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Article

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Suggested Citation: Asafo-Adjei, Emmanuel et al. (2023) : Asymmetric relationships among financial sector development, corruption, foreign direct investment, and economic growth in sub-Saharan Africa, Cogent Economics & Finance, ISSN 2332-2039, Taylor & Francis, Abingdon, Vol. 11, Iss. 1, pp. 1-25,
https://doi.org/10.1080/23322039.2023.2182454

This Version is available at:
https://hdl.handle.net/10419/303986

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Cogent Economics & Finance

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/oaef20

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To cite this article: Emmanuel Asafo-Adjei, Peterson Owusu Junior, Anokye M. Adam, Clement Lamboi Arthur, Ebenezer Boateng & Kwadwo Ankomah (2023) Asymmetric relationships among financial sector development, corruption, foreign direct investment, and economic growth in sub-Saharan Africa, Cogent Economics & Finance, 11:1, 2182454, DOI: 10.1080/23322039.2023.2182454

To link to this article: https://doi.org/10.1080/23322039.2023.2182454

Published online: 26 Feb 2023.

Asafo-Adjei et al., *Cogent Economics & Finance* (2023), 11: 2182454
https://doi.org/10.1080/23322039.2023.2182454

cogent economics & finance

FINANCIAL ECONOMICS | RESEARCH ARTICLE

Asymmetric relationships among financial sector development, corruption, foreign direct investment, and economic growth in sub-Saharan Africa

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Received: 04 October 2022
Accepted: 15 February 2023

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Reviewing editor:
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Abstract: Prior studies on the relationship between FDI and growth have generally concentrated on mean effects, or average growth benefits. It seems improbable that the majority of sub-Saharan economies will have similar "average" economic growth, hence the emphasis on mean effects in particular falls short. All other drivers can be seen to have an impact based on the uneven growth rates of these economies. The current study brings new evidence about the asymmetric relationship between foreign direct investment (FDI) and economic growth amidst financial sector development (FSD) and corruption covering a sample period of 2002 to 2020 for 48 sub-Saharan economies. For this reason, the instrumental variables panel quantile regression technique is employed to achieve the purpose of the study. The study finds that FDI inflows have a significant positive relationship with economic growth for economies with low growth (less than 50% quantile) but negative at high growth levels (at quantiles 50% and beyond). Also, control of corruption significantly interacts negatively with FDI and GDP per capita irrespective of the GDP levels, whereas FSD significantly positively interacts with FDI to contribute to economic growth at various growth levels. Findings from the study imply that FSD promotes economic growth in sub-Saharan Africa at diverse growth levels. On the other hand, the interacting effect of control of corruption is inimical to FDI-growth nexus at all growth levels. It is pertinent that efforts are made by financial policymakers in sub-Saharan Africa to improve the local financial sector conditions to recuperate the economic advances from FDI.

Subjects: Public Finance; Investment & Securities; International Business

Keywords: Dependency; Domestic credit to private sector; Financial development; Gross domestic product; Heterogeneity; Panel quantile regression

1. Introduction

The inflow of foreign capital, particularly direct investments, has increased tremendously in developing economies over the past three decades after spates of economic liberalisation. Foreign direct investments (FDI), have been recognised as a key source of foreign exchange, which augments the balance of payments. FDI is also seen as a source of employment creation, technological advancement and knowledge spillover, and an increase in domestic tax revenue for developing economies (Anyanwu, 2012; Jugurnath et al., 2016). However, a burgeoning body of

literature indicates that the influence of FDI on economic growth can be more complex than generally thought. It has been argued that knowledge spillover benefits from FDI can be an illusion for developing countries due to unskilled labour and the use of backward structures that may be incompatible with the technology of multinational companies (Herzer, 2012). Moreover, since multinational corporations may have a competitive advantage, competition can lead to domestic firms crowding out, thereby reducing overall productivity.

Empirical evidence adduced on the nexus has also been inconclusive. In support of the modernisation theory, which revolves around neoclassical and endogenous growth theories, several studies reveal that FDI spurs economic growth (see, Adams & Opoku, 2015; Akadiri et al., 2020; Kalai & Zghidi, 2019; Sengupta & Puri, 2020; Seyoum et al., 2015; Sunde, 2017). Countervailing this evidence, some studies report a significant negative effect of FDI on economic growth (see, Herzer, 2012; Mencinger, 2003) while others find that FDI has no causal relationship with economic growth (Akinlo, 2004; Bermejo Carbonell & Werner, 2018; Chakraborty & Basu, 2002).

A growing body of literature, however, suggests that the discord regarding the influence of FDI on growth can largely be attributable to host country characteristics, primarily the absorptive capacity of these countries. Yeboua (2019) asserted that one of the essential domestic factors that expedite the ability of the indigenous firms to appropriately react to the challenges and benefits associated with FDI activities is the local financial system. Hermes and Lensink (2003) and Alfaro et al. (2004) also revealed that a strong financial system is crucial for a host country to benefit the growth gains from FDI. Particularly, the financial system boosts the efficient allocation of resources, and can enable foreign capital to be channelled to effective use, thereby boosting overall growth (Hermes & Lensink, 2003). Moreover, the absence of easy access to external firms can constrain multinational firms with limited funds which can make them forsake profitable growth opportunities that require large fixed costs to be incurred upfront in acquiring or establishing a new affiliate and commencing early production (Desbordes & Wei, 2017). Thus, a strong financial sector can attract more FDI inflows as domestic financial development makes more outside capital available to foreign investors (Desbordes & Wei, 2017).

However, greater access to outside capital also creates an incentive for multinational corporations to substitute foreign outsourcing for integration (Desbordes & Wei, 2017). Likewise, better access to capital in host countries can spur local competition. Thus, from a theoretical perspective, it is not clear whether foreign direct investors may be attracted more to host countries with developed financial markets. As a corollary to this, some empirical studies have also investigated the role of financial sector development (FSD) in the FDI-economic growth relationship. Studies by Adjasi et al. (2012) and Agbloyor et al. (2014) based on samples of African countries found that FDI impacts positively on economic growth only when it interacts with financial development indicators. The mutual limitation of these studies is that they utilise a linear interaction model where FDI simply interacts with economic growth. This modelling strategy according to Yeboua (2019) relies heavily on the a priori assumption that the effect of FDI on economic growth fluctuates monotonically with financial development. Yeboua (2019), therefore investigated the role of financial development in facilitating the materialisation of the growth-enhancing effect of FDI in African countries by using a panel smooth transition regression model. The results showed that only countries that experience beyond a certain threshold level of financial development enjoy the growth-enhancing effect of FDI. However, there may be a possibility that the growth advances from FDI are revealed during certain levels of growth.

Aside from the level of financial development, it has been argued that foreign investors are concerned about the quality of institutions, particularly the level of corruption in their host countries. Generally, institutions may matter for foreign direct investors because they influence the structure of economic incentives in an economy and help allocate resources to the most efficient use (Acemoglu et al., 2005). In particular, the level of corruption has an impact on the distribution and allocation of resources, and includes the abuse of public office for personal gains

(Hamdi & Hakimi, 2020). De Jong and Udo (2006, p. 1) define corruption as "the misuse of public power for private benefit". Corruption may hamper the contribution of FDI to the growth of an economy by deteriorating the expenditures of business institutions, thus reducing productivity (Dabour, 2000; Hamdi & Hakimi, 2020). Consequently, the host country's corruption level may not only guide investors' decisions pertinent to overseas investment but can be expected to shrink the anticipated effectiveness and productivity of investment projects, thereby distorting economic growth.

This has induced a nascent body of literature to also investigate the impact of corruption on economic growth, and its interacting effect on the relationship between FDI and economic growth around the globe. Several studies have indicated the adverse impact of corruption on economic development and poverty reduction (Alesina & Angeletos, 2005; Langnel & Amegavi, 2020). Other studies document otherwise (Li et al., 2000; Mauro, 1997). As a result, studies that find a positive impact of corruption on economic growth claim that corruption fosters economic development by reducing administrative bottlenecks and increasing system transparency, especially in developing economies imbued with bureaucracy. Thus, for a way out of political inadequacies, bureaucratic impediments and stern conventions instituted by the government make agents highly indulge in corrupt practices which augment economic growth (Li et al., 2000; Mauro, 1997). This clearly shows the contradictory findings on the dynamics of corruption on economic growth.

Extant literature on the contribution of corruption on FDI has documented mixed outcomes. However, most studies indicate a negative relationship (Darley, 2012; Hamdi & Hakimi, 2020), due to the high level of cost of investment operations and distortion in the transparency system. This minimises the forecasted investment project's profitability and the efficiency of government to properly function with weak institutions (Hamdi & Hakimi, 2020). The uncertainty level advanced by corruption within a nation acts as a disincentive for FDI inflows. Notwithstanding, studies conducted by Bellos and Subasat (2012), Buchanan, Le and Rishi (2012), Lucke and Eichler (2016), Gossel (2018) among others found that corruption promotes FDI inflows. That is, corruption is necessary for minimising predicaments in nations with weak institutions and regulations. For instance, corruption promotes bureaucratic effectiveness by increasing decision-making process, in nations with rigid and ineffective bureaucratic systems. Other studies advocate that the relationship between corruption and FDI is insignificant (Helmy, 2013; Mudambi et al., 2013).

From prior works, it can be examined that the development of the financial system and level of corruption has a role to play in addressing the contribution of FDI to economic growth in developing countries but with limited empirical outcomes. This becomes a gap to fill in answering the question of whether the level of financial development and corruption act as an impetus to enhancing the FDI-growth nexus. This issue is important for sub-Saharan Africa where financial development and corruption have faced rapid ramifications (Adomako et al., 2021; Akinlo et al., 2021; Asafo, 2021; Stevens & Newenham-Kahindi, 2021). Predominantly, in sub-Saharan economies, corruption is of grave concern since it affects the achievement of growth and sustainable development in the long-run (Transparency International, 2020; United Nations Economic Commission for Africa, 2016). According to World Bank (2020) estimates, the percentage of the population that is poor is higher than in other large geographical areas, as is the average perceived level of corruption.

Prior studies on FDI-growth relationship mainly focus on mean effects that are average gains in growth. The special focus on mean effects is a shortcoming because it is extremely unlikely that most sub-Saharan economies enjoy the "average" economic growth or even near. Economies in this region are indeed characterised by different growth levels. The growth levels of these economies are heterogeneous upon which all other drivers illustrate their influence. Thus, limited studies have investigated this issue using the panel quantile regression to reveal the asymmetric dimensions of economic growth in assessing the FDI-economic growth relationship conditioned on financial sector development and corruption. An issue of extreme concern is whether the

contribution of FDI coupled with interactions from financial sector development and corruption improve outcomes for economies in the lower tails or upper tails of economic growth distributions. Consequently, the panel quantile regression may sanction more meaningful interpretations in situations where oscillations are involved with economic growth. The outcomes using the quantile regression technique are relatively stable when there are outliers (Buchinsky, 1998), which is germane for sub-Saharan countries.

We specifically adopt the instrumental variables panel regression. This technique is rarely explored in the empirical literature, especially on FDI-growth relationship in sub-Saharan Africa. The estimation technique enables us to set multiple endogenous variables as well as instruments while still maintaining the asymmetric dimensions of the dependent variable (Autor et al., 2017), which in this case economic growth. In this study, we employ legal origins of the sampled sub-Saharan African countries and human genetic diversity as relevant instruments for our endogenous variables—FDI, FSD and Corruption with the quest of addressing the endogeneity issue for two main reasons.

First, in the legal origins' tradition, it is common practice in economic research to establish clear distinctions between countries that practice Civil law and those that practice Common law. Legal origins theory is well suited to a developing economy context, particularly, sub-Saharan Africa countries, where most countries have legal systems that were exogenously transplanted through invasion, imperialism, and colonialism by France or England in the 19^{th} and 20^{th} centuries. Essentially, the colonial history of sub-Saharan Africa makes it an ideal sample for research. Legal origin is specifically selected as an instrument because it has a direct influence on financial development and external finances other than on economic growth (Acemoglu et al., 2005; Beck & Levine, 2005 Beck et al., 2003; Demirgüç-Kunt & Maksimovic, 2002; Levine, 2002, 1999, 2002).

Second, we address the endogeneity issue associated with corruption using the predicted genetic human diversity carefully generated by Ashraf and Galor (2013) for 207 countries for our empirical discourse. As noted by Ramachandran et al. (2005), the migratory distance of human beings from East Africa depicts a strong inverse linear influence on genetic diversity. Comparatively, the predicted genetic diversity of Ashraf and Galor (2013) is a linear function of migratory distance from East Africa, and can be considered as exogenous. Arguments on the predicted genetic human diversity stipulate that a broad spectrum of traits mitigates trustful behaviour (Ashraf & Galor, 2013) to distort good human interactions and cooperation during production. Conversely, diverse traits enhance knowledge creation as revealed by Ashraf and Galor (2013). The contradictory outcomes expatiate the fact that different levels of traits could have an asymmetric impact to incite either dishonest conduct (leading to more corrupt practices) or new knowledge. Along the lines of dishonest behaviour, the homogeneous and heterogeneous nature of human traits induce corruption to occur more frequently, but at the intermediate level of human traits, corruption occurs less frequently, as found by Kunieda et al. (2016). The genetic diversity is therefore exogenous in this study, and its original and squared values can reliably be employed as instruments for corruption (see, Kunieda et al., 2016).

In his study, Mauro (1995) employed ethnolinguistic fractionalisation as an instrument for corruption. In addition, the works of Alesina et al. (2003), Easterly and Levine (1997), and La Porta et al. (1999), assert the significant influence of ethnic fractionalisation on the quality of government. Nonetheless, recently, ethnic fractionalisation has faced rapid ramifications having determinants such as the duration of human settlements (Ahlerup & Olsson, 2012), changes in regional land quality (Michalopoulos, 2012), human genetic diversity (Ashraf & Galor, 2013a), etc. These factors render the less likelihood of employing ethnolinguistic fractionalisation as a relevant instrument for corruption due to its endogenous dynamics recently.

The purpose of this study, is, therefore, to find out whether the role played by the development of the financial system and corruption in sub-Saharan Africa is an important precondition for FDI to

have a positive influence on economic growth. The contribution of this study to empirical literature is that it is one of the few attempts to assess the FDI-growth nexus conditioned on financial sector development and corruption in sub-Saharan Africa, where the financial system is still underdeveloped, and the level of corruption is of grave concern. In addition, due to different levels of growth over a given period, we adopt the instrumental variable quantile regression to establish the extent of heterogeneity in growth outcomes. We seek to answer the question of whether the aforesaid relationships are strong for high and low economic growth in sub-Saharan economies. In this manner, the unique contribution of this study is application of the instrumental variable quantile regression approach to examine the interacting effects of FSD and control of corruption on the nexus between FDI and economic growth in the context of sub-Saharan Africa.

We found that financial sector development significantly increases gross domestic product (GDP) per capita growth in sub-Saharan Africa irrespective of the growth levels. Also, the development of the financial sector remained a necessary factor in enhancing the FDI-growth relationship positively. On the other hand, FDI inflows and control of corruption were only important for low GDP per capita economies, as found in the direct relationships. Notwithstanding, the contribution of FDI and control of corruption to GDP per capita levels became worse when control of corruption interacted with FDI inflows at all growth levels.

The following section reviews brief literature on related empirical studies. This is followed by a discussion of the methodology and data sources employed in the study. Also, the study presents and discusses the findings and finally, provides the concluding section.

2. Literature review

Basically, the Modernisation theory and the dependency theory support the relationship between FDI and economic growth. The Modernisation theory is linked with neoclassical and endogenous growth theories. The modernisation theory states that it is essential and highly desirable for transnational businesses to operate in developing nations through FDI operations because they advance economic growth and development through capital accumulation and technology transfer. Particularly, the long-run influence of FDI on economic growth is debatable from the Neoclassical and endogenous growth models. While the Neoclassical growth models advocate that implication is that FDI can only augment growth if it influences technology positively, the endogenous growth models stress that FDI can enhance growth in the long-run through factors such as research and development, human capital and spillover effects (Grossman & Helpman, 1991).

Conversely, the dependency theory contends that FDI stunts economic development and widens income disparities in developing nations. According to the dependence theory, exogenous factors like foreign investment and commerce are what lead to underdevelopment. These causes cause the periphery economies (developing economies) to be integrated into the developed country-dominated global economy and to initiate a phase of dependent development. This viewpoint contends that transnational firms harm economic growth through their FDI activity. They create fierce rivalry in the local market, which forces domestic companies out of the most vibrant economic areas and monopolises the market. Additionally, they exert influence on political and economic decisions in developing nations in a variety of ways (Cardoso & Faletto, 1979; Prebisch, 1968; Yeboua, 2019).

The nexus between FDI and EG abounds in most empirical literature and is an inconclusive sequel to the division in the theoretical literature. Blomstrom et al. (1994) found that FDI is growth-enhancing if the country is sufficiently measured in terms of high per capita income. Other studies also find a bi-directional relationship between them (Adem & Güvercin, 2020; Asghar et al., 2011; Bilas, 2020; Ibrahim & Acquah, 2021; Moudatsou & Kyrkilis, 2011; Raza et al., 2019). They advocate that economic growth attracts more domestic investment and FDI, which, in turn, leads to direct positive effect on economic growth in host nations.

Conversely, studies also find an insignificant relationship between FDI and economic growth (Carkovic & Levine, 2005; Ndambendia & Njoupouognigni, 2010; Olagbaju & Akinlo, 2018). A nascent and fledgling body of literature has gained massive interest in the heterogeneous dynamics of growth outcomes within economies (Akram et al., 2021; Amegavi, 2021; Autor et al., 2017; Gyamfi et al., 2021; Zhu et al., 2016). This has induced the application of the panel quantile regression models. However, the instrumental variables panel regression technique is rarely explored in the empirical literature, especially on FDI-growth relationships amidst financial sector development and corruption in sub-Saharan Africa. This may be due to the difficulty in selecting reliable external instruments for relevant endogenous variables in addressing the endogeneity issue.

Moreover, there has been a constant debate on the contribution of the financial sector to economic growth. Several works have disregarded finance as an exaggerated factor in the determinants of growth (Bauer, Lucas, 1988; Bauer et al., 1984; Miller, 1998, etc.). On the other hand, Bagehot (1873), Schumpeter (1911), and Gurley and Shaw (1955), and other recent empirical literature such as Asafo-Adjei et al. (2021) and Fagiolo et al. (2020) find finance-growth relationship worthy of discussion. A study by Yeboua (2019) is instrumental in addressing the role played by financial sector development on the relationship between FDI and economic growth. The study found that only countries that are located above a certain threshold level of financial development enjoy the growth-enhancing effect of FDI. However, there may be a possibility that the growth advances from FDI are revealed during certain levels of economic growth.

Arguments on economic growth have also prompted discussions on corruption. The agency theory has provided the theoretical basis for most research on corruption with the quest of responding to governance issues (Persson et al., 2013). From this theory, corruption occurs when public servants are allowed to exercise their discretion and less likelihood of being held answerable for results. The self-interested public officials are agents entrusted with the power to promote the interest of citizens as principals. It becomes practically impossible for the citizens to monitor the behaviour of the self-interest public officials due to information asymmetry (Rose-Ackerman & Palifka, 2016). Consequently, corruption can be mitigated when citizens minimise the discretion level of public officials, enhance information access, and impose stricter rules against corrupt practices. In addition, Shleifer and Vishny (1993) revealed that the structure of institutions of government and the political process are pertinent determinants of corruption.

Corruption has an influence on FDI inflows and the economic growth of nations (D' Agostino et al., 2016; Blackburn et al., 2006; Mauro, 1995; Tanzi & Davoodi, 1998). This has induced a plethora of literature to investigate this issue with mixed outcomes. Because of the mixed results on the direct effects of corruption on economic growth, some empirical studies have been conducted to look into the indirect consequences of corruption through government spending. According to Dzhumashev (2009), numerous empirical studies discover no strong negative outcomes for the direct effect of corruption, but the indirect effect is statistically significant. According to Ugur (2014), the indirect consequences of corruption on public finance and human capital are likely to impair economic development in low-income nations with inefficient bureaucracies. Furthermore, corruption has the potential to distort income collection and alter the composition of government spending. According to some researchers, major initiatives such as engineering and infrastructure projects are more susceptible to being corrupted than administrative areas such as pay (Mauro, 1997; Shleifer & Vishny, 1993). D' Agostino et al. (2016) revealed that whereas military and consumer expenditures have a negative corruption effect, corruption in investment expenditures is likely to boost economic growth.

An area of recent concern is to investigate whether corruption can enhance the FDI-growth nexus since the level of corruption is of grave concern in sub-Saharan Africa. In light of control of corruption, we expect that FDI is completely disincentive due to unprofitable investments and thereby plunging economic growth. Table 1 specifically presents summary of prior empirical studies with respect to econometric techniques, data range, geographical area and findings.

3. Methodology

In this study, we adopt the instrumental variable quantile regression (IVQR) which is robust for our empirical discourse. Although the application of this technique is at the expense of imposing somewhat restrictive assumptions on the quantile process, such as limited in considering the lags of the dependent variable as found in the generalised methods of moments techniques. In this study, we utilise upper case letters to mean random variables, whereas lower case denotes values on the random variables. The econometric model is ascertained on a data set with several observations (*n*), a continuous result variable (*Y*), a treatment variable (*E*), and instrument variable (*Z*) which can be binary or otherwise, and a vector of covariates (*X*) of exogenous variables. In this study, *Y* is gross domestic product per capita (GDPPC), *E* is a vector of continuous variables indicating foreign direct investment (FDI), domestic credit to the private sector (DCPS), Control of corruption (CoC), Total force Labour (Labour), Population growth (PopG), Trade as a percentage of GDP and Gross fixed capital formation as a percentage of GDP (GFCF), and *Z* is an indicator for legal origin and human genetic diversity.

Since the mean effect might not capture all the treatment effects of the outcome distribution, we conveniently specify the quantile treatment effect as

$$(\partial/\partial e)QY_e((\tau|x) \tag{1}$$

where Y_e and τ denote potential outcomes of *Y* indexed against the treatment variables *e*, and quantile index, respectively. The quantile treatment effect demonstrates the causal effect of *E* on *Y* while holding unobserved heterogeneity (U_D) constant at $(U_D) = \tau$.

The selection of treatment variables endogenously requires that a quantile model with instrumental variables be considered in order not to bias the estimates (Autor et al., 2017; Chernozhukov & Hansen, 2004, 2005, 2006; Koenker & Bassett, 1978). The setting of instrumental variables *Z* with correlated effects through the treatment variables (*E*) but are independent of potential outcomes, we obtain the causal effect of *E* on *Y* over the entire distributions of *Y*.

The IVQR objective function can be presented as

$$R(\tau,\alpha,\beta,\gamma) = \sum_{t=1}^{T}\sum_{i=1}^{N}\rho_\tau(y_{it} - e_{it}^{'}\alpha - x_{it}^{'}\beta - z_{it}^{'})V_{it} \tag{2}$$

where again, *n*, y, *e*, *x* and *z* denote number of observations, outcome variable, a vector of endogenous variables, a vector of exogenous covariates and a vector of instrumental variables. Also, $\rho_\tau = u(\tau - I(u \leq 0))$ is the loss function of the quantile regression, *i* refers to each Sub-Saharan economy (*i* = 1, 2, 3, …,48); *t* refers to time period from (*t* = 1, 2, 3, …, 19). Again, $V_i = V(x_{it}, z_{it})>0$ is a scalar weight, τ denotes the quantile index. Following the two steps estimation procedure of Chernozhukov and Hansen (2004, 2008), we first minimise the objective function for β,γ which signify as functions of τ and α,

$$\{\hat{\beta}(\tau,\alpha),\hat{\gamma}(\tau,\alpha)\} = \arg\min_{\beta,\gamma} R(\tau,\alpha,\beta,\gamma) \tag{3}$$

The parameters on the instruments are thus estimated by finding the value of α. See, Chang et al. (2018), Chernozhukov and Hansen (2008) and Koenker (2005) for additional details.

4. Data Description and Sources

We employ a secondary panel data analysis of four main variables. The panel data is recorded annually; it covers the period from 2002 to 2020 for 48 sub-Saharan economies. The selected countries and chosen period are due to consistent data availability. They include GDP per capita, FDI inflows, Domestic credit to private sector (DCPS) and Control of Corruption (CoC). For

Table 1. Summary of empirical studies

Authors	Economic techniques	Data range	Geographical area	Findings
	FDI-Growth nexus			
Dinh et al. (2019)	Panel-based unit root test, Johansen cointegration test, Vector Error Correction Model (VECM), and Fully Modified OLS (FMOLS)	2000–2014	Four ASEAN countries (Indonesia, Laos, Philippines and Vietnam)	FDI enhances economic growth in long-run but has a negative effect in the short-run.
Lasbrey et al. (2018)	Systematic review	1980 up to 2018	Developing, Developed and Organisation for Economic Co-operation and Development countries	Most studies revealing significant positive effect of FDI on economic growth
Adem and Güvercin (2020)	Panel VAR	1990–2016	25 Sub Saharan African countries	Significant positive effect of FDI on economic growth
	Conditional effect of FSD			
Yeboua (2019)	Panel smooth transition regression model	1990–2013	26 African countries	It was revealed that only countries that are found above a particular threshold level of financial development appreciate the growth-enhancing effect of FDI.
Hermes and Lensink (2003)	Estimations with a common constant, with fixed effects and with random effects.	1970–1995	67 developing countries	Instead of human capital, it was discovered that local financial development is necessary for the growth-enhancing effect of FDI to manifest.
Agbloyor et al. (2014)	Panel Instrumental Variable Generalized Method of Moments	1990–2007	Selected African countries	It was discovered that strong financial markets are necessary for private capital flows to have a favourable impact on economic growth.
	Conditional effect of Corruption			
Haruna and Bakar (2021)	Driscoll and Kraay standard errors based on the pooled ordinary least squares	1984 to 2018	Five selected sub-Saharan African nation	The interaction term for domestic financial liberalisation and corruption showed a negative influence on growth
Okada and Samreth (2014)	Panel data and the OLS technique	1995 to 2008	130 economies	It was found that the interaction effect of corruption and FDI promote economic growth.

robustness purposes, we employ the financial sector index of IMF an alternative proxy for financial development. This enables the study to explore the multidimensional and multifaceted nature of financial development (Svirydzenka, 2016). FDI results in more technological transfers and improves domestic companies' competitiveness (Alfaro et al., 2004). Gross Domestic Product (GDP) per capita will be used as an indicator of economic growth. Foreign Direct Investment (FDI) inflows (% of GDP) will be the main independent variable, while economic growth will be the main dependent variable. Financial Sector Development (FSD) and Corruption will be the interacting variables to assess the FDI-growth nexus. The study also utilises control variables such as Trade openness (Trade as a percentage of GDP), Gross fixed capital formation (as a % of GDP), growth in Population and Total labour force as a result of their possible influence on economic growth. Data on GDP per capita, FDI, FSD, Population growth (PoPG), Labour force, and Trade openness were sourced from World Development Indicators, whereas Control of Corruption data was sourced from World Governance indicators. The choice of these variables is based on extant literature (Ibrahim & Alagidede, 2017, 2018; Opoku et al., 2019; Pandya & Sisombat, 2017).

4.1. Descriptive analysis

Tables 2 and 3 present summary statistics and pairwise correlations from data averaged over the 2002–2020 period for 48 sub-Saharan economies.

There are high cross-country fluctuations for GDP per capita indicating that nations within sub-Saharan economies experience heterogeneous growth patterns. It becomes interesting to ascertain the heterogeneous dynamics of growth considering their low, middle and high-income levels. The maximum growth level at GDP per capita (constant 2015 US$) was enjoyed by Equatorial Guinea (US$ 16,438.641), while Ethiopia suffered from a growth level of US$ 258.629. The data also depict large variations in FDI inflows with Mauritania recording as low as −11.625, and Liberia recording as high as 103.337.

Data on domestic credit to private sector also suggest high fluctuations relative to the average level within this region. To produce a reliable estimate, we find the natural logarithm of GDP per capita, FDI inflows and domestic credit to private sector to take care of the excess of the Standard deviation over the average levels, and subsequently used it for the analysis. Most of the variables are positively skewed except for growth in population from the skewness (SKS) values. However, the entire series exhibit leptokurtic distribution as shown by the kurtosis (KTS) values. Accordingly, it can be confirmed from the Jarque-Bera (J-B) statistic that the variables deviate from normality. As a result, the instrumental variable quantile regression (IVQR) employed in this study is robust to investigate asymmetric relationship between FDI and economic growth amidst FSD and control of corruption.

From Table 3, we notice a positive significant relationship for variables such as the natural logarithm of FDI, DCPS and control for corruption with GDP per capita. These relationships are considered not strong and may be due to the heterogeneous growth levels within the region. As a result, the application of linear static models to examining growth levels within sub-Saharan economies may not always be worthwhile in revealing hidden relationships.

Table 2 reports the descriptive statistics of the variables used in the study. GDPPC represents gross domestic product per capita, FDI also represents foreign direct investment inflows, Domestic credit to private sector (DCPS) is our proxy for financial development, and CoC also represent Control of Corruption (CoC). Ancillary variables include Trade openness, gross fixed capital formation (GFCF), population growth (PoPG), and Labour participation. FD represents financial development index.

Table 3 reports the pairwise correlation analysis of the variables used in the study. lnGDPPC represents the natural log of gross domestic product per capita, lnFDI also represents the natural log of foreign direct investment inflows, Domestic credit to private sector, the proxy for financial

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	SKS	KTS	J-B
GDPPC	881	2156.69	3166.32	111.93	22,942.61	3.03	13.95	5749.59*
DCPS	787	20.46	23.78	0.00	160.13	3.39	15.81	6891.16*
FD	874	0.14	0.11	0.00	0.64	2.36	8.74	2012.80*
FDI	831	4.82	8.42	−11.63	103.34	5.92	52.97	91,295.42*
Trade	814	73.29	37.95	9.96	311.35	1.77	8.44	1427.73*
GFCF	782	21.89	9.24	2.00	81.05	1.33	7.67	942.78*
PoPG	903	2.48	0.94	−2.63	5.03	−0.87	4.75	229.93*
Labor	893	7,378,505.90	10,423,312.00	45,862.00	63,226,720.00	2.81	11.86	4095.41*
CoC	904	−0.65	0.64	−1.91	1.23	0.63	2.91	60.87*

[*] indicate significance at 1%

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Table 3. Pairwise correlations Pairwise correlations

Variables	lnGDPPC	lnFDI	FD	lnDCPS	CoC	lnLabour	Trade	GFCF	PoPG
lnGDPPC	1.000								
lnFDI	0.167***	1.000							
FD	0.611***	0.047	1.000						
lnDCPS	0.434***	−0.017	0.722***	1.000					
Coc	0.378***	0.126***	0.613***	0.595***	1.000				
lnLabour	−0.337***	−0.101***	−0.003	−0.061*	−0.269***	1.000			
Trade	0.424***	0.397***	0.297***	0.125***	0.250***	−0.399***	1.000		
GFCF	0.299***	0.383***	0.091**	0.108***	0.207***	−0.017	0.308***	1.000	
PoPG	−0.300***	0.077**	−0.486***	−0.435***	−0.460***	0.270***	−0.275***	0.141***	1.000

[*], [**], and [***] indicate significance at 10%, 5% and 1% levels respectively.

development, is also log transformed (lnDCPS), and CoC also represent Control of Corruption (CoC). Ancillary variables include trade openness, gross fixed capital formation (GFCF), population growth (PoPG), and Labour participation. Note that labour force has also been logged transformed. FD represents financial development index.

4.2. Cross-sectional dependence test

Table 4 displays the cross-section dependence test for the 48 sub-Saharan countries for each variable under the null hypothesis of cross-section independence.

We reject the null hypothesis of cross-section independence for almost all the variables except control of corruption. This suggests that most variables employed for the analysis in sub-Saharan Africa exhibit cross-section dependence. Hence, the study employs Pesaran's CADF panel unit root test which deals with heterogenous panels with cross-section dependence as proposed by Pesaran (2003). The presence of cross-section dependence may be due to the heightened interdependencies of economies among cross-sectional units within this region (De Hoyos & Sarafidis, 2006). Consequently, the propensity for each country to respond similarly to common shocks may plausibly enhance convergence in policy implications or policy interdependencies. New policy interventions by the countries on these variables must hinge on existing nations' policies in the same region as a yardstick for future progress.

Table 4 reports the cross-sectional dependence test of the variables used in the study. lnGDPPC represents the natural log of gross domestic product per capita, lnFDI also represents the natural log of foreign direct investment inflows, Domestic credit to private sector, the proxy for financial development, is also log transformed (lnDCPS), and CoC also represent Control of Corruption (CoC). Ancillary variables include trade openness, gross fixed capital formation (GFCF), population growth (PoPG), and Labour participation. Note that labour force has also been logged transformed.

4.3. Unit root test

Table 5 provides the unit root test for each variable. We assess stationarity both at levels and 1st differenced.

It can be observed that GDP per capita, Control of Corruption and FDI inflows are stationary at levels. On the other hand, all the variables are stationary at first difference. Nonetheless, since the instrumental variable panel quantile regression is robust to deal with asymmetric, non-stationary, non-normal and non-linear distributions, subsequent analysis is conducted based on levels.

Table 5 reports the unit root test of the variables used in the study. lnGDPPC represents the natural log of gross domestic product per capita, lnFDI also represents the natural log of foreign

Table 4. Cross-section dependence

Variable	CD-Test	Average Joint	T mean	Average Absolute Correlation(ρ)
lnGDPPC	107.595***	17.73	0.75	0.77
lnDCPS	54.176***	14.95	0.38	0.55
lnFDI	6.501***	15.29	0.05	0.33
CoC	809	18.67	0.01	0.37
lnLabour	139.877***	19.00	0.94	0.94
Trade	9.094***	16.55	0.06	0.38
GFCF	3.928***	15.37	0.02	0.36
PoPG	6.647***	18.63	0.04	0.52

[*], [**], and [***] indicate significance at 10%, 5% and 1% levels respectively.

Table 5. PESCADF—Test (Unit Root)

Variable	Levels	Difference (1)
lnGDPPC	−3.238***	−11.081***
lnDCPS	0.126	−7.714***
lnLabour	0.268	−9.459***
CoC	−2.073**	−15.590***
lnFDI	−6.595***	−19.684***
Trade	−0.713	−13.053***
GFCF	−0.905	−12.365***
PopG	1.620	−5.705***

direct investment inflows, Domestic credit to private sector, the proxy for financial development, is also log transformed (lnDCPS), and CoC also represent Control of Corruption (CoC). Ancillary variables include trade openness, gross fixed capital formation (GFCF), population growth (PoPG), and Labour participation. Note that labour force has also been logged transformed.

5. Results and discussion

Tables 6, 7 and 8 show the instrumental variables quantile regression for the direct and interacting relationships.

From Table 6, before the 50% quantile, FDI inflows positively influence GDP per capita in line with the modernisation theory. Thus, economies that are at lower levels of GDP can enjoy the influence of FDI inflows. On the other hand, we notice the adverse impact of FDI inflows on GDP per capita from the 50% quantile through to 90%. This demonstrates that economies with higher GDP levels in sub-Saharan Africa do not benefit from FDI inflows. The negative influence of FDI is supported by the dependency theory which contends that FDI hurts economic development and widens income disparities in developing nations which is proved in this study to be economies with higher GDP levels.

This finding, therefore, contradicts the study of Blomstrom et al. (1994) who found that FDI is growth-enhancing if the country is sufficiently measured in terms of high per capita income. Also, Adem and Güvercin (2020) revealed the significant influence of FDI on economic growth in 25 selected sub-Saharan African countries when the panel VAR approach was employed. We show otherwise that FDI inflows is much beneficial to low-income economies that require more FDI inflows to boost and discover new economic activities. This signifies those high-income economies in Sub-Saharan Africa do not necessarily need external funds to progress their economies. Although beyond the context of this study, the high-income earning economies may require a choice between innovation or imitation along the lines of Acemoglu (2003) to enhance the level of technological knowledge for future growth.

We further find that FSD measured by domestic credit to the private sector has a positive and significant impact on growth levels throughout the quantiles. This indicates that the development of the financial system is relevant for the advancement of GDP levels in sub-Saharan economies that have witnessed rapid changes in their financial systems. This is in line with recent studies on finance-growth relationships which revealed finance worthy of discussion on growth dynamics (Asafo-Adjei et al., 2021; Fagiolo et al., 2020). Similar to the effect of FDI on GDP per capita, control of corruption positively influences GDP only in lower GDP per capita economies, whereas negative and significant for higher GDP per capita nations. This goes to reason those economies with low GDP per capita levels can boost their growth anytime they put in place mechanisms to control corruption.

Table 6. Direct relationships

Quantiles	LnFDI	lnDCPS	CoC	LnLabour	Trade	GFCF	PoPG
0.05	0.057***	0.299***	0.238***	−0.052***	−0.001**	0.010***	−0.199***
0.15	0.094***	0.222***	0.175***	−0.139***	−0.002***	0.023***	−0.206***
0.25	0.024***	0.373***	0.094***	−0.140***	−0.001***	0.018***	−0.081***
0.35	0.036***	0.480***	0.103***	−0.144***	−0.001***	0.014***	−0.101***
0.50	−0.037**	0.360***	−0.164***	−0.073***	0.004***	0.020***	−0.409***
0.65	−0.074***	0.551***	−0.312***	−0.177***	0.003***	0.029***	−0.311***
0.75	−0.098***	0.569***	−0.108***	−0.187***	0.007***	0.029***	−0.233***
0.85	−0.061***	0.639***	−0.245***	−0.119***	0.009***	0.028***	0.082***
0.90	−0.061***	0.639***	−0.245***	−0.119***	0.009***	0.028***	0.082***

[*], [**], and [***] indicate significance at 10%, 5% and 1% levels respectively.

The positive effect of control of corruption on economic growth is in line with the studies of Darley (2012) and Hamdi and Hakimi (2020) who found a negative relationship between the level of corruption and GDP per capita. This is due to the high level of cost of investment operations and distortion in the transparency system when there are high levels of corruption in low-income economies. Consequently, the forecasted investment project's profitability and the efficiency of government to properly function with weak institutions are minimised. The negative influence of control of corruption on large growth economies signifies those countries with high levels of economic growth in the sampled SSA countries may likely put in place bureaucratic structures due to high levels of economic activity in these countries. However, firms in these countries may probably use petty corruption as a means of oiling the wheels of exchange.

Moreover, we find from Table 7 that control of corruption interacts negatively with FDI and GDP per capita irrespective of the GDP levels. In other words, the mechanisms put in place by these economies to manage corruption are not enough to stimulate GDP per capita levels. Consequently, the effort put in place to control the level of corruption plummets their GDP levels. This implies that corruption may be necessary for minimising predicaments in nations with weak institutions and regulations as found by Okada and Samreth (2014) that FDI stimulates economic growth when corruption is severe. Conversely, Haruna and Bakar (2021) found a negative interacting effect of corruption on economic growth in five selected sub-Saharan African nation.

Accordingly, corruption promotes bureaucratic effectiveness by increasing decision-making process, in nations with rigid and ineffective bureaucratic systems. For the direct impact of corruption on GDP per capita, it can be seen that low levels of corruption (increase in the control of corruption) are not a necessary condition in enhancing the GDP per capita of high-income economies in sub-Saharan. We also confirm that in light of control of corruption, FDI is completely disincentive which renders unprofitable investments and thereby minimising economic growth. This is intuitive enough to suggest that low levels of corruption inhibit economic development by increasing administrative bottlenecks. Thus, with the quest of ensuring political adequacies, bureaucratic enhancers and severe conventions instituted by the government to induce high control of corruption make agents reluctant due to less tendency to exploit.

From Table 8, owing to the major contribution of the development of the financial system to economic growth, we notice that FSD positively interacts with FDI to contribute to GDP per capita levels. This is true for less extremely low, middle and high GDP per capita inclined economies. This shows that the relevance of FDI inflows to GDP per capita levels in sub-Saharan economies is mostly realised through the development of the financial system relative to the control of corruption. This is in line with the study of Agbloyor et al. (2014), Alfaro et al. (2004) and Hermes and Lensink (2003). In

Table 7. Direct relationships with interaction from Corruption

Quantiles	LnFDI	lnDCPS	CoC	INTCoC	LnLabour	Trade	GFCF	PoPG
0.05	0.064**	0.328***	0.270***	−0.042*	−0.099***	−0.003***	0.010***	−0.153***
0.15	0.050***	0.261***	0.244***	−0.077***	−0.136***	−0.002***	0.021***	−0.181***
0.25	−0.035***	0.408***	0.157***	−0.153***	−0.179***	−0.003***	0.023***	−0.172***
0.35	−0.141***	0.375***	0.291***	−0.189***	−0.094***	−0.001***	0.021***	−0.190***
0.50	−0.172***	0.502***	0.032***	−0.243***	−0.153***	0.000***	0.027***	−0.355***
0.65	−0.092***	0.439***	−0.122***	−0.116***	−0.102***	0.003***	0.032***	−0.389***
0.75	−0.072***	0.526***	−0.028***	−0.036***	−0.184***	0.006***	0.034***	−0.319***
0.85	−0.072***	0.701***	−0.164***	−0.060***	−0.231***	0.008***	0.022***	0.146***
0.90	−0.047***	0.656***	−0.148***	0.020***	−0.234***	0.007***	0.031***	0.153***

[*], [**], and [***] indicate significance at 10%, 5% and 1% levels respectively.

support, Yeboua (2019) also found that only countries that are found above a particular threshold level of financial development appreciate the growth-enhancing effect of FDI.

While the interaction term suggests that FSD and FDI are substitutes in boosting economic growth, the results also show that the coefficients of FDI are all negative. This implies that when more credit is dispensed to the private sector or when there are higher levels of financial development, FDI inflows deter economic growth. This implies that amid higher levels of financial development (DCPS), FDI inflows may result in increased competition since private firms can have access to external funding to finance expansion. In SSA economies where regulations may be weak, an aggressively competitive environment may be inimical to growth since it can drive down firm profits, resulting in firm fragility and hampering overall productivity. This can be true especially when multinational corporations (a key source of FDI) usually operate with lower marginal costs and can result in price wars and price cuts.

Table 5 reports IV quantile regression estimates on the asymmetric relationship impact of foreign direct investment inflows, financial development and control of corruption on economic growth in SSA. lnGDPPC represents the natural log of gross domestic product per capita, lnFDI also represents the natural log of foreign direct investment inflows, Domestic credit to private sector, the proxy for financial development, is also log transformed (lnDCPS), and CoC also represents Control of Corruption (CoC). Ancillary variables include trade openness, gross fixed capital formation (GFCF), population growth (PoPG), and Labour participation. Note that labour force has also been logged transformed.

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Table 7 reports IV quantile regression estimates on the asymmetric relationship impact of foreign direct investment inflows, financial development and control of corruption on economic growth in SSA. lnGDPPC represents the natural log of gross domestic product per capita, lnFDI also represents the natural log of foreign direct investment inflows, Domestic credit to private sector, the proxy for financial development, is also log transformed (lnDCPS), INTDCPS is the interaction of FSD and CoC also represents Control of Corruption (CoC). Ancillary variables include trade openness, gross fixed capital formation (GFCF), population growth (PoPG), and Labour participation. Note that labour force has also been logged transformed.

6. Robustness

The study tests the sensitivity of the estimates with an alternative proxy of financial development, the financial sector index. The financial development index published by the IMF is multidimensional and captures the performance of financial institutions and stock markets. Over time, financial sectors have experienced massive evolution across the globe and modern financial systems have become multifaceted. Although banks remain the largest and most important, investment banks, insurance companies, mutual funds, pension funds, venture capital firms, and other nonbank financial institutions now play substantive roles (Svirydzenka, 2016). Likewise, the presence of financial markets also allows individuals and firms to diversify their savings, and firms can now raise money through stocks, bonds, and wholesale money markets, by-passing traditional bank lending. The contribution of these actors may have synergistic effect on growth and foreign investors (Asafo-Adjei et al., 2021). The

Table 8. Direct relationships with interaction of FSD

Quantiles	LnFDI	lnDCPS	CoC	INTDCPS	LnLabour	Trade	GFCF	PoPG
0.05	−0.123***	0.190***	0.221***	0.079***	−0.024***	0.000***	0.007***	−0.199***
0.15	0.147***	0.219***	0.226***	−0.016***	−0.151***	−0.004***	0.020***	−0.188***
0.25	−0.054***	0.224***	−0.031***	0.028***	−0.186***	−0.006***	0.020***	−0.185***
0.35	−0.088***	0.469***	−0.091***	0.039***	−0.130***	−0.001***	0.020***	−0.199***
0.50	−0.073***	0.440***	−0.177***	0.036***	−0.134***	0.001	0.026***	−0.412***
0.65	−0.070***	0.567***	−0.266***	0.010***	−0.166***	0.003***	0.030***	−0.324***
0.75	−0.080***	0.421***	−0.038***	0.014***	−0.131***	0.005***	0.033***	−0.291***
0.85	−0.088***	0.696***	−0.249***	0.015**	−0.233***	0.012***	0.024***	0.149***
0.90	−0.087***	0.664***	−0.185***	0.019***	−0.181***	0.008***	0.025***	0.181***

[*], [**], and [***] indicate significance at 10%, 5% and 1% levels respectively.

results shown in Tables 9 and Table 10 are not significantly different from the baseline estimates. Consequently, the study concludes that the results are robust.

Table 9 reports IV quantile regression estimates on the asymmetric relationship impact of foreign direct investment inflows, financial development and control of corruption on economic growth in SSA. lnGDPPC represents the natural log of gross domestic product per capita, lnFDI also represents the natural log of foreign direct investment inflows, Domestic credit to private sector, the proxy for financial development is FD, and CoC also represents Control of Corruption (CoC). Ancillary variables include trade openness, gross fixed capital formation (GFCF), population growth (PoPG), and Labour participation. Note that labour force has also been logged transformed.

Table 10 reports IV quantile regression estimates on the asymmetric relationship impact of foreign direct investment inflows, financial development and control of corruption on economic growth in SSA. lnGDPPC represents the natural log of gross domestic product per capita, lnFDI also represents the natural log of foreign direct investment inflows, Domestic credit to private sector, the proxy for financial development is FD, and CoC also represents Control of Corruption (CoC). Ancillary variables include trade openness, gross fixed capital formation (GFCF), population growth (PoPG), and Labour participation. Note that labour force has also been logged transformed.

7. Conclusion and policy recommendations

The study presented an asymmetric analysis of the FDI-growth relationship amidst FSD and corruption in 48 sub-Saharan economies with relevant control variables. For this reason, the instrumental variables panel quantile regression technique is employed to achieve the purpose of the study. This study sought to find out whether the role played by the development of the financial system and corruption in sub-Sahara Africa is an important precondition for FDI to have a positive influence on economic growth. The study is one of the few attempts to assess the FDI-growth nexus conditioned on financial sector development and corruption in sub-Saharan Africa, where the financial system is still underdeveloped and the level of corruption is of grave concern. Also, due to different levels of growth over a given period among sub-Saharan economies, we adopt the instrumental variable quantile regression to establish the extent of heterogeneity in growth outcomes.

The nexus between FDI and economic growth was seen to be bi-directional at diverse growth levels supported by both the modernisation theory and dependency theory. We mainly found that financial sector development is a necessary factor in promoting GDP per capita growth in Sub-Saharan Africa irrespective of the growth level of each economy. On the other hand, FDI and control of corruption inflows are only important for low GDP per capita economies, as found in the direct relationships. Notwithstanding, the contribution of FDI and control of corruption to GDP per capita levels became worse when control of corruption interacted with FDI inflows among all growth levels. Yet, the development of the financial sector remained the necessary factor in enhancing the FDI-growth relationship positively.

We advocate that governments and policy-makers within this region should be wary of the development of the financial system since it has potential benefits for all levels of growth. Due to evidence of cross-sectional dependence, governments and policy-makers can rely on policies aimed at promoting financial sector development instituted by neighbouring Sub-Saharan nations to provide them with insights. Such policies may include improving the regulatory environment of the financial system to minimise insider dealings. We also advocate countries with low levels of economic growth (growth below the average levels in the region) institute measures to reduce corruption and attract FDI.

Further studies can apply other instruments to see how the findings depart from this study. Other measures of corruption such as corruption perception index and International Country Risk

Table 9. Direct relationships

quantiles	0.05	0.15	0.25	0.35	0.50	0.65	0.75	0.85	0.95
	lnGDPPC	lnGDPPC	lnGDPPC	lnGDPPC	lnGDPPC	lnGDPPC	lnGDPPC	lnGDPPC	lnGDPPC
FD	5.434***	5.727***	5.306***	4.908***	5.542***	5.722***	5.700***	5.707***	5.747***
lnFDI	0.0462***	0.0770***	0.0303***	−0.0372	−0.103***	−0.0368***	−0.0436***	−0.0458***	−0.0461***
CoC	0.124***	0.118***	0.156***	0.0107	−0.115***	−0.127***	−0.141***	−0.162***	−0.0843***
lnLabour	−0.163***	−0.149***	−0.153***	−0.139***	−0.149***	−0.188***	−0.159***	−0.170***	−0.155***
Trade	0.001***	0.002**	0.009***	−0.0001	0.002***	0.0002***	0.0014***	0.00085***	0.00103***
GFCF	0.0230***	0.0309***	0.0263***	0.0238***	0.0301***	0.0269***	0.0264***	0.0280***	0.0266***
PoPG	−0.0733***	−0.105***	−0.204***	−0.216*	−0.0681**	−0.107***	−0.0834***	−0.100***	−0.134***
N	680	680	680	680	680	680	680	680	680

[*], [**], and [***] indicate significance at 10%, 5% and 1% levels respectively

Table 10. Results of interaction of FDI with FDI

	0.05	0.15	0.25	0.35	0.50	0.65	0.75	0.85	0.95
	lnGDPPC	lnGDPPC	lnGDPPC	lnGDPPC	lnGDPPC	lnGDPPC	lnGDPPC	lnGDPPC	lnGDPPC
FD	5.910***	5.813***	5.470***	5.572***	5.654***	5.805***	5.605***	5.741***	5.870***
lnFDI	−0.0309***	0.000446	−0.0232*	−0.00873	−0.0186***	0.0603***	−0.0134***	−0.0251***	−0.00972***
INTFD	−0.0851*	−0.268***	−0.172***	−0.252***	−0.0897***	−0.469***	−0.161***	−0.0789***	−0.204***
CoC	−0.178***	−0.163***	−0.133***	−0.180***	−0.142***	−0.144***	−0.130***	−0.158***	−0.174***
lnLabour	−0.192***	−0.190***	−0.166***	−0.188***	−0.182***	−0.158***	−0.177***	−0.177***	−0.185***
Trade	−0.000274**	−0.000384	0.000185	−0.000885***	−0.000336***	0.00119***	−0.000316***	−0.000214***	−0.000306***
GFCF	0.0272***	0.0258***	0.0294***	0.0281***	0.0288***	0.0222***	0.0290***	0.0297***	0.0285***
PoPG	−0.121***	−0.160***	−0.117***	−0.145***	−0.125***	−0.172***	−0.116***	−0.113***	−0.117***
N	680	680	680	680	680	680	680	680	680

*[*1], [**1], and [***] indicate significance at 10%, 5% and 1% levels respectively*

Guide corruption index can be utilised for comparative analysis. Another weakness in our estimation is that the study does not control for other global factors such as global economic policy uncertainty, and volatility of developed markets as well such as the US market.

Funding
The authors have no funding to report.

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Disclosure statement
No potential conflict of interest was reported by the author(s).

Citation information
Cite this article as: Asymmetric relationships among financial sector development, corruption, foreign direct investment, and economic growth in sub-Saharan Africa, Emmanuel Asafo-Adjei, Peterson Owusu Junior, Anokye M. Adam, Clement Lamboi Arthur, Ebenezer Boateng & Kwadwo Ankomah, *Cogent Economics & Finance* (2023), 11: 2182454.

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***Cogent Economics & Finance* (ISSN: 2332-2039) is published by Cogent OA, part of Taylor & Francis Group.**