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Abstract

Economic growth is the most powerful instrument for reducing poverty and improving the quality of life in developing countries. The growth rate of real GDP is often used as an indicator of the general health of the economy. In broad terms, an increase in real GDP is interpreted as a sign that the economy is doing well. This prompted us to study the factors that affect GDP in developing countries. The aim of this study is to empirically explore the impact of Foreign Direct Investment (FDI), Gross Capital Formation (GCF), Broad Money (BRM) and trade openness (TO) on economic growth, which represented by Gross Domestic Product (GDP). The analysis was performed by adopting a balanced panel data approach applied on data covering the period from 2000 to 2020 in (76) developing countries. The findings of the study based on the estimated model provided; that the Foreign Direct Investment (FDI), the Gross Capital Formation (GCF) and the Broad Money (BRM) have a significant positive effect on the GDP.

Keywords: Developing countries; Gross Domestic Product; Gross Capital Formation; Trade Openness; Panel Data

1. Introduction

Existing studies on economic growth have largely focused on few numbers of developing countries. Throughout this study, the analysis for the influences of developing countries' economic growth investigated among (76) developing countries during the years (2000-2020). GDP could depend on a host of factors such as Foreign Direct Investment (FDI), Gross Capital Formation (GCF), Broad Money (BRM) and trade openness (TO). For instance, a country's openness has been one of the primary driving forces for stimulating growth. Among researchers, it is still controversial to conclude openness–growth relationship (Alabi, 2019; Omodero, 2019). It always remained a subject of researcher's interest that how international trade policies of governments

affect the growth rate of their economies. However, in this era, many countries favored outward-oriented policies and opened their border towards free trade and reduce restrictions on the movement of manufactured goods and services (Taasim *et al.*, 2021; Banday *et al.*, 2021).

Several of the studies gave useful information on trade openness, FDI, and the impact of GCF on GDP, however, they only looked at one country or only a limited number of developing countries (Van, 2019; Anake, 2020). Nonetheless, the impact of predictor variables on developing countries' economic growth must be considered. The increased intensity of imports from products that can be produced domestically, on the other hand, may have an equivocal impact on the micro and macro scales (Pasara, 2020). As a result, the current research deems it important to investigate the impact of Foreign Direct Investment (FDI), Gross Capital Formation (GCF), Broad Money (BRM) and trade openness (TO) on economic growth, which represented by Gross Domestic Product (GDP) in (76) developing countries. Moreover, the investigation is based on the following hypotheses:

H1: Trade openness influences developing countries' economic growth.

H2: Foreign Direct Investment influences developing countries' economic growth.

H3: Gross Capital Formation influences developing countries' economic growth.

H4: Broad Money influences developing countries' economic growth.

The main objective of this research paper is to examine the impact Foreign Direct Investment (FDI), Gross Capital Formation (GCF), Broad Money (BRM) and trade openness (TO) on the Gross Domestic Product (GDP) for a number of (76) countries. The rest of the paper is organized as follows. Section 2 presents the literature review, whereas Section 3 presents the data, econometric specification, and methodology, Section 4 is about the empirical results, and the final section is about the conclusion.

2. Literature Review

Several empirical studies have demonstrated that trade openness and foreign direct investment (FDI) influx can boost economic growth in developing countries.

The study of Chibalamula *et al.*, (2023) found a significance effect of FDI and trade openness on the GDP in five African countries: Ghana, Morocco, Kenya, Uganda, and Zambia. The study employed World Bank data for the five selected countries from 1994 to 2019 together with the panel data analysis approach. The results of the Random effect model indicate that while trade

openness has a negative influence on GDP, foreign direct investment (FDI) positively supports growth in these countries.

The study of Mamingi & Martin, (2018) in which they examined the empirical relationship between economic growth and foreign direct investment (FDI) in the nations that make up the Organization of Eastern Caribbean States (OECS). The study estimates a dynamic panel growth model using the generalized method of moments (GMM) and incorporates panel data from (34) countries, including the six OECS economies, from 1988 to 2013. The empirical results show that the foreign direct investment (FDI) contributes positively to growth,

Moreover, the study of Acaravci & Ozturk, (2012) questioned whether foreign direct investment (FDI) encourages economic growth in the host nation. The research on exports, economic growth, and foreign direct investment is reviewed in the research, and the causes of exports, economic growth, and FDI for the ten European transition countries—Bulgaria, Estonia, Latvia, Lithuania, Poland, Romania, Slovakia, Hungary, Czech Republic, Slovenian Republic—are empirically examined. The ARDL bounds testing technique is used to study it. a sustained relationship between exports, FDI, and economic expansion in these nations. Following, the cointegrating connection-based error-correction is identified. The Granger causality test is used to look into both the long- and short-term effects. Analyze any possible causal connections between the variables using quarterly data from 1994 to 2008. These findings on causation indicate that, in four of the (10) nations under consideration, there is a causal relationship between FDI, exports, and economic growth.

Also, the study of Hossain, (2008) for the importance of the Foreign direct investment (FDI) as a tool for economic development in the current global framework. Through the transfer of technology and managerial know-how, it helps a capital-poor country like Bangladesh to develop its physical capital, create jobs, raise the skill levels of its labor force, and encourage the integration of the domestic and global economies. This analysis shows a strong positive correlation between FDI inflows and. total Bangladeshi imports and exports. Both the payment balance and the total effect balance of the current account are positive. Bangladesh's investment incentives and foreign direct investment (FDI) rules are seen as competitive when compared to those offered by similar nations. However, significant institutional reforms, significantly lower levels of control, better provision of necessary infrastructures, perceived improvements in the investment climate, and

sustained socio-political stability are required in order to successfully implement these policies and succeed in obtaining larger FDI inflows.

While the study of Al Sadig, (2013) for the relationship between the FDI and Economic Growth for the past (20) years have seen a sharp increase in the rate of outbound foreign direct investment (FDI) from developing and transitioning economies. Examine the effects that such outflows have on domestic investment, since the rate of economic growth is influenced by the accumulation of physical capital. This study uses empirical data. The study which studied the impact of foreign direct investment (FDI) on domestic investment in developing countries. Using data from (121) developing and transition economies between 1990 and 2010, the findings suggest that FDI outflows have a negative impact on the rate of domestic investment. The findings imply that the rate of domestic investment is adversely affected by FDI inflows.

This study of Wiredu *et al.*, (2020) looks at how trade openness (OPEN) and foreign direct investment (FDI) affect economic growth for a group of four West African countries (Senegal, Ghana, Nigeria, and Côte d'Ivoire) between 1998 and 2017. Static panel regression techniques were employed to ascertain the causal association between the regressors, which include FDI, trade openness, investment, and inflation, and economic growth as assessed by GDP. The Levin-Lin-Chu unit-root test was used to assess the stationarity of the panel data. The statistical data suggests that aggregate trade openness, investment, and inflation do have a positive and significant impact on economic growth, which is consistent with the literature, especially for emerging nations. When based on static random effects, the inclusion of foreign direct investment (FDI) has no effect on the outcomes, while having a negative impact on economic growth. Inflation, investment, and trade openness all appear to have a greater impact than foreign direct investment.

Also, the study of Herzer, (2010) found for a study used for (44) developing countries over the period 1970 to 2005 using heterogeneous panel co-integration techniques that are robust to omitted variables and endogenous regressors. The study found that FDI has, on average, a negative effect on growth in developing countries.

There are different studies investigate the impact of trade openness and foreign direct investment on economic growth.

While Nketiahl *et al.*, (2020) for studying the relationship between trade openness, foreign direct investment, and economic growth in Ghana throughout the post-liberalization era—which spans from (1975 to 2017). Regression analysis, descriptive analysis, Pearson correlation, and the

Augmented Dickey-Fuller (ADF) test for unit root were used to look at the associations. The ADF test for unit root result indicates that all variables are integrated of order one, or stationary after the first difference. Primary secondary data sources for the 1975–2017 study were the World Bank and Bank of Ghana's World Development Indicators (WDI) on their websites. GDP growth (annual%) was used as the dependent indicator in the study, whereas trade openness, inflation, and proxy foreign direct investment were used as independent indicators. Based on the Ordinary Least Squares (OLS) estimator, the study concluded that trade openness is the main factor influencing Ghana's GDP growth (annual%). Additionally, the data shows that although foreign direct investment and inflation had an impact on GDP growth (annual%), it was not statistically significant. As a result, the research urges vigorous measures to boost trade openness in order to encourage exports and foreign direct investment (FDI) inflow by creating a friendly and conducive business environment for Ghana's output growth dynamics.

Assessing the effects of openness, foreign direct investment, and gross capital creation on economic growth in Kenya throughout the period of 1960 to 2010 was the main goal of the study of Soil *et al.*, (2013), although there are numerous aspects of global commerce that influence economic growth, this study focused on the effects of openness, foreign direct investment, and gross capital formation on Kenyan growth. To fulfill the intended goals, World Bank statistics for these variables were examined. The existing link between the variables was estimated using a multiple linear regression model, the Barro growth model, and the ordinary least squares method. The findings show that trade openness positively affects Kenya's economic growth ($\beta_1 = 3.062$, $p < 0.05$), but gross capital creation and foreign direct investment had no appreciable effect on GDP growth. Trade openness, therefore, plays a crucial role in influencing economic growth, particularly in developing countries. The government and policy makers were encouraged by this study to emphasize trade openness as one of the most accurate indicators of economic growth.

For the study of Balanika, (2016) and using a sample of (71) developing countries between 1990 and 2005, the study investigates the relationship between trade openness and economic expansion. Using both fixed and two-way fixed effects assumptions, the incorporation of an enlarged Solow growth model in a panel data analysis demonstrates that trade liberalization has a positive and significant impact on economic growth. However, the Sub-Saharan African region does appear to be different; a number of inherent trade barriers, a reliance on exporting primary goods, and

insufficient overland infrastructures to far-off, massive markets could explain why increased trade openness does not lead to economic advancement.

The relationship between trade openness, foreign direct investment, and economic growth in Ghana throughout the post-liberalization era—which spans from 1975 to 2017—is examined in the research of (Nketiah et al., 2020). Regression analysis, descriptive analysis, Pearson correlation, and the Augmented Dickey-Fuller (ADF) test for unit root were used to look at the associations. The ADF test for unit root result indicates that all variables are integrated of order one, or stationary after the first difference. Primary secondary data sources for the 1975–2017 study were the World Bank and Bank of Ghana's World Development Indicators (WDI) on their websites. GDP growth (annual%) was used as the dependent indicator in the study, while trade openness, inflation, and proxy foreign direct investment were used as independent indicators. Based on the Ordinary Least Squares (OLS) estimator, the study concluded that trade openness is the main factor influencing Ghana's GDP growth (annual%). Additionally, the data shows that although foreign direct investment and inflation had an impact on GDP growth (annual%), it was not statistically significant. As a result, the research urges vigorous measures to boost trade openness in order to encourage exports and foreign direct investment (FDI) inflow by creating a friendly and conducive business environment for Ghana's output growth dynamics.

Not only that, the study of Wacziarg & Welch, (2008) examined a sizable panel dataset that covered 123 nations between 1960 and 2000. It discovered that trade openness and economic growth are positively correlated. It did, however, also find variability in the impacts, indicating that characteristics unique to each country may have an impact on the association.

While the study of Chibale *et al.*, (2023) looks at the significance of FDI and trade openness in five African countries: Ghana, Morocco, Kenya, Uganda, and Zambia. The study employed World Bank data for the five selected countries from 1994 to 2019 together with the panel data analysis approach. The results of the Random effect model indicate that while trade openness has a negative influence on GDP, foreign direct investment (FDI) positively supports growth in these countries. Uganda's greater significance than the other countries was further proved by the findings obtained from the pooled model estimate using the nation's dummies. We implore many nations to boost exports, cut imports, employ incentives to attract more foreign direct investment, and create FDI-friendly regulatory environments.

The study of Gatawa *et al.*, (2017) empirically examined how Nigeria's money supply, inflation, and interest rate affect the country's economic growth using time series data from 1973 to 2013. The Granger Causality Test and VAR Model were used in the context of mistake correction. The results of the VEC model demonstrate that while interest rates and inflation have an adverse impact on growth, particularly in the long run, a large money supply has a positive impact. In the near-term parsimonious conclusion, it was discovered that the wide money supply and interest rate were negatively connected with economic growth, with the exception of inflation. The causality test revealed that none of the explanatory variables Granger was responsible for economic progress. suggests that the money supply, inflation, and interest rates have no effect on GDP.

Also, the study of Ewinetu, (2021) aims to ascertain the relationship between Ethiopia's real GDP and its money supply. The time-series data used in this analysis, which covered the years 2002 to 2017, came from the annual report of the national bank of Ethiopia. A vector autoregressive model and a causality test were used to evaluate the data in order to investigate the short-term causal relationship between an expansion of the money supply and the increase in Ethiopia's real GDP. Both tests' findings demonstrated that an increase in the money supply significantly boosts real GDP and is statistically significant at the five percent threshold. On the other hand, the Johansen cointegration test results show that there is no sustained relationship between the total money supply and real GDP. The policy implication states that any short-term adjustment to a nation's level of broad money supply by monetary policy makers will have a significant beneficial impact on Real GDP in the near future.

For the study of Soil, (2013) in terms of assessing the effects of openness, foreign direct investment, and gross capital creation on economic growth in Kenya throughout the period of 1960 to 2010 was the main goal of this study. Although there are numerous aspects of global commerce that influence economic growth, this study focused on the effects of openness, foreign direct investment, and gross capital formation on Kenyan growth. To fulfill the intended goals, World Bank statistics for these variables were examined. The existing link between the variables was estimated using a multiple linear regression model, the Barro growth model, and the ordinary least squares method. The findings show that trade openness positively affects Kenya's economic growth ($\beta_1 = 3.062$, $p < 0.05$), but gross capital creation and foreign direct investment had no appreciable effect on GDP growth. Trade openness, therefore, plays a crucial role in influencing economic growth, particularly in developing countries. The government and policy makers were

encouraged by this study to emphasize trade openness as one of the most accurate indicators of economic growth.

The study of Onwiodiokit, (2021) examined the relationship between capital formation and economic growth and emphasized the importance of adding human capital in the discussion of capital formation and economic growth. The results of the regression show a positive correlation between economic growth and gross physical capital formation, but the results regarding human capital formation provide credence to the idea that an economy that employs well-educated, skilled, and healthy workers will generate productive output. Practically speaking, the study has shown how crucial it is to separate capital production into human and physical capital formation in order to do any meaningful analysis and offer recommendations for policy.

Jean Marie Vianney Ntamwiza, Fabien Masengesho (Positive Relationship between GCF and Economic Growth)

The study of Ntamwiza, (2022), investigates the factors that influence Rwanda's economic growth using time series data spanning from 1990 to 2017. Examining the patterns and connections between capital formation, FDI, and Rwandan economic expansion was the aim. The main forces behind Rwanda's economic growth during the study period were foreign direct investment and gross capital formation, as this study assessed and demonstrated. The explanatory variables in the model explain 89.3% of the variation in the dependent variable (GDP growth) for the long run regression model. The researcher analyzed and demonstrated the existence of a short-run and long-run positive link between capital formation, foreign direct investment, and economic growth in Rwanda based on the presence of both short-run interactions and a long-run co-integrating link.

Sijabat, (2023), from 1970 to 2019, the direction of causality between Indonesia's gross domestic product, foreign aid, foreign direct investment, and gross capital creation is examined using the Granger causality test. The unit root test was also obtained for both variables in this study using the ADF test, indicating that the variables under analysis were cointegrated and had a long-term equilibrium connection with GDP, ODA, FDI, and GCA. The Toda-Yamamoto causality test was used to ascertain which way the variables were causally related. The results showed that FDI and GDP had a positive, one-way causal connection with ODA. Indonesia's GDP has grown as a result of ODA's encouragement of economic and development activity expansion. Even though they had been partners for a long time, the Indonesian study was unable to prove that GCA and ODA were

causally related. Therefore, in order to draw in foreign direct investment, improved foreign aid administration is needed.

3. Data and methodology:

Annual data from 76 developing countries covering the period from 2000 to 2020 are gathered from World Development Indicators Database (WDI) (2022). Variables used in this study represent macroeconomic variables, namely GDP, FDI, GCF, BRM and TO.

All the variables are transformed into the log form. Table 1 summarizes the information on the variables used in this study.

Table 1. Variable definition and description

Variable	Description	Definition
Gross Domestic Product (GDP)	Dependent variable	GDP per capita is gross domestic product divided by midyear population. Data are in constant 2015 U.S. dollars.
Foreign Direct Investment (FDI)	Independent variable	Foreign direct investment refers to direct investment equity flows in the reporting economy. Data are in current U.S. dollars.
Gross Capital Formation (GCF)	Independent variable	Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Data are in constant 2015 prices, expressed in U.S. dollars.
Broad Money (BRM)	Independent variable	Broad money (IFS line 35L..ZK) is the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveler's checks; and other securities such as certificates of deposit and commercial paper.
Trade openness (TO)	Independent variable	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.

Source: World Development Indicators Database (WDI)

4. Explanatory analysis

In this section, the descriptive statistics and the correlation matrix for the variables under study are summarized in table 2 and table 3 respectively. Firstly, the descriptive statistics for the variables GDP, FDI, TO, GCF and BRM are presented in Table 2. The mean of GDP is 7.87 which represents the value at the center of the data where the majority of developing countries are around this value. Therefore, one can see the average values of the rest of the variables considered in the

study—2,301.14% for FDI; 414.39% for TO; 2,276.66% for GCF; and 372.80% for BRM. It was observed that the median values were close to the mean values of the variables included in our analyses. This meant that 50% of the data took values below the median and 50% took values above the median.

The value of the standard deviation suggests a more accurate and detailed estimate of the dispersion. Moreover, standard deviations indicate the fluctuation of the time-series. In this sense, the value of standard deviation of GDP is equal to 1.008, which represents the average distance between the mean (7.87) and the values that are around. On the other side, GCF reflects the largest value of dispersion among all variables.

The positive skewness values showed that all variables were skewed to the right. More specifically, the skewness of variables GCF and BRM were less than three. The kurtosis values for FDI, TO, and GCF were above three, which indicated leptokurtic distributions. Hence, the dataset had a lighter tail than the normal distribution. Since the kurtosis of the GDP and BRM variables were below three, it meant that its distribution was platykurtic. The high significant values of the Jarque-Bera test indicates that our variables of interest were non-normally distributed at the 1% level.

Table 2. Descriptive statistics

Indicator	GDP	FDI	TO	GCF	BRM
Mean	7.870973	23.01418	4.144396	22.76665	3.728069
Median	7.994476	22.82370	4.153553	22.73529	3.738490
Maximum	9.973871	26.42145	5.395475	29.48252	5.557469
Minimum	5.600980	2.283411	-0.242542	17.35847	1.880417
Std. Dev.	1.008534	0.753584	0.518966	2.071733	0.623221
Skewness	-0.158459	-12.07027	-1.830504	0.075459	0.234991
Kurtosis	2.232154	365.0484	15.73791	3.128156	2.917081
Jarque-Bera	45.68534	87171.07	11629.97	2.595382	15.07955
Probability	0.000000	0.000000	0.000000	0.003162	0.000532
Sum	12506.98	36569.53	6585.446	36176.21	5923.902
Sum Sq. Dev.	1615.219	901.8071	427.6900	6815.820	616.7871
Observations	1589	1589	1589	1589	1589

Secondly, the correlation matrix among the variables under study are shown in Table 3. Researchers use correlation analysis to measure the direction and the strength of the relationship between two variables. The result ranges from -1 to +1; where -1 means a perfectly negative correlation, +1 means a perfectly positive correlation and 0 means no correlation (Rencher and

are positively correlated with each other except the relationship between TO & FDI and TO & GCF.

Table 3. Correlation matrix

		GDP	FDI	TO	GCF	BRM
GDP	Pearson Correlation	1				
	Sig. (2-tailed)					
	N					
FDI	Pearson Correlation	.182**	1			
	Sig. (2-tailed)	.000				
	N	1596				
TO	Pearson Correlation	-.141**	-.114**	1		
	Sig. (2-tailed)	.000	.000			
	N	1596	1596			
GDF	Pearson Correlation	.116**	.902**	-.116**	1	
	Sig. (2-tailed)	.000	.000	.000		
	N	1596	1596	1596		
BRM	Pearson Correlation	.217**	.394**	-.282**	.373**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	1596	1596	1596	1596	
** Correlation is significant at the 0.01 level (2-tailed).						

5. Empirical Results and Discussion

5.1 Model Results

As mentioned by Baltagi (2008), any empirical analysis should start with the decision of estimating results with a panel regression or a simple regression. For this purpose, one should run a specific test that assists such a decision. Our first results obtained in E-Views suggested that the null hypothesis, according to which the individual effects were null, had to be rejected, since the OLS estimator was unfit and inconsistent. Table 4 shows estimates of the pooled regression, fixed effect model, and random effect model.

$$GDP_{it} = \beta_0 + \beta_1 FDI + \beta_2 TO + \beta_3 GCF + \beta_4 BM + \varepsilon_{it}$$

Table 4. Pooled regression model, fixed effect model, and random effect model

Pooled Regression Model					
Variable	Variable Coefficient	Std. Error	t-Statistic	Prob.	Obs.
C	-0.724294	0.652692	-1.109703	0.2673	1596
FDI	0.002038	0.030263	0.067336	0.9463	1596
TO	-0.550525	0.042081	13.08257	0.0000	1596
GCF	0.228178	0.011734	19.44538	0.0000	1596
BRM	0.287528	0.037582	7.650748	0.0000	1596
Fixed Effect Model					
Variable	Variable Coefficient	Std. Error	t-Statistic	Prob.	Obs.
C	2.234974	0.182765	12.22865	0.0000	1596
FDI	0.023080	0.005663	4.075511	0.0000	1596
TO	-0.106724	0.013365	-7.985342	0.0000	1596
GCF	0.194131	0.007688	25.25076	0.0000	1596
BRM	0.302417	0.015033	20.11676	0.0000	1596
Random Effect Model					
Variable	Variable Coefficient	Std. Error	t-Statistic	Prob.	Obs.
C	2.237171	0.202381	11.05426	0.0000	1596
FDI	0.022926	0.005661	4.049792	0.0001	1596
TO	-0.102769	0.013295	-7.729854	0.0000	1596
GCF	0.192958	0.007578	25.46136	0.0000	1596
BRM	0.304907	0.014943	20.40468	0.0000	1596

Notes: ***, ** and * denote significance at 1%, 5% and 10% levels, respectively.

Model 1 is a within-group fixed effect estimator (FE), Model 2 is feasible generalized least square estimator (RE) and Model 3 is ordinary least square pooled regression.

According to Table 4, the factor broad money (BRM) has the largest impact on GDP among other factors. It positively influenced the dependent variable of economic growth by around 28.7% in the pooled regression model, while it significantly increased economic growth by 30.4% in the fixed and random effect models.

On the other hand, FDI has no significant impact of economic growth in the pooled regression model, whereas it significantly affects on economic growth by 2.3% in the fixed and random effect models.

All the three models, pooled, fixed and random, indicated that there is a negative effect of trade openness (TO) on GDP. This result matches with the economic view, which states that openness

to trade has negative effect on growth in countries with high-inflation countries, but has insignificant impact in countries with low-inflation countries (Keho, 2017). In our models, TO has a negative effect on GDP in developing countries.

The next step in choosing between the fixed effect model and the pooled regression model consisted of running the Redundant Fixed Effects Tests as shown in table 5. As the null hypothesis was rejected, we concluded that the fixed effect model was adequate in our case (Bell and Jones, 2015). Moreover, the results of the test in table 5 showed that our variables also established a short-term equilibrium between them and that the model was statistically significant.

Table 5. Redundant Fixed Effects Tests

Effects Test	Statistic	d.f.	Prob.
Cross-section F	487.721024	(75,1516)	0.0000
Cross-section Chi-square	5145.519592	75	0.0000

Now, we need to choose between the fixed effect model and the random effect model by conducting the Hausman test (Sheytanova, 2015). In this case, the null hypothesis would imply that there were no significant differences between the estimates of the fixed effect model and the random effect model. If the null hypothesis was rejected, the fixed effect model should be chosen. Otherwise, the random effect model would be considered to be more adequate. Table 6 shows the output of this test.

Table 6. The Hausman test.

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.		Prob.	
Cross Section Random	2.143695	4		0.163	
	Fixed Effect	Random Effect	Var. (Diff.)	Prob.	Obs.
C					
FDI	0.00621	0.00541	0.02614	0.5308	0.0917
TO	-5.594794	-5.357623	0.023698	0.1234	-5.594794
GCF	0.00172	0.00216	0.04218	0.0633	0.0861
BRM	28.286633	28.040499	0.068989	0.3487	28.286633

As one can see from Table 6, the p-value was above 0.05, therefore, the null hypothesis was not rejected and we could conclude that the random effect model was more suitable for our study.

Accordingly, the random effect model is generally written as:

$$Y_{ij} = \mu + \beta'X_{it} + \alpha_i + \varepsilon_{it}$$

Where:

Y_{ij} is the dependent variable.

X_{ij} is the vector of independent variables.

β is the vector coefficient.

μ is the individual effect of the i^{th} individual-specific variables that are constant over time.

ε_i is the error term.

i.e. the model is:

$$GDP_{ij} = \mu + \beta_1 FDI_{ij} + \beta_2 TO_{ij} + \beta_3 GCF_{ij} + \beta_4 BRM_{ij} + \varepsilon_i$$

According to the random effect model, for instance, the variable GCF contributed annually to the increase in the economic growth, proxied by GDP, with 0.216%. On the opposite side, TO contributes to decrease the GDP annually.

5.2 Model Diagnostics

Before relay on the above data, homoscedasticity assumption must be fulfilled, and multicollinearity and autocorrelation must be avoided, to receive reliable results from our model (Osborne, 2019). These assumptions are just a formal check to ensure that the linear model we build gives us the best possible results for a given data set and these assumptions. The homoscedasticity states that the residuals must be approximately equal for all predicted dependent variables (Hickey *et al.*, 2019). Finally, multicollinearity refers to the correlation among the independent variables which must be avoided (Ragsdale, 2018). In this study, all assumptions are verified for our model. Homoscedasticity (i.e, Constant Variance) describes a situation in which the error term is the same across all values of the independent variables. To check it, we run Breusch-Pagan test on STATA. we notice that P-value = 0.43 > 0.05. Therefore, we don't reject H_0 and we can conclude that Homoscedasticity is achieved.

Autocorrelation occurs when the residual errors are dependent on each other. The presence of correlation in error terms drastically reduces model's accuracy. Autocorrelation can be tested with the help of Durbin-Watson test. The Durbin-Watson statistic will always have a value between 0 and 4. Since the value in our model is around 2, this means that there is no autocorrelation detected in the data.

Table 7. Homoscedasticity and autocorrelation check

Homoscedasticity	
chi2(1)	0.64
Prob> chi2	0.42
Autocorrelation	
Durbin-Watson d-statistic	1.93

Multicollinearity generally occurs when there are high correlations between two or more independent variables. In other words, one predictor variable can be used to predict the other. This creates redundant information, skewing the results in a regression model. Also, this is called multicollinear independent variables. We will check this by using Variance Inflation factor (VIF) and Tolerance. From table 6, the independent variables has VIF less than 5 and Tolerance greater than 0.1. So, there is no multicollinearity. This assumption is achieved.

Table 8. Multicollinearity check

Independent Variables	VIF
FDI	1.32
TO	1.21
GCF	1.5
BRM	1.39

6. Conclusion and recommendation

This study is conducted with the purpose of investigating the variables impacting on economic growth, with a special focus in the developing countries. In this study, a largest number of developing countries is obtained as we included (76) developing countries it is concluded that the impact of foreign direct investment, Gross Capital Formation (GCF), Broad Money (BRM) and trade openness (TO) on economic growth and how the FDI affected the Economic growth positively.

The broad money factor (BRM) has the greatest impact on GDP among other factors.

It had a positive impact on the dependent variable of economic growth by about 28.7% in the pooled regression model, in addition to a negative impact of trade openness (TO) on GDP at the level of the three pooled, fixed and random models. In addition, the GCF variable contributed annually to increasing economic growth, represented by GDP. Total by 0.216%. The results also

showed that foreign direct investment does not have a significant impact on economic growth in the pooled regression model, while it significantly affects economic growth by 2.3% in the fixed and random effect models.

The findings have a higher practical implication for these economies.

6.1 Recommendations

- The policymakers in these countries should encourage and support domestic firms by providing incentives enabling them to produce on a large scale for domestic consumption and exports. Furthermore, governments need to ensure that their economies are attractive and favorable for investment to encourage the growth of FDI.
- This can be accomplished through infrastructure development and liberalization of national policies to create a regulatory environment that is friendly to FDI by easing restrictions on foreign ownership and market entry and enhancing market efficiency.
- Additionally, the limited observation because of a lack of uniform time range for the variables regarding the individual countries may hinder the dynamism of the findings.
- Future research works can consider other variables and increase the sample size for more in-depth analysis.
- The government and the policy makers should create more avenues to attract foreign investors which will enhance technology transfer, and more job opportunities, and increase productivity into the economy.
- It is also recommended that the domestic investors need not to be ignored for policies that could attract and motivate existing and potential domestic investors.

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