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Threshold effects of inflation on the FDI – growth nexus: evidence from inflation-targeting countries in sub-Saharan Africa

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ABSTRACT

The purpose of this study is to examine the threshold effect of inflation on the foreign direct investment (FDI) – economic growth nexus in sub-Saharan Africa using panel samples of countries that have adopted an inflation-targeting regime. The study sourced data from the World Bank's World Development Indicators over a period of 1982–2020 and adopted the fixed-effect panel threshold model approach for its analysis. The findings reveal two separate thresholds of inflation in the FDI – growth nexus. The growth-enhancing effect of FDI is largely realized when inflation is below the optimal threshold level of 7.26%. Beyond the second threshold level of 16.49%, the beneficial effect of FDI on growth is seen to diminish in terms of effect-size. This study provides new insights into the growth effect of FDI and the role of inflation levels in this nexus. The thresholds of inflation and the attendant size-effect of FDI on growth can be benchmarks for Africa and other developing and emerging economies in assessing their situations. As African monetary authorities choose which inflation targets to set for their monetary policies, the findings raise significant implications for them.

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1. Introduction

The world economies have been open to foreign trade and investments owing to globalization. One prominent feature of this phenomenon has been foreign direct investments (FDI). In an effort to promote economic growth, nations all over the world have opened up their economies by creating suitable conditions to attract foreign investment. One of such conditions created by countries to attract FDI is inflation management. Empirically, numerous recent studies have determined that the FDI—growth relationship depends on other factors related to the host country's absorptive

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capacity, such as the control of inflation (Ndoricimpa, 2017), level of economic development (Blomstrom et al., 1994), development of financial markets (Alfaro et al., 2004; Azman-Saini et al., 2010; Hermes & Lensink, 2003), and human capital (Borensztein et al., 1998). Others include trade liberalization (Balasubramanyam et al., 1996), the technology gap between the host and origin countries (Havranek & Irsova, 2011), economic stability and open markets (Bengoa & Sanchez-Robles, 2003), and shared ownership of the FDI firm (Javorcik, 2004). Bénétrix et al. (2023) have also recently noted that the FDI—growth relationship is not stable over time (considering the pre and post 1990s periods), and the results on the role of absorptive capacities may be due to the global value chain revolution in the 1990s. This paper agrees with the idea of inflation management and its importance in defining the FDI—growth relationship. In general, inflation is bad news. Aside from distorting pricing, it erodes savings, discourages investment, encourages capital flight (into foreign assets, precious metals, or unproductive real estate), stifles economic growth, makes economic planning a nightmare, and, in extreme cases, causes social and political instability. The recent spate of political unrest in some African countries, the sudden deterioration in living conditions/standards of many African nations as a result of inflationary surges occasioned by the Covid-19 pandemic and the Russia-Ukraine war has proven how important it is for governments to manage inflation. Governments all over the world consider inflation as a scourge and attempt to combat it by conservative and long-term fiscal and monetary policies (Debelle et al., 1998). Experience and convenience have induced most governments to conduct their monetary policy by relying on intermediate targets such as monetary aggregates or exchange rates. However, over the last few decades, some developed and developing economies such as the current study's sample economies have broken with this tradition of using such intermediate targets and have begun to focus on the inflation rate itself; a practice known as inflation targeting. This approach is characterized by the setting of official inflation targets for one or more horizons, and the clear acknowledgement that stable and low inflation is the overarching long-term goal of monetary policy (Bernanke et al., 1998).

Since understanding the inflation—growth nexus is crucial for monetary policy (Bernanke & Mishkin, 1997; Madurapperuma, 2023; Seleteng et al., 2013), examining the link between inflation and economic growth has been the focus of extensive theoretical and empirical research. Historically, the relationship between inflation and economic growth has been linear; the impact of inflation can be neutral, positive, or negative depending on whether money is super-neutral (Sidrauski, 1967), a substitute for capital (Mundell, 1965; Tobin, 1965), or complementary to capital (Fischer, 1983; Stockman, 1981). The major goal of macroeconomic policies is to achieve rapid economic growth while maintaining low and stable inflation (Seleteng et al., 2013; Vinayagathasan, 2013). Inflation that is overly high harms the economy because of its unfavourable re-distributive and welfare effects (Eggoh & Muhammad, 2014), and despite Friedman's (1969) proposal, negative inflation is never a policy agenda simply because a certain level of inflation is required to 'grease the wheels' of the economy (Seleteng et al., 2013). Low inflation stimulates economic growth by encouraging local investment and the effective use of productive resources, as well as boosting FDI inflows (Ahortor et al., 2012). This begs the question, at what point does inflation

change from good to bad? In other words, at what level should monetary policymakers set inflation to avoid its negative consequences on growth? Again, at what level(s) of inflation do economies attract and reap the greatest impact of FDI on growth? The answer to these questions lies in examining the threshold effects of inflation particularly in the FDI—growth nexus. The current study therefore seeks to examine the possible threshold effects of inflation on the FDI—growth relationship with a goal to proffer some suggestions to both regional and national monetary policymakers of Africa and other developing economies.

The contributions of this study to the literature can be deciphered in the following ways. Firstly, by focusing on selected African countries which have adopted inflation targeting regimes, the current study through its examination of the effects of inflation levels, sheds light on inflation-thresholds at which certain economic growth determinants, particularly FDI, become significant or changes. Secondly, the study adds to our knowledge of emergent suspected non-linearities in the FDI—growth relationship from an African context. Thirdly, this study applies the fixed-effect panel threshold regression; an estimation technique recently advanced by Wang (2015) which allows model parameters to change in response to the value of a specified threshold variable. This helps enlighten our understanding on certain mechanisms *via* which the growth effects of certain economic variables are transmitted. Overall, the study's findings, from an African context, theoretically support the idea of the growth effect of FDI being contingent on certain transmission mechanisms or absorptive capacities of host economies, in this case, inflation management.

The remainder of this paper is organized as follows: Section 2 reviews the literature on FDI cum inflation and economic growth; Section 3 presents the study's data and method of analysis while Section 4 discusses the results and findings. The last section draws conclusions.

2. Literature review

In theory, the link between inflation and economic growth has generally been linear. Mundell (1965) and Tobin (1965) forecast a positive link between inflation and capital accumulation, which suggests a beneficial impact on growth. According to the Mundell-Tobin effect, because money and capital are interchangeable, an increase in the inflation rate erodes the purchasing power of money balances, causing resource substitution and a shift in portfolio allocation away from money balances and toward real assets. This will increase capital accumulation and, as a result, promote economic growth (Choi et al., 1996; De Gregorio, 1996). Furthermore, it has been found out that when governments in developing nations have insufficient public income, they frequently borrow from central banks to pay their budget deficits. Governments can employ this seigniorage, or inflation tax resources, to stimulate capital formation by bolstering real investment. As long as this financing mechanism does not crowd out private-sector investment, inflationary finance will contribute to economic growth (the Kalecki effect). Again, nominal wages frequently lag behind prices as a result of slowly shifting expectations, slow wage negotiating, or government suppression. As a result, inflation may increase economic growth by changing income distribution away from

individuals and toward higher saving capitalist enterprises, so raising savings, investment, and growth (the Kaldor effect).

Stockman (1981) and Fischer (1983), on the other hand, argue that there is a negative relationship between inflation and economic growth. A large volume of empirical literature has also demonstrated long-run negative relationship between inflation and growth of economies both in linear frameworks (Mamo, 2012; Olamide et al., 2022), as well as in nonlinear and threshold frameworks (Azam & Khan, 2022; Ekinci et al., 2020; Ndoricimpa, 2017; Rustayisire, 2015). The literature on the long-run impacts of inflation on economic growth is based on the assumption that high inflation increases economic inefficiencies and inhibits growth through lowering investment levels as well as the rate of productivity growth (Fischer, 1993). High and volatile inflation disrupts the price signaling mechanism, resulting in confusing information for economic agents on relative prices, which causes distortions in investment decisions and thus impedes the efficient allocation of resources (Fischer, 1993; Huybens & Smith, 1998; Khan & Senhadji, 2000, 2001). Furthermore, inflation causes uncertainty in financial markets and raises the risk of investing. Financial intermediaries are hesitant to provide long-term financing for capital formation and prefer to keep their portfolios liquid, resulting in a decrease in economic activity (Boyd et al., 1996; Hellerstein, 1997; Romer, 2001). High inflation also creates 'shoe leather costs', which are related with extra efforts made by people to minimize their cash holdings, and 'menu costs', which are caused by the need to adjust prices more frequently (Rustayisire, 2015). Inflation stifles financial development; an inflationary environment is frequently associated with financial repression, as governments adopt actions such as setting interest rate caps and credit allocation to safeguard specific priority sectors of the economy. Such controls impede economic progress by causing inefficient resource allocation (Boyd et al., 1996; Haslag & Koo, 1999; Rousseau & Wachtel, 2002).

A few references to some empirical studies that demonstrate the negative effect of inflation on economic growth would suffice. Kormendi and Meguire (1985) discovered in a cross-country analysis utilizing data from 47 sample nations from 1950 to 1977 that a 1% increase in inflation affects economic growth by 0.57%. Fischer (1993) demonstrated a negative association between economic growth and some macroeconomic indices, most notably inflation and budget deficits. He went on to show that there is a link between these macroeconomic indices and economic growth. Barro (1995) investigated the inflation—growth nexus using panel data for 100 countries from 1960 to 1990. His empirical finding was that the two variables have a statistically significant negative association. He predicted that a 10% increase in inflation lowers output growth by 0.2% to 0.3% on average. Motely (1998) discovered a similar association in a cross-country analysis using the same data set and found that a 5% increase in inflation leads in a 0.1% to 0.5% decline in economic growth. De Gregorio (1992) for Latin America; Fischer et al. (1996) for transition economies; and Gillman et al. (2004) for OECD and APEC countries verified the existence of a negative link between inflation and economic growth. These research works concluded that inflation impedes efficient resource allocation by distorting the signaling role of price fluctuations and causing a range of output-reducing inefficiencies. According to the findings of the preceding studies, the effect of inflation on economic growth is

positive or non-significant at low rates, but becomes significantly negative at increasing rates (see also Ndoricimpa, 2017). These findings imply that policymakers should aim for low inflation rates in order to promote economic growth. However, how low should inflation be? Again, at what point does inflation begin to harm output growth? These issues would be addressed by investigating the threshold effects of inflation.

With respect to the relationship between FDI and growth, the extant literature shows that, it is traditionally linear (Kumari et al., 2023; Madurapperuma, 2023; Rao et al., 2023) with isolated evidences of non-linear relationship (see, e.g. An & Yeh, 2021). The endogenous growth model, which predicts FDI spillover to domestic companies and sometimes individuals (Arestis et al., 2023) resulting in the beneficial influence on productivity and growth (see Barro & Sala-I-Martin, 1997; Helpman & Grossman, 1991; Rao et al., 2023), provides theoretical basis for policy concerning the FDI—growth nexus. Empirical evidence also shows that FDI productivity may be realised through various channels such as carbon emissions changes (Liu et al., 2023), or the host country having a minimal threshold stock of human capital (Borensztein et al., 1998). Because of the increase in cross-border investments, a tremendous amount of energy and effort has been devoted to determining the varied effects of FDI on host economies. However, while theoretical studies repeatedly show that FDI has a favourable influence on many different areas of the host country's economy, empirical studies continue to produce contradictory conclusions. As a result, the FDI—growth link is regarded as mixed at best (Gorg & Greenaway, 2004). Bruno and Campos (2013) discovered in a metadata study of 1,102 estimates that approximately 44% of the research papers discovered a positive and significant impact of FDI on growth, 44% were insignificant, and 12% of the studies reported a negative and significant impact of FDI on the host country's economic growth. Bénétrix et al. (2023) recently submitted that the FDI—growth nexus is unstable and elusive over time while also acknowledging the role of host countries' absorptive capacities. The conflicting empirical evidences against theoretical predictions may partly be explained by the fact that, the FDI—growth relationship, as earlier noted, is contingent on other factors related to the absorptive capacity of the host countries. These include macroeconomic indicators such as inflation levels, which the current study seeks to investigate.

3. Data and method

Data was sourced from the World Bank's World Development Indicators (WDI) covering three sub-Saharan African (SSA) countries, Ghana Nigeria and South Africa over a period of 39 years from 1982 to 2020. These countries were selected because they are the only SSA countries that have formally adopted inflation targeting (Ndoricimpa, 2017). Besides, it is worthy to note that, Africa is a heterogeneous group of countries at various stages of development. Therefore, including several African countries in model estimations such as the threshold model employed in the current study would likely present confidence regions that are wide, leaving some uncertainty about the exact location of the threshold (see also, Khan & Senhadji, 2000). Hence, the current study focused on the three countries that are distinguished

by inflation targeting. The data coverage period reflects the period in which data on all the study's variables were readily available for analysis. Moreover, owing to data limitations which do not permit any meaningful statistical analysis to be carried out individually on each of the three countries, the study carried out its analysis on the surveyed countries together. Table 1 summarises the study's variables, definitions and measurements along with the attendant descriptive statistics.

3.1. Theoretical background of the study's model development

Long panel time series data models are commonly used in studies to assess relationships between variables that are observed throughout time. In many of these models, the relationship between the variables is assumed to remain constant across time. The underlying relationship between the model's variables can, on occasion, alter as a result of modifications to variables outside the model. By including abrupt changes in the parameters of the models, structural break models accurately reflect these situations. All model parameters can be changed and integrated into structural break models. Regarding how changes in model parameters happen, these models make a number of very particular assumptions. They expect that parameters change instantly when they reach a certain breakpoint. This makes intuitive sense when conditions that affect the model change immediately or noticeably. Other models, however, allow for various types of parameter shifts in the absence of such conditions, such as threshold models and time-varying parameter models, which both assume that model parameters change in response to the value of 'a specified threshold variable'. Because the degree of inflation has been identified in the literature as an absorptive capacity *via* which the growth effects of FDI may be realized by host nations, the current study uses the threshold model, which uses a predetermined threshold variable, namely inflation.

The fixed-effect panel threshold model developed by Hansen (1999) and modified by Wang (2015) was used in the investigation. Because of their straightforward and clear economic implications, threshold models are frequently utilized in macroeconomics and financial research. Heterogeneity is one of the main issues with panel data. In other words, because every participant in a study is unique, structural relationships may differ between participants. Only the heterogeneity in intercepts is reflected by the traditional fixed effect or random effect. For this issue, econometricians have developed a variety of slope models, including threshold models (see, for example, Hansen, 1999; Hsiao, 2003).

The structural break or leaping behavior in the relationship between variables is described by threshold models. The underlying premise of threshold models is that they depend on the value of a certain threshold variable to change their model parameters. Despite being common in time-series analysis, threshold models have not been widely used with panel data. The current analysis uses Wang's (2015) introduction of the -xthreg- command for implementing the panel threshold model in Stata. Theoretically speaking, a single or multiple threshold models may be sequentially fitted for a study's investigation of the jumping character or structural break in the relationship between variables upon consideration of economic theory prescriptions or

Table 1. Variables' description, sources and descriptive statistics.

Variables	Description	N	Mean	SD	Min	Max
GDP (Y_{it})	GDP per capita growth (annual %) sourced from WDI. The alternate [$Y(a)_{it}$] GDP(a) is the GDP growth (annual %)	117	0.983	3.756	−13.15	12.46
Inflation (π_{it})	Inflation, consumer prices (annual %) sourced from WDI	117	17.00	16.88	−0.692	122.9
Local Investment (INV_{it})	Equivalent to gross fixed capital formation (% of GDP) sourced from WDI. The alternate (INV(a) is gross capital formation (% of GDP).	117	23.55	13.28	3.761	85.94
Population Growth (PG_{it})	Population growth (annual %) sourced from WDI	117	2.322	0.502	1.218	3.045
Government Expenditure (GE_{it})	General government final consumption expenditure (% of GDP) sourced from WDI	117	10.48	6.116	0.911	20.65
Household Expenditure (HCE_{it})	Households and NPISHs final consumption expenditure (% of GDP) sourced from WDI	117	66.71	15.16	12.35	94.23
Foreign Direct Investment (FDI_{it})	Foreign direct investment, net inflows (% of GDP) sourced from WDI	117	1.854	2.144	−0.766	9.467
Openness (OP_{it})	Equivalent to the sum of import and export goods and services (annual % growth) sourced from WDI	117	48.98	21.64	6.320	116.0

Note: This table reports descriptive statistics based on a balanced panel with 117 firm-year observations covering the 3 countries over a period of 39 years. All variables are sourced from WDI.
Source: Authors' compilation and Stata output of descriptive statistics.

intuition and the observable changes in the span of a series. On the basis of economic theory, and of the span of the current study's panel datasets being used in its investigations, the study following Wang (2015) formulated a single threshold model for its preliminary investigation as follows:

$$y_{it} = \mu + X_{it}(q_{it} < \gamma)\beta 1 + X_{it}(q_{it} \geq \gamma)\beta 2 + u_i + e_{it}$$

The q_{it} variable is the threshold variable, whereas γ is the threshold parameter that divides the equation into two regimes with coefficients $\beta 1$ and $\beta 2$. The parameter u_i is the individual effect, while e_{it} is the disturbance.

Given γ, the ordinary least-squares estimator of β is

$$\hat{\beta} = \left\{X^*(\gamma)'\ X^*(\gamma)\right\}^{-1}\left\{X^*(\gamma)'\ y^*\right\}$$

where y^* and X^* are within-group deviations. The residual sum of squares (RSS) is equal to $\hat{e}^{*\prime}\hat{e}^*$. To estimate γ, one can search over a subset of the threshold variable q_{it}. Instead of searching over the whole sample, we restrict the range within the interval $(\gamma,\ \gamma)$, which are quantiles of q_{it}. γ's estimator is the value that minimizes the RSS, that is,

$$\hat{\gamma} = \arg\min_{\gamma} S_1(\gamma)$$

In the situation where γ is known, the model is no different from the ordinary linear model. However, where γ is unknown, a nuisance parameter problem ensues,

which makes nonstandard the γ estimator's distribution. Hansen (1999) has proven $\hat{\gamma}$ to be a consistent estimator for γ, and he argued further that forming the confidence interval using the 'no-rejection region' method with the following likelihood-ratio (LR) statistic is the best way to test $\gamma = \gamma 0$:

$$LR_1(\gamma) = \frac{\{LR1(\gamma) - LR1(\hat{\gamma})\}}{\sigma^2} \xrightarrow{Pr} \xi$$

$$Pr(x < \xi) = \left(1 - e^{\frac{-x}{2}}\right)^2$$

Given significance level α, the lower bound corresponds to the highest value in the LR series that is less than the α quantile, and the upper bound corresponds to the minimum value in the LR series that is less than the α quantile. The quantile can be computed using the inverse function of (2):

$$c(\alpha) = -2 \log 1 - \sqrt{(1 - \alpha)}$$

If $LR_1(\gamma 0)$ exceeds $c(\alpha)$, then we reject H_0. Testing for a threshold effect is the same as testing to see if the coefficients in each regime are the same. The null hypothesis and alternative hypothesis (linear versus single-threshold model) are as follows:

$$H_0 : \beta 1 = \beta 2 \; Ha : \beta 1 \neq \beta 2$$

The *F* statistic is constructed as

$$F_1 = \frac{(S_0 - S_1)}{\sigma^2}$$

Under H_0, the threshold γ is not identified, and F_1 has an asymptotic distribution that is nonstandard. To test the significance of the threshold effect, bootstrap is used on the critical values of the *F* statistic. S_0 is the RSS of the linear model. Hansen's (1996) suggested bootstrap design is adopted as follows:

Step 1: Fit the model under Ha and obtain the residual $\hat{e}^*_{it.}$
Step 2: Make a cluster resampling $\hat{e}^*_{it}$ with replacement, and obtain the new residual $v^*_{it.}$
Step 3: Generate a new series under the Ha data-generating process (DGP), $y^*_{it} = X^*_{it}\beta + v^*_{it}$ where β can take arbitrary values.
Step 4: Fit the model under H_0 and Ha, and compute the *F* statistic using (3).
Step 5: Repeat steps 1–4 *B* times, and the probability of *F* is $Pr = I(F > F_1)$, namely, the proportion of $F > F_1$ in bootstrap number *B*.

If there are multiple thresholds (that is, multiple regimes), then you would need to fit the model sequentially. For example, a double-threshold model may be fitted as follows:

$$y_{it} = \mu + X_{it}(q_{it} < \gamma 1)\beta 1 + X_{it}(\gamma 1 \leq q_{it} < \gamma 2)\beta 2 + X_{it}(q_{it} \geq \gamma 2)\beta 3 + u_i + e_{it}$$

Our study's preliminary investigations revealed the double threshold estimator as the optimal threshold model to be used for our analysis. Consequently, we settled on a double threshold model formulation in our ultimate selection. Our preliminary results have been detailed under Section 3.2.

3.2. Model specification and estimation

The following models are specified for the study's analysis in three steps.

Linear model specification

$$Y_{it} = \alpha_0 + \alpha_1\pi_{it} + \alpha_2 INV_{it} + \alpha_3 PG_{it} + \alpha_4 GE_{it} + \alpha_5 HCE_{it} + \alpha_6 OP_{it} + \alpha_7 FDI_{it} + \nu_t + \mu_i + \varepsilon_{it} \quad (1)$$

Threshold model specification

$$Y_{it} = \alpha_0 + \alpha_1\pi_{it} + \alpha_2 INV_{it} + \alpha_3 PG_{it} + \alpha_4 GE_{it} + \alpha_5 HCE_{it} + \alpha_6 OP_{it} + \alpha_7 FDI_{it}(\pi_{it} < \Upsilon 1) + \alpha_8 FDI_{it}(\Upsilon 1 \leq \pi_{it} < \Upsilon 2) + \alpha_9 FDI_{it}(\pi_{it} \geq \Upsilon 2) + \nu_t + \mu_i + \varepsilon_{it} \quad (2)$$

Where $\Upsilon 1$ and $\Upsilon 2$ are respectively the single and double threshold estimators, whereas the other variables are as defined in Table 1.

Besides, FDI which is the study's main independent variable of interest, and inflation being used as its threshold variable, local investment, market openness, population growth, government expenditure and household expenditure were also controlled for in the study's estimations in line with previous studies (Ibarra & Trupkin, 2016; Mamingi & Martin, 2018; Ndoricimpa, 2017). These variables have severally been observed to have an impact on economic growth of emerging and developing economies (Kumari et al., 2023; Ndoricimpa, 2017; Zhang & Guo, 2019). For example, the impacts of trade openness on economic growth have been observed to vary depending on the degree of openness; when trade openness grows, economic growth accelerates; otherwise, it slows (Zhang & Guo, 2019). Ndoricimpa also finds that local investment and population growth enhances economic growth in both low and middle income economies while government spending harms it. Household expenditure has also been found to boost economic growth of developing economies (Ezako, 2023).

For our preliminary analysis, we specify a linear model (Equation (1)) and estimate this model using the standard fixed effect with robust standard errors as well as the fixed effect with Driscoll-Kraay standard errors estimators. The fixed effect estimator is utilized because the Hausman test suggests the fixed effect model is most appropriate and comes close to the data generating process. For robustness checks, we further apply the feasible generalized least squares as well as the Prais-Winsten panel-corrected standard errors estimators to our linear model because they are deemed unbiased and

Table 2. Single threshold estimator and effect test (level = 95).

	Baseline Model			Robustness Test Model			Additional Test Model		
Model	Threshold Estimate	F-Stat	P-Value	Threshold Estimate	F-Stat	P-Value	Threshold Estimate	F-Stat	P-Value
Single	16.4946	3.15	0.0467	16.4946	3.14	0.0867	16.4946	2.98	0.0800

Note: This table reports the inflation threshold values and the sequential threshold effect test. A rejection of the null hypothesis in a single threshold model implies a double threshold model must be tested for. Single corresponds to Ho (linear model) and Ha (single threshold model); Double corresponds to Ho (single threshold model) and Ha (double threshold model); and Triple corresponds to Ho (double model) and Ha (triple threshold model).
Source: Stata output of single threshold estimator.

Table 3. Double threshold estimator and effect test (level = 95).

Baseline Model				Robustness Test Model			Additional Test Model		
Model	Threshold Estimate	F-Stat	P-Value	Threshold Estimate	F-Stat	P-Value	Threshold Estimate	F-Stat	P-Value
Single	16.4946	3.15	0.0833	16.4946	3.14	0.0767	16.4946	2.98	0.1167
Double	7.2646	2.32	0.0000	7.2646	2.31	0.0000	7.2646	2.34	0.0000

Note: This table reports the inflation threshold values and the sequential threshold effect test. A rejection of the null hypothesis in a single threshold model implies a double threshold model must be tested for. Single corresponds to Ho (linear model) and Ha (single threshold model); Double corresponds to Ho (single threshold model) and Ha (double threshold model); and Triple corresponds to Ho (double model) and Ha (triple threshold model).
Source: Stata output of double threshold estimator.

efficient when the average absolute value of the off-diagonal elements of the Pesaran test is different from zero (i.e. 0.175 in this case).

Thereafter, we formulate our threshold model (Equation (2)) and estimate this using the fixed effects (within) regression approach. The study adopts the fixed-effect panel threshold model approach to combat the problems with estimation and inference complications from threshold models by the existence of nuisance parameters. Firstly, we fit a single threshold model, with the threshold variable $\pi 1$ trimmed off 5% at both sides to be searched for the threshold estimator. To reduce computation costs, we use grid(400) and set the bootstrap number to bs(300). The single-threshold model estimator is 16.4946 with 95% confidence interval [16.2942 16.5235]. The F statistic is significant; therefore, we reject the linear model and fit double- and triple-threshold models in the next two steps. The F statistic for the single threshold estimator in our double and triple-threshold models are similar but not identical because of the randomness of bootstrap sampling. However, this does not affect the conclusions in the threshold effect tests. From the threshold effect tests, the double threshold estimator comes across as the optimal threshold estimator at 7.2646 with 95% confidence level [7.1436 7.3541] (Tables 2–4).

4. Results and discussion of findings

4.1. Descriptive statistics

Tables 1 and 5 summarises the descriptive statistics and the correlation diagnostics for the study's variables. The mean GDP per capital growth which represents the economic growth levels among the sampled countries is 0.983 along a continuum from −13.15 to 12.46. This is reflective of minimal gains chalked in the respective countries efforts at enhancing their economic growth. Average inflation over the period stood

Table 4. Triple threshold estimator and effect test (level = 95).

Baseline Model				Robustness Test Model			Additional Test Model		
Model	Threshold Estimate	F-Stat	P-Value	Threshold Estimate	F-Stat	P-Value	Threshold Estimate	F-Stat	P-Value
Single	16.4946	3.15	0.0667	16.4946	3.15	0.0567	16.4946	2.98	0.0933
Double	7.2646	2.32	0.0000	7.2646	2.32	0.0000	7.2646	2.34	0.0467
Triple	8.0625	1.43	0.6400	8.0625	1.43	0.5867	8.0625	1.43	0.4933

Note: This table reports the inflation threshold values and the sequential threshold effect test. A rejection of the null hypothesis in a single threshold model implies a double threshold model must be tested for. Single corresponds to Ho (linear model) and Ha (single threshold model); Double corresponds to Ho (single threshold model) and Ha (double threshold model); and Triple corresponds to Ho (double model) and Ha (triple threshold model).
Source: Stata output of triple threshold estimator.

at 17% whereas FDI also averaged 1.854 with a standard deviation of 2.144. Market openness measured by the aggregate of import and export reported a mean of 48.98, local investment averaged 23.55, whereas government and household expenditure were respectively 10.48 and 66.71. Population growth within the surveyed countries showed a rate of 2.32% over the period.

Table 5 shows that most of the variables hypothesized in the literature to be correlated with economic growth (Azam & Khan, 2020; Ndoricimpa, 2017; Rustayisire, 2015) are also true among the three surveyed countries. This, at least, seems to provide a rough support for their inclusion in the study's regression analysis to mitigate omitted variable bias. Again, Table 5 shows that none of the correlation coefficients among independent variables is larger than 0.80, indicating the absence of multicollinearity problems in the regression analysis (Gujarati, 2004). This is supported by the VIF values, as shown in Table 5. According to Chatterjee and Hadi (2012, p. 236), a VIF score more than 10 indicates the presence of collinearity issues. The values of VIFs are all less than three, as seen in the last column of Table 5. This evidence shows that multicollinearity is an unlikely concern in our empirical regression models.

4.2. Multiple regression results and analysis

To determine the appropriate econometric estimation method, some statistical tests are conducted. First, the Hausman specification test is performed, which is the traditional technique for determining whether fixed or random-effects models should be employed for panel data. The results reveal that the fixed effects model ($p = 0.0087$) is of greater value than the random effects model. Again, the fixed effect with Driscoll-Kraay standard errors estimator was also considered because of its robustness to non-normally distributed residuals ($p = 0.0003$ on the joint test for normality on residual). No cross-sectional dependence or serial correlation was detected, neither were there endogeneity issues. Finally, tests of error heteroscedasticity are performed to ensure that there is no bias that may alter the significance of the coefficients. As a result, the Breusch-Pagan Lagrange multiplier test is used to detect potential heteroscedasticity. The results show that the error structure in the panels is heteroscedastic ($p < 5\%$). The problem of heteroscedasticity is eliminated by applying a robust test to the regression model. Table 6 summarizes the outcomes of the study's linear model estimations.

The results of Table 6 shows that, inflation and local investment are both negatively correlated with economic growth whereas market openness is positively related

Table 5. Correlation coefficients and VIFs.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	VIFS
(1) Y_{it}	1.000								
(2) π_{it}	−0.209** (0.024)	1.000							1.26
(3) INV_{it}	−0.289*** (0.002)	0.100 (0.283)	1.000						5.99
(4) PG_{it}	−0.010 (0.918)	0.432*** (0.000)	0.194** (0.036)	1.000					2.24
(5) OP_{it}	0.374*** (0.000)	−0.101 (0.279)	−0.287*** (0.002)	−0.200** (0.031)	1.000				2.25
(6) FDI_{it}	0.351*** (0.000)	0.007 (0.943)	−0.045 (0.629)	−0.013 (0.889)	0.459*** (0.000)	1.000			1.61
(7) HCE_{it}	0.318*** (0.000)	0.100 (0.284)	−0.780*** (0.000)	0.159* (0.087)	0.473*** (0.000)	0.279*** (0.002)	1.000		6.05
(8) GE_{it}	−0.048 (0.609)	−0.332*** (0.000)	−0.562*** (0.000)	−0.597*** (0.000)	0.323*** (0.000)	−0.180* (0.053)	0.208** (0.025)	1.000	3.16

Note: This table presents pair-wise correlation coefficients which are based on a balanced panel with 177 firm-year observations. The variables are as defined in Table 1. Asterisks indicate significance at 10% (*) 5% (**) and 1% (***).
Source: Stata output of correlation and VIF coefficients.

Table 6. Linear regression results of the FDI - growth nexus using FE, FGLS and PCSE estimators.

Variables	(1) FE	(2) FE D-K	(3) FGLS CAR1	(4) FGLS PSAR1	(5) PCSE CAR1	(6) PCSE PSAR1
π_{it}	−0.0762**	−0.0762***	−0.0709***	−0.0712***	−0.0679***	−0.0690***
	(0.0157)	(0.0160)	(0.0206)	(0.0204)	(0.0210)	(0.0208)
INV_{it}	−0.257**	−0.257***	−0.219***	−0.230***	−0.224***	−0.238***
	(0.0359)	(0.0450)	(0.0620)	(0.0605)	(0.0636)	(0.0620)
PG_{it}	−2.824	−2.824***	−1.255	−0.870	−0.458	−0.0540
	(1.145)	(0.968)	(0.915)	(0.976)	(0.988)	(1.051)
OP_{it}	0.0955**	0.0955***	0.0892***	0.0911***	0.0849***	0.0880***
	(0.0182)	(0.0301)	(0.0221)	(0.0217)	(0.0229)	(0.0223)
FDI_{it}	0.428*	0.428***	0.185	0.207	0.207	0.233
	(0.116)	(0.144)	(0.176)	(0.171)	(0.185)	(0.179)
HCE_{it}	−0.0619	−0.0619	−0.0609	−0.0766	−0.0766	−0.0941*
	(0.0285)	(0.0533)	(0.0515)	(0.0506)	(0.0530)	(0.0520)
GE_{it}	−0.0759	−0.0759	−0.461***	−0.452***	−0.410***	−0.403***
	(0.207)	(0.109)	(0.0957)	(0.0969)	(0.101)	(0.102)
Constant	388.6	388.6***	182.6**	174.8**	147.8*	150.0*
	(135.1)	(100.8)	(81.31)	(83.87)	(88.96)	(90.34)
Time-Fixed-Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Observations	117	117	117	117	117	117
R-squared	0.437	0.437			0.335	0.355
Number of groups	3	3	3	3	3	3
F-statistic	59.64**	13.71***				
Wald chi-square statistic			60.91***	61.28***	51.98***	54.51***

Note: This table reports empirical results from estimating the study's model through the use of the FE, FGLS and PCSE Estimators. FE D-K refers to FE with Driscoll-Kraay standard errors estimator. CAR1 refers to common AR1 and PSAR1 refers to panel-specific AR1. Asterisks indicate significance at 10% (*), 5% (**) and 1% (***). The notations in all the regression tables are as defined in Table 1.
Source: Stata output of linear regression results.

with economic growth with these findings being robust across different econometric estimators. Our findings concerning the growth effect of inflation is largely consistent with the extant literature (Ezako, 2023; Madurapperuma, 2023; Mamingi & Martin, 2018). Again the results regarding local investment and market openness is consistent with those of Mamingi and Martin (2018). The favourable effect of market openness on economic growth is not surprising given that trade liberalisation is recognized to be a substantial contributor to economic growth, with nations such as China and Mexico benefiting from strong export-led growth. In the context of African countries, trade relevance can be explained by the idea of comparative advantage, which states that trade leads to more efficient use of a country's resources by importing items and services that are too expensive to produce locally. The practical failures of import substitution, as well as the influence of international entities such as the International Monetary Fund (IMF), the World Bank, and the World Trade Organization (WTO), have led to African governments favouring outward-looking measures.

However, the negative effect of local investment, in contrast to other studies such as Narteh-Yoe et al. (2023) and Ndoricimpa (2017), is quite surprising, as local investment is expected to benefit from the spill-over effects of trade openness and FDI by increasing productivity and competitiveness and allowing technological imitation (Edwards, 1998). However, as Mamingi and Martin (2018) explain, a negative relationship between local investment and economic growth may be suggestive of domestic investment being crowded-out by foreign investments. Domestic capital investments have clearly decreased in many emerging economies in the face of significant FDI projects, for a variety of reasons. The competitive disadvantage of local enterprises versus

Table 7. Baseline results on the inflation threshold effects on the FDI – growth nexus.

Variables	(1) Model 1	(2) Model 2	(3) Model 3
π_{it}	−0.0663***	−0.0681***	−0.0658***
	(0.0203)	(0.0202)	(0.0201)
INV_{it}	−0.241***	−0.250***	−0.242***
	(0.0563)	(0.0561)	(0.0561)
PG_{it}	−2.722**	−3.311***	−3.439***
	(1.219)	(1.258)	(1.255)
OP_{it}	0.0948***	0.0944***	0.0958***
	(0.0199)	(0.0198)	(0.0197)
GE_{it}	−0.0627	−0.0590	−0.0204
	(0.149)	(0.148)	(0.150)
HCE_{it}	−0.0491	−0.0544	−0.0364
	(0.0583)	(0.0579)	(0.0589)
0b._cat#c.FDI_{it}	0.594***	0.109	0.172
	(0.207)	(0.353)	(0.354)
1._cat#c.FDI_{it}	0.291	0.678***	1.617**
	(0.196)	(0.211)	(0.685)
2._cat#c.FDI_{it}		0.299	0.682***
		(0.194)	(0.210)
3._cat#c.FDI_{it}			0.330*
			(0.195)
Constant	391.3***	410.8***	436.7***
	(100.1)	(99.84)	(100.9)
Time-fixed-effects	*Yes*	*Yes*	*Yes*
Observations	117	117	117
R-squared	0.448	0.462	0.473
Number of groups	3	3	3
F-statistic	9.45***	8.95***	8.41***

Note: This table reports empirical results from estimating a fixed effect panel threshold regression model with inflation as the threshold variable and FDI as the region variable. This regression was executed *via* the community contributed Stata command 'xthreg'. Asterisks indicate significance at 10% (*), 5% (**) and 1% (***). The notations in all the regression tables are as defined in Table 1.
Source: Stata output of single, double and triple threshold regression results.

efficient multinational corporations is at the top of the list. Unlike local enterprises, multinational companies typically benefit from favourable fiscal incentives, putting the former at a competitive disadvantage. The manufacturing of substitute goods is also a contributing part to this crowding-out effect. Population growth, government as well as household expenditure are all negatively related to economic growth although these findings are not significantly robust across different estimators. Our finding regarding population growth although in contrast with that of Ndoricimpa (2017), is corroborated by the findings of Mamingi and Martin (2018). Regarding government expenditure, our finding is corroborated by those of both Ndoricimpa (2017) and also Mamingi and Martin (2018). Besides, our finding regarding household expenditure contradicts that of Ezako (2023). The impact of population growth was found to be negative and significant in almost all the model specifications, although the literature from developing economies gives mixed evidences (see e.g. Eggoh & Muhammad, 2014; Furuoka, 2009; Vinayagathasan, 2013). The current study's findings, according to Barro (1997), can be interpreted as follows: once the population grows, a percentage of its revenue must be utilized to supply capital for new workers, rather than raising capital per worker. Interestingly, Thacker et al. (2012) discovered that Eastern Caribbean countries like Antigua and Barbuda could boost their output per capita by focusing on raising their capital per worker ratio. Government expenditure has also been noted to

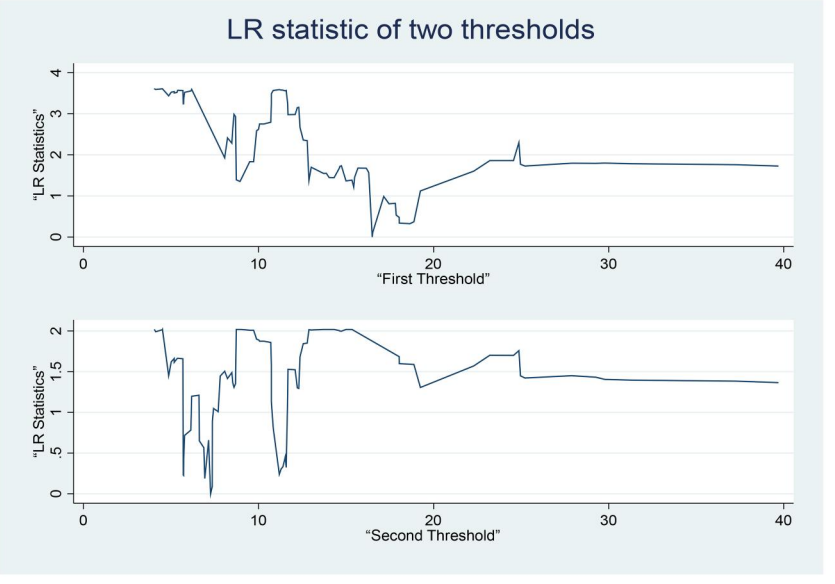

Figure 1. LR statistic of two thresholds (using critical value of 7.35 at 95% CI) (Hansen, 2000).
Source: Stata output of LR statistic of the two thresholds.

Table 8. Robustness test results on the inflation threshold effects on the FDI – growth nexus.

Variables	(1) Model 1	(2) Model 2	(3) Model 3
π_{it}	−0.0681***	−0.0699***	−0.0675***
	(0.0208)	(0.0207)	(0.0206)
INV_{it}	−0.247***	−0.256***	−0.248***
	(0.0577)	(0.0575)	(0.0575)
PG_{it}	−1.755	−2.359*	−2.489*
	(1.250)	(1.289)	(1.286)
OP_{it}	0.0972***	0.0967***	0.0982***
	(0.0204)	(0.0203)	(0.0202)
GE_{it}	−0.0624	−0.0586	−0.0191
	(0.153)	(0.152)	(0.153)
HCE_{it}	−0.0507	−0.0561	−0.0376
	(0.0597)	(0.0593)	(0.0604)
0b._cat#c.FDI_{it}	0.608***	0.111	0.175
	(0.212)	(0.362)	(0.363)
1._cat#c.FDI_{it}	0.298	0.694***	1.655**
	(0.201)	(0.217)	(0.702)
2._cat#c.FDI_{it}		0.307	0.698***
		(0.199)	(0.216)
3._cat#c.FDI_{it}			0.339*
			(0.200)
Constant	400.3***	420.2***	446.7***
	(102.6)	(102.3)	(103.5)
Time-fixed-effects	*Yes*	*Yes*	*Yes*
Observations	117	117	117
R-squared	0.429	0.444	0.455
Number of groups	3	3	3
F-statistic	8.77***	8.32***	7.83***

Note: This table reports empirical results from estimating a fixed effect panel threshold regression model with inflation as the threshold variable and FDI as the region variable. $Y(a)_{it}$ is a used as dependent variable in this table Asterisks indicate significance at 10% (*), 5% (**) and 1% (***). The notations in all the regression tables are as defined in Table 1.
Source: Stata output of single, double and triple threshold regression results.

Table 9. Additional tests results on the inflation threshold effects on the FDI – growth nexus.

Variables	(1) Model 1	(2) Model 2	(3) Model 3
π_{it}	−0.0695***	−0.0716***	−0.0691***
	(0.0213)	(0.0211)	(0.0211)
$INV(a)_{it}$	−0.144**	−0.156***	−0.146**
	(0.0582)	(0.0581)	(0.0582)
PG_{it}	−2.215*	−2.851**	−2.981**
	(1.275)	(1.317)	(1.313)
Export (EXP_{it})	0.183***	0.183***	0.185***
	(0.0411)	(0.0407)	(0.0406)
GE_{it}	0.0331	0.0354	0.0771
	(0.152)	(0.150)	(0.152)
HCE_{it}	0.0548	0.0476	0.0676
	(0.0622)	(0.0618)	(0.0630)
0b._cat#c.FDI_{it}	0.629***	0.113	0.178
	(0.216)	(0.368)	(0.369)
1._cat#c.FDI_{it}	0.304	0.717***	1.690**
	(0.205)	(0.220)	(0.713)
2._cat#c.FDI_{it}		0.313	0.721***
		(0.203)	(0.219)
3._cat#c.FDI_{it}			0.346*
			(0.203)
Constant	385.7***	407.0***	433.9***
	(104.0)	(103.8)	(105.0)
Time-fixed-effects	*Yes*	*Yes*	*Yes*
Observations	117	117	117
R-squared	0.409	0.426	0.437
Number of groups	3	3	3
F-statistic	8.09***	7.71***	7.27***

Note: This table reports empirical results from estimating a fixed effect panel threshold regression model with inflation as the threshold variable and FDI as the region variable. $Y(a)_{it}$ is a used as dependent variable in this table. Also, EXP_{it} is used in place of OP_{it} whereas $INV(a)_{it}$ is used in place of INV_{it}. Asterisks indicate significance at 10% (*), 5% (**) and 1% (***). The notations in all the regression tables are as defined in Table 1.
Source: Stata output of single, double and triple threshold regression results.

crowed-out private sector investments and consequently dampens economic growth (Barro & Sala-I-Martin, 1997).

Finally, FDI seems to positively affect economic growth similar to findings from other developing economies (see e.g. Saidi et al., 2022) although this is not consistent across the different econometric estimators employed in this study. As argued in the literature, it appears the effect of FDI on growth is contingent on other factors including the level of inflation in an economy. Against this backdrop, the current study attempts to re-estimate a threshold model (Equation (2)) to examine the likely effect of FDI on economic growth given certain inflation thresholds. A threshold analysis using inflation as a threshold variable is considered for the current study's sample on the premise that, these countries are the only countries south of the Sahara which have formally adopted an inflation-targeting regime (Table 7 and Figure 1).

The evidence shows that, FDI positively affects growth but with different effect sizes with respect to different threshold regions. Below the inflation threshold estimate of 7.26%, FDI has the highest impact on growth (with effect size of 1.617**), whiles the impact of FDI on growth within the first and second threshold estimates of 7.26% and 16.49% is moderate (with effect size of 0.682***). Above the inflation threshold estimate of 16.49%, the impact of FDI on growth seems to diminish (with effect size of 0.330*). These findings are robust across different measures of growth

and alternative specifications and do indicate that, sound monetary targeting regimes or a managed float regime to keep inflation low (preferably below the threshold of 7.26%), or the formal adoption of inflation targeting can be a beneficial and legitimate toolkit available to policy makers in developing countries in their quest to attract FDI towards enhancement of their economic growth (see also, Tapsoba, 2012). The current study thus submits that, besides other strategies advocated by prior studies to attract FDI for growth in the sub-region (see, Awadhi et al., 2022; Ayenew, 2022; Kechagia & Metaxas, 2022), monetary policy-makers in SSA countries should also target their efforts at managing inflation preferably below 7.26% in order attract and reap the highest effects of FDI on growth of their economies (Tables 8 and 9).

5. Conclusions

Previous research shows evidence of the detrimental effect of inflation rate on growth. These studies, however, have yet to establish any exact threshold level(s) or turning point(s) that policymakers must follow in order to achieve the desired amount of growth. As a result, this study re-examines empirically the issue of the occurrence of threshold effects in the relationship between inflation rate and economic growth from 1982 to 2020. The present study specifically examines the threshold effects of inflation on the FDI—growth nexus using sub-Sahara African samples of countries that currently practice inflation targeting.

By using the fixed-effect panel threshold regression approach, the study finds two distinct thresholds of level-of-inflation in the FDI—growth nexus. The growth-enhancing effect of FDI is largely realized when inflation is below the optimal threshold level of 7.26%. Beyond the second threshold level of 16.49%, the beneficial effect of FDI on growth is seen to diminish in terms of effect-size. Theoretically, our findings from an African context, provide support for the idea of the beneficial effects of FDI being realised by host economies through certain mechanisms or absorptive capacities instead of *via* the endogenous growth models. The findings of this study can also have important policy implication for African countries as well as other emerging economies with similar characteristics. So far, only Ghana, Nigeria, and South Africa have officially adopted inflation targeting frameworks for their monetary policies. Currently, Ghana's medium-term inflation target is somewhere in the range of 6–10%, which is in line with our predicted inflation threshold, while South Africa's is 3–6% (Ndoricimpa, 2017). Although not formally stated, many African governments have particular inflation targets in their policy statements, poverty reduction plan documents, or national development strategies (Heintz & Ndikumana, 2010). It is typical for countries in the same regional economic community to use inflation as a convergence criterion. COMESA countries, for example, aim for 5% inflation, while SADC, CEMAC, and WAEMU aim for 3%, and WAMZ members aim for a single digit (unspecified) inflation rate. The study's findings on the double inflation thresholds of 7.26% and 16.49% may thus be useful to African monetary policymakers as they decide on the respective bands of inflation targets to adopt for their monetary policies in order to avoid the negative effects of high inflation while reaping the growth benefits of low inflation. In a nutshell, while our estimates do not necessarily imply causality but rather correlation between inflation, FDI, and

growth, our findings do suggest that policymakers in African countries should consider an inflation target below 7.26%, or at worst, in the range of 7.26% to 16.49%, to avoid the FDI—growth damaging effects of high inflation. Other developing economies with similar features can use the current study's findings on estimated inflation thresholds to evaluate their own circumstances. In terms of the impact of control variables on economic growth, our research finds that reducing population growth, minimizing trade barriers, and encouraging FDI inflows through proper management of inflation levels within acceptable thresholds (ideally below 7.26%) are all ways to boost African economic growth. Finally, government officials all around the world, notably in Africa, have recognized that reducing inflation is beneficial for improved growth performance. Again, although the policies of governments do not appear to coincide, the goal has evolved into reducing inflation to single digits. The findings of this article consequently give strong empirical support for African monetary policymakers to maintain the target of keeping inflation in the single digits and keeping it there.

Although the current study's results are informative, some caveats are important to bear in mind when interpreting these results. First, the predicted relationship between FDI and growth fails to describe specific routes *via* which FDI influences growth beyond inflation management and perhaps trade attraction since trade openness was controlled for. This also implies that the total favourable effect of FDI may be understated. It is worth noting that some recent studies have observed other FDI—growth transmission mechanisms including changing carbon emissions (Liu et al., 2023). The authors recommended for the introduction of FDI to be accompanied by corresponding environmental regulations. Again, in the FDI—growth regression, FDI is not an exogenous variable, therefore the coefficient estimates may be biased. The gravity of this problem will be determined in large part by whether causality runs from FDI to growth, in which case the endogeneity problem may be minor, or the other way around, in which case the bias may be severe. The direction of causality found in most previous studies has largely been mixed though. Lastly, FDI may have other effects on the economy beyond its growth-effects. These have not been addressed here and merit further investigation. Future studies are invited to validate the study's findings using larger sample sizes of countries with similar characteristics, and alternative methodologies such as other non-linear frameworks like the panel-smooth-transition regression. Moreover, comparative studies between economies that practice inflation-targeting and those that do not, would also shed some light in this area. Finally, our study found local investment to have adverse effect on economic growth of the sampled countries in contrast to some other empirical evidences (Azam & Khan, 2022; Narteh-Yoe et al., 2023; Ndoricimpa, 2017; Ongo & Vukenkeng, 2014) as well as theoretical prescription of a positive effect of local investment on economic growth from endogenous growth models (Eckaus & Lefeber, 1962; Földvári et al., 2015). Could it possibly be the result of the prerogative of the governments of these countries to increase local capital formation by financing real investment thereby crowding out private-sector investment? Further studies are invited to probe the possible reasons for the negative impact of local capital formation on the economic growth of the selected countries, especially, the mechanisms through which local investment may prove detrimental to the growth of economies, or the possible deindustrializing effect of FDI on these countries (see also, Mamingi & Martin, 2018; Wako, 2021).

Disclosure statement

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

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Data availability statement

Data for the study was obtained from publicly available sources and can be made available upon request.

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Appendices

Appendix A1: Trend of GDP, FDI and Inflation for South Africa.

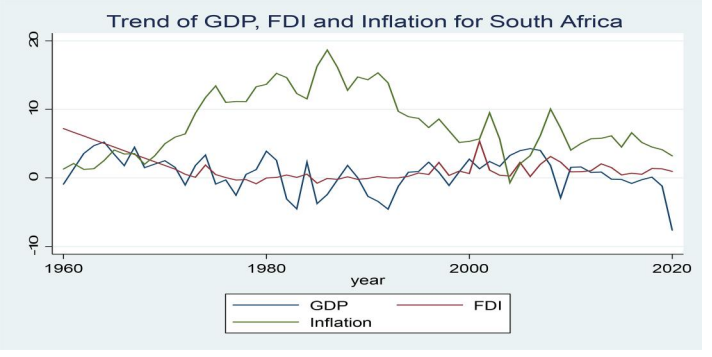

Figure A1. Source: Stata graphs of trends in inflation, FDI and GDP of South Africa.

Appendix A2: Trend of GDP, FDI and Inflation for Nigeria.

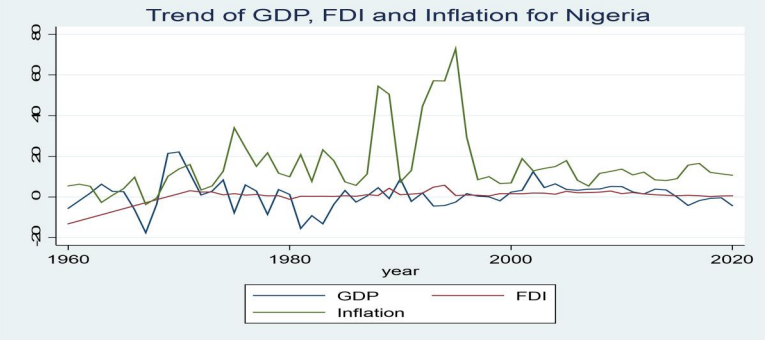

Figure A2. Source: Stata graphs of trends in inflation, FDI and GDP of Nigeria.

Appendix A3: Trend of GDP, FDI and Inflation for Ghana.

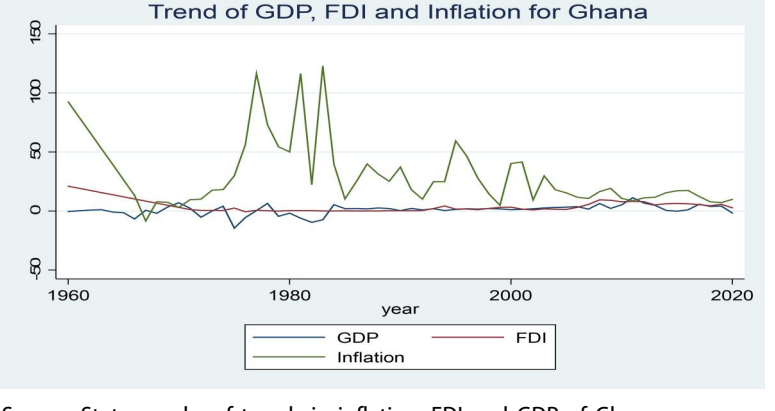

Figure A3. Source: Stata graphs of trends in inflation, FDI and GDP of Ghana.

Appendix A4: Trend of GDP, FDI and Inflation for All Surveyed Countries; South Africa, Nigeria, & Ghana.

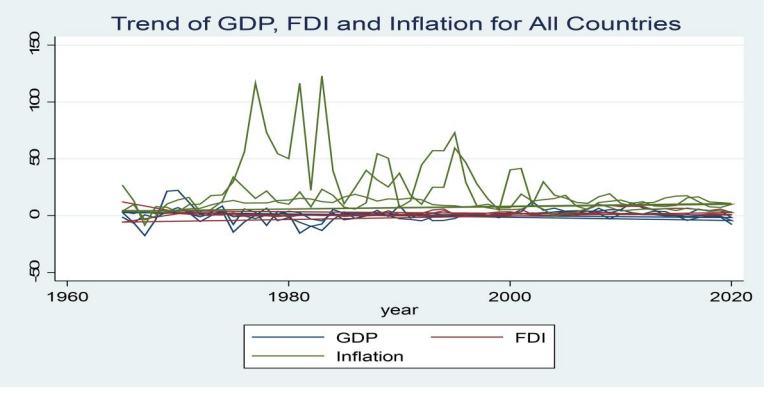

Figure A4. Source: Stata graphs of trends in inflation, FDI and GDP of South Africa, Nigeria and Ghana.