimation technique. The system GMMM is capable of controlling for the endogeneity that may result from an econometric model with lag of dependent variable as one of the regressors (Roodman, 2009). The two-step system GMM procedure is used in this study because it is said to be asymptotically more efficient than one-step estimators (Blundell & Bond, 1998).

The Sargan test which is a test for over-identifying restrictions and the Arellano-Bond test for no second-order serial correlation in the error term are computed to confirm the validity of the estimates. Tests for normality and multicollinearity using the Variance Inflation Factor (VIF) are also computed.

4.   Discussion of results

In this section the descriptive statistics are presented and discussed. Also, the empirical results from the regression estimates are presented and discussed.

4.1   Descriptive statistics

The descriptive statistics are presented in Table 1 below. From the table, the average poverty head count from 2007 to 2021 across the 41 SSA countries is 38.8%, with a standard deviation of 22. The standard deviation indicates that the levels of poverty headcount vary widely across the continent. This is reflected in the huge gap between the minimum of 0.1% and the maximum of 92%. The average value of extreme poverty is the lowest among the three measures of poverty used in this study. The average of extreme poverty measured as a poverty gap below $2.15 is 15.09%, while the average of poverty gap below $3.65 is 30.16%. These findings evidenced the progress made in SSA in the war against extreme poverty. Despite this achievement, moderate poverty, and poverty headcount are still high in SSA. The minimum poverty head count, extreme poverty and moderate poverty of 0.1, 0 and 0.3, respectively were found in Mauritius as of 2021, while the highest poverty head count, extreme poverty, and moderate poverty of 91.5%, 58.5%, and 73.6%, respectively, were experienced in the Democratic Republic of the Congo as of 2008.

Among the institutional variables, tax burden has the highest average value of 74.21 and the lowest standard deviation of 9.14. In fact, it also shows the highest minimum value of 44.13. Meaning that the performance of SSA countries in terms of tax burden is similar over time. On average, the quality of institutions in terms of trade freedom, fiscal health, labour freedom, and business freedom is relatively high. On the other hand, the quality of protection of property rights is averagely low on the continent. Property rights have the lowest mean of 35.28 with a standard deviation of 14.52. The low value of the standard deviation points to the fact that the quality of property rights projection is similar across the SSA.

Table 1. Summary statistics

Variable	Observation	Mean	Standard deviation	Min	Max
PHC	615	38.87057	22.01065	0.1	91.5
PG2.15	615	15.09138	11.52539	0	58.5
PG3.65	615	30.15837	15.85559	0.3	73.6
OEF	615	55.044	7.4981	21.4	77
GINT	615	30.72	10.5268	10	67.9
PR	615	35.2787	14.52029	5	78.4
BF	615	52.70022	12.09396	23.3	83.7
IF	615	48.98374	15.39596	0	90
FF	615	41.96748	13.23302	10	70
GS	205	38.30878	12.61324	13.1	83.2
TB	615	74.20511	9.13529	44.1326	92.5
FH	205	60.85317	29.2131	0	99.5
LF	615	56.05122	13.61007	21.9	91.4
TF	615	67.03415	9.931303	28.4	89
EMPT	600	60.83958	12.20034	35.979	85.866
EDUC	600	47.3153	21.21987	10.59879	114.7148
PCI	600	13007.51	13793.12	1699.893	61231.76

Source: computed by the authors

The test for the normal distribution of the three dependent variables and the residual are computed, and the result is reported in Appendix A. Also, the result of VIF is presented in Appendix B. The result obtained from the Shapiro-Wilk test for normality shows that we are to reject the null hypothesis of normality. The Variance Inflation Factor (VIF) result shows no evidence of multicollinearity.

4.2 Regression results

The regression results are presented in Tables 2 through 4. Through all the regressions, the lag of poverty is statistically significant with positive signs, indicating that previous levels of poverty significantly influence current levels. This confirms the possibility of a vicious cycle of poverty in SSA. There is a need for concerted efforts so as to break the vicious cycle of poverty. Improvements in economic institutions that provide opportunities for people to undertake economic activities are likely to create the force for breaking the cycle.

The last two rows in each table present the probabilities of rejecting the null hypothesis of the validity of the overidentifying restriction obtained from the Sargan test and the absence of second order serial correlation (AR 2 serial correlation test), respectively. Based on the 5% significant level, none of the hypotheses is rejected, implying that the restrictions imposed by the system GMM are valid and that there is no evidence for the presence of serial correlation.

Tables 2a and 2b present the regression results on the poverty headcount ratio. The results in the two tables show that overall economic institutions have a significant negative impact on poverty headcount. Meaning that as the quality of economic institutions improves generally, the level of poverty will reduce in SSA. This finding conforms with the position of the extant literature on the impact of economic freedom on poverty (see for example, Asongu, 2013; Connors, 2013; Koyuncu & Ünal, 2020; Saccone & Migheli,

2022). Looking at the relative impacts of the ten indicators of economic institutions reveals that only four indicators have significant negative effects on poverty head count. These are government integrity, business freedom, investment freedom, and financial freedom. Implying that improvement in these four indicators would yield a significant reduction in poverty in the SSA. Property rights, government size, fiscal health, and labour freedom have negative signs, but they are not statistically significant. The remaining two indicators, viz, tax burden and trade freedom, have significant positive coefficients. The findings on these two are contrary to expectations. However, this may be due to the fact that as the populace is burdened with more tax or as the tax rate increases, more people will not want to engage in economic activities so as to avoid the burden of tax. Consequently, the rate of poverty will increase. In the case of trade freedom, as economies in SSA become more open to international trade, the infant industries on the continent will not be able to compete. Hence, most of them will shut down, which may lead to more unemployment and poverty.

Table 2a: Results on poverty headcount

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
L.PHC	0.930***	0.922***	0.939***	0.896***	0.933***	0.933***
	(0.00618)	(0.00293)	(0.00692)	(0.00872)	(0.00478)	(0.00493)
EMPT	-0.172***	-0.128***	-0.122***	-0.157***	-0.153***	-0.114***
	(0.0278)	(0.0310)	(0.0349)	(0.0229)	(0.0248)	(0.0408)
EDUC	-0.0503***	-0.0374***	-0.0450***	-0.0375***	-0.06***	-0.038***
	(0.00692)	(0.00734)	(0.00687)	(0.00744)	(0.00629)	(0.0110)
PCI	-1.95e-05	2.85e-05*	1.82e-05	-3.97e-05*	2.17e-05	-9.58e-06
	(2.18e-05)	(1.61e-05)	(2.54e-05)	(2.07e-05)	(2.07e-05)	(2.18e-05)
OEF	-0.0830***					
	(0.0247)					
GINT		-0.105***				
		(0.00971)				
BF			-0.0824***			
			(0.0160)			
IF				-0.0907***		
				(0.0106)		
FF					-0.0837***	
					(0.0133)	
PR						-0.00411
						(0.00690)
Constant	19.38***	14.28***	15.25***	19.24***	16.83***	10.68***
	(1.955)	(1.962)	(2.114)	(1.814)	(1.448)	(3.255)
Observations	546	546	546	546	546	546
Number of SSAID	39	39	39	39	39	39
Sargan test	0.1012	0.0961	0.1953	0.1091	0.3342	0.2341
AR2 test	0.0618	0.1208	0.0794	0.0647	0.0779	0.0711

Table 2b: Results on poverty headcount

Variables	Model 7	Model 8	Model 9	Model 10	Model 11
L.PHC	0.728***	0.937***	0.758***	0.930***	0.933***
	(0.0452)	(0.00448)	(0.0443)	(0.00436)	(0.00445)
EMPT	-0.0739	-0.177***	-0.0755	-0.142***	-0.159***
	(0.145)	(0.0281)	(0.124)	(0.0229)	(0.0293)
EDUC	-0.0338*	-0.0538***	-0.0374**	-0.0570***	-0.0596***
	(0.0184)	(0.00519)	(0.0186)	(0.00455)	(0.00840)
PCI	-7.42e-06	-3.42e-05***	-7.07e-05	-1.16e-05	-3.69e-05**
	(0.000110)	(1.26e-05)	(9.93e-05)	(1.88e-05)	(1.72e-05)
GS	-0.0441				
	(0.0614)				
TB		0.0151*			
		(0.00869)			
FH			-0.00328		
			(0.00420)		
LF				-0.00209	
				(0.0114)	
TF					0.0106***
					(0.00401)
Constant	14.90	13.98***	13.55*	13.47***	13.95***
	(9.239)	(1.420)	(7.137)	(1.355)	(2.189)
Observations	195	546	195	546	546
Number of SSAID	39	39	39	39	39
Sargan test	0.1971	0.2038	0.2367	0.1859	0.1410
AR2 test	0.4934	0.0622	0.0896	0.1495	0.0745

Note: Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Tables 3a and 3b display the relationship between a poverty gap below $2.15, which measures the extreme poverty line, and the ten indicators of economic institutions as well as the overall index of economic institutions. The results show that the overall economic institution has a negative and significant impact on extreme poverty, which indicates that as economic institutions strengthen, the levels of extreme poverty in SSA will reduce significantly. Assessing the impact of individual indicators reveals that six of ten indicators of economic institutions have significant and negative effects on extreme poverty. These indicators are government integrity, business freedom, investment freedom, financial freedom, property rights, and trade freedom. Implying that improvement in these six indicators would significantly reduce the level of extreme poverty in the SSA. Like in the results on poverty headcount, tax burden also has a significant positive impact on extreme poverty. Again, the tax burden is capable of throwing more people into extreme poverty. While government size and fiscal health have negative signs but are not statistically significant.

Table 3a: Results on Poverty Gap below $2.15 (Extreme Poverty Line)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
L.PG$2.15	0.919***	0.914***	0.925***	0.879***	0.921***	0.919***
	(0.00370)	(0.00353)	(0.00476)	(0.00811)	(0.00365)	(0.00388)
EMPT	-0.0408***	-0.0313**	-0.0257**	-0.0451***	-0.0422***	-0.0238
	(0.00943)	(0.0122)	(0.0129)	(0.0118)	(0.00632)	(0.0178)
EDUC	-0.0230***	-0.0244***	-0.0238***	-0.0190***	-0.0280***	-0.0243***
	(0.00341)	(0.00483)	(0.00337)	(0.00406)	(0.00185)	(0.00429)
PCI	1.52e-05**	1.58e-05***	1.76e-05***	-1.53e-06	9.19e-06*	2.92e-06
	(5.98e-06)	(3.93e-06)	(6.55e-06)	(7.43e-06)	(5.21e-06)	(6.78e-06)
OEF	-0.0610***					
	(0.00939)					
GINT		-0.0432***				
		(0.00225)				
BF			-0.0414***			
			(0.00329)			
IF				-0.0530***		
				(0.00781)		
FF					-0.00680**	
					(0.00276)	
PR						-0.00692**
						(0.00318)
Constant	7.360***	4.872***	5.250***	7.376***	4.688***	3.461**
	(0.913)	(0.915)	(0.897)	(0.961)	(0.472)	(1.390)
Observations	546	546	546	546	546	546
Number of SSAID	39	39	39	39	39	39
Sargan test	0.1868	0.2875	0.1660	0.2587	0.3337	0.2039
AR 2 test	0.2339	0.1840	0.3569	0.1810	0.3961	0.2691

Source: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 3b: Results on poverty gap below $2.15 (extreme poverty line), continue

Variables	Model 7	Model 8	Model 9	Model 10	Model 11
L.PG$2.15	0.712***	0.924***	0.728***	0.921***	0.925***
	(0.0254)	(0.00409)	(0.0355)	(0.00398)	(0.00373)
EMPT	-0.0299	-0.0489***	-0.0303	-0.0374***	-0.0337***
	(0.0647)	(0.0121)	(0.0616)	(0.00692)	(0.00815)
EDUC	-0.0153	-0.0290***	-0.0135	-0.0290***	-0.0265***
	(0.0105)	(0.00284)	(0.00983)	(0.00203)	(0.00252)
PCI	2.72e-06	-1.92e-06	1.04e-05	2.09e-06	1.36e-06
	(4.18e-05)	(4.53e-06)	(4.00e-05)	(9.62e-06)	(3.61e-06)
GS	-0.0107				
	(0.0134)				

TB		0.0142***			
		(0.00280)			
FH			-0.00160		
			(0.00168)		
LF				0.000969	
				(0.00571)	
TF					-0.0101***
					(0.000980)
Constant	5.341	3.905***	4.911	4.224***	4.533***
	(3.807)	(0.699)	(3.414)	(0.683)	(0.641)
Observations	195	546	195	546	546
Number of SSAID	39	39	39	39	39
Sargan test	0.1943	0.3097	0.2590	0.1191	0.2197
AR 2 test	0.3121	0.1466	0.3968	0.1466	0.2995

Source: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Finally, Tables 4a and 4b present the impact of economic institutions on the poverty gap below $3.65. The result on the effect of the overall index of economic institutions shows that moderate poverty would significantly reduce with improvement in economic institutions. Cross-checking the effects of the individual indicators of institutions reveals that improvements in government integrity, business freedom, investment freedom, and financial freedom would significantly lead to a reduction in moderate poverty in SSA. Though property rights, government size, fiscal health, and labour freedom have negative coefficients, they are not statistically significant. Meanwhile, tax burdens and trade freedom have significant positive impacts. Meaning that moderate poverty would increase with a rise in tax burden and trade openness.

Through all the regressions, education has significant negative effects on poverty. Employment also shows mostly significant negative signs through the estimations. Therefore, it is necessary for the government to encourage education among the youths and also formulate policies that will enhance the creation of jobs across the countries in the SSA countries. Reforms that would make institutions generally inclusive are critical to ending poverty in SSA.

Table 4a: Results on Poverty Gap Below $3.65

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
L.PG$3.65	0.930***	0.924***	0.936***	0.897***	0.931***	0.932***
	(0.00689)	(0.00422)	(0.00645)	(0.0101)	(0.00565)	(0.00569)
EMPT	-0.124***	-0.0884***	-0.0985***	-0.107***	-0.100***	-0.0766**
	(0.0201)	(0.0259)	(0.0259)	(0.0171)	(0.0182)	(0.0306)
EDUC	-0.0370***	-0.0252***	-0.0375***	-0.0265***	-0.0485***	-0.0255***
	(0.00570)	(0.00636)	(0.00415)	(0.00576)	(0.00617)	(0.00802)
PCI	-1.21e-05	1.81e-05	6.56e-06	-2.50e-05*	2.66e-05	-6.22e-06
	(1.54e-05)	(1.17e-05)	(1.85e-05)	(1.43e-05)	(1.81e-05)	(1.32e-05)
OEF	-0.0595***					
	(0.0192)					
GINT		-0.0745***				

			(0.00831)			
BF			-0.0510***			
			(0.0117)			
IF				-0.0609***		
				(0.00979)		
FF					-0.0623***	
					(0.0141)	
PR						-0.00344
						(0.00577)
Constant	14.18***	10.12***	11.71***	13.45***	12.02***	7.404***
	(1.445)	(1.622)	(1.408)	(1.369)	(0.985)	(2.457)
Observations	546	546	546	546	546	546
Number of SSAID	39	39	39	39	39	39
Sargan test	0.1095	0.0973	0.1881	0.1280	0.1621	0.2999
AR 2 test	0.2275	0.3321	0.4297	0.1019	0.1411	0.1139

Source: Standard errors are in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4b: Results on poverty gap below \$3.65, *continue*

Variables	Model 7	Model 8	Model 9	Model 10	Model 11
L.PG\$3.65	0.706***	0.936***	0.742***	0.929***	0.932***
	(0.0500)	(0.00509)	(0.0465)	(0.00494)	(0.00502)
EMPT	-0.0649	-0.115***	-0.0568	-0.0922***	-0.109***
	(0.0919)	(0.0200)	(0.0804)	(0.0173)	(0.0207)
EDUC	-0.0237*	-0.0410***	-0.0266**	-0.0425***	-0.0421***
	(0.0126)	(0.00443)	(0.0128)	(0.00396)	(0.00699)
PCI	7.11e-06	-2.22e-05**	-4.90e-05	-4.72e-06	-2.28e-05**
	(6.93e-05)	(9.16e-06)	(6.43e-05)	(1.42e-05)	(1.05e-05)
GS	-0.0388				
	(0.0412)				
TB		0.0138**			
		(0.00631)			
FH			-0.00122		
			(0.00230)		
LF				-0.00466	
				(0.00937)	
TF					0.00458*
					(0.00276)
Constant	12.87**	9.423***	10.93**	9.540***	9.987***
	(6.110)	(1.100)	(4.683)	(0.948)	(1.527)

Observations	195	546	195	546	546
Number of SSAID	39	39	39	39	39
Sargan test	0.1903	0.1961	0.1813	0.2564	0.1621
AR 2 test	0.5722	0.1825	0.1439	0.1698	0.1411

Source: Standard errors are in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

5. Conclusion

The study investigated the relative impacts of ten different indicators of economic institutions on poverty headcount, extreme poverty, and moderate poverty. The analyses revealed generally that the improvement of economic institutions is critical to poverty reduction in Sub-Saharan Africa (SSA). However, not all the indicators of economic institutions have a significant influence on poverty reduction. This finding is supported by existing studies such as Acemoglu and Robinson (2010), Gwartney and Connors (2010), Connors (2013), Doran and Stratmann (2020), Okunlola and Akinlo (2021), as well as Fritsch et al. (2021). On the one hand, improvements in government integrity, business freedom, investment freedom, and financial freedom are crucial in reducing poverty headcount, extreme poverty, and moderate poverty, respectively. On the other hand, a rise in tax burden will significantly result in an increase in poverty headcount, extreme poverty, and moderate poverty. More trade freedom will significantly reduce extreme poverty but may lead to an increase in moderate poverty and poverty headcount. Probably, trade freedom would reduce poverty up to a certain threshold, beyond which more trade freedom would lead to more poverty. While government size, fiscal freedom, and labour freedom do not show any significant influence on poverty reduction throughout the analysis.

A number of policy issues can drown out the aforementioned findings. Speaking generally, institutional reforms that give equal opportunities to everyone in society without discrimination on the basis of either ethnicity, or religion, or socio-economic status are important in significantly reducing poverty in SSA. Specifically, efforts should be directed towards improving the integrity of government by making government decisions and activities more transparent with less corruption. Transparency improves the efficiency of government regulations, which in turn reduce barriers to business and trade. Hence, improvement in government integrity would create room for more income-earning activities for the majority of people in society without discrimination.

Secondly, it is important for policymakers to make not only the process of starting a business easy but also to create an environment that allows individuals to run enterprises without burdensome and redundant interference from the government. Thus, regulations should impose less burden on business owners and be consistent so as to make the regulatory environment predictable. Thirdly, it is necessary to create a free and open investment environment that allows easy and free movement of capital and labour, as well as encourage innovation and competition and provide the right incentives to individuals to undertake entrepreneurial activities. This investment framework should be effective, transparent, and support all firms and businesses equitably. All these will allow capital and other productive resources to flow into sectors and activities where they are best utilised and yield the greatest returns.

Fourthly, the financial system should be made more open and fairly accessible to entrepreneurs and investors without discrimination. A variety of alternative financial facilities should be provided to complement the banking system so as to ensure diversification of risk. Financial regulations are to be limited to institutional frameworks that ensure transparency and integrity in the system. Going beyond this will create unnecessary impediments. Finally, the government should not place unbearable burdens on the system in terms of multiple and high taxes, high public debts, and high unproductive public spending. Trade

openness should be done with caution. Areas where the economy has developed competitive strength can be fully open, while other areas should be given time and support to grow before exposing them to international competition. Future research on the impact of economic institutions on poverty should endeavour to explore the influence of political institutions on the effectiveness of economic institutions in the fight against poverty.

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Conflict of interest statement

The authors have no competing interests to declare that are relevant to the content of this article.

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An example appendix

Authors including an appendix section should do so after References section. Multiple appendices should all have headings in the style used above. They will automatically be ordered A, B, C etc.

A.   Result of normality test

```
           Shapiro-Wilk W test for normal data

Variable |    Obs       W        V        z     Prob>z

     PHC |    615    0.97411  10.498    5.704   0.00000
   PG215 |    615    0.92484  30.482    8.290   0.00000
   PG365 |    615    0.98188   7.349    4.839   0.00000
 res_std |    585    0.98194   6.999    4.710   0.00000
```

B.   Result of normality test

```
Variable |       VIF      1/VIF

   GDPPCE |      2.67    0.375216
     EDUC |      1.89    0.530065
    EMPYT |      1.84    0.542509
  ECOINST |      1.43    0.699449

 Mean VIF |      1.96
```

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Authors' contributions

Abdulhakeem Abdullahi Kilishi conceptualized the central idea of the research, drafted the proposal and drafted the outlines of the article as assigned to each team member. He also designed and wrote the article. Musa Ayodeji Adebiyi collected and carried out the data analysis. While Abdulrahman Idris Abdulganiyu wrote the literature review, revised the article and supervised the research progress.