The dynamism between, Import, Foreign Direct Investment inflow, Inflation and Covid-19 on Economic Growth: Evidence from Ghana

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ABSTRACT: This research examines the long-term relationships between imports, inflation, and Foreign Direct Investment (FDI) influx in Ghana and their impact on productivity expansion. Using World Bank data from 1990 to 2019, the study applies statistical tests such as the ADF unit root test, Johansen cointegration test, vector error correction model, and Granger causality test. The results show that Ghana's economic growth is long-term dependent on imports and FDI influx. The Johansen tests reveal a long-term correlation between these factors, indicating a sustained relationship. Additionally, inflation negatively affects FDI, imports, and GDP. The Granger causality test identifies a short-run unidirectional effect between the variables. However, the vector error correction model (VECM) does not confirm a long-term relationship between imports and GDP as established by the Johansen test. The study suggests that FDI inflows are more effective than imports and inflation in the Ghanaian economy. Furthermore, the literature review highlights the significant impact of the COVID-19 pandemic on global trade, including agricultural exports to China. China's early effective management of the pandemic and strategic actions have helped mitigate some of the negative effects on their total exports.

Keywords: Johansen cointegration test; Vector error correction model; Covid Impact and Economic growth; FDI inflows; Export and Import; Gross Domestic Product Ghana.

INTRODUCTION

A crucial method of raising money for development initiatives is through foreign direct investment. It not only boosts a country's capital formation but also raises the standard of its capital stock (Onyeagu, 2013). However, the FDI flow has decreased as a result of the COVID-19 epidemic, according to the United Nations Conference on Trade and Development's investment report from 2020. Forecasts indicate that FDI will continue to decline in 2021 by 5 to 10% before beginning to rebound in 2022 (Unctad, 2020). Recently, developing countries have made economic growth one of their top priorities while constructing their national economic systems. It is reasonable to infer that global FDI foreign direct investment recovered to pre-pandemic levels, reaching $1.6 trillion (UNCTAD, 2022). In contrast to the widespread mistrust of FDI in the 1960s and early 1970s, 2005). FDI greatly accelerates the economic development of poor countries (Antwi et al., 2013). However, these nations depend heavily on imports and deal with additional problems like inflation.

In comparison to other regions of the world, private savings are lower in Sub-Saharan Africa and Ghana (Prince and Victor, 2014). The host country gains many advantages from the FDI infusion, such advantages include the ability to close the gap between low domestic savings and investment (Prince and Victor, 2014). The need for investments, particularly FDI, is crucial since Ghana hopes to achieve the Millennium Development Goals (MDGs) goal year (Justice and Gloria, 2012). The Ghanaian economy has witnessed one of Africa's most comprehensive structural adjustment programs since the launch of the Economic Recovery Programs in 1983 (Addo, 2019).

In a developing country like Ghana, the service sector attracts more investors than the other sectors. However, Ghana's building and construction sectors are one of the main drivers of economic advancement since this sector can effectively utilize human and material resources to develop and maintain infrastructure, enhancing economic efficiency (Kwasi and Yao, 2016). FDI's increased function in developing and emerging countries has raised expectations about its potential contribution to their development (OECD, 2008). Over the years, Ghana has been attracting a meaningful share of FDI inflow to the African continent to boost its economy while consistently depending on imports.

The contribution of this research is in two folds, firstly, by focusing on the situation in Ghana, this new study offered the opportunity to analyze the country-specific context, utilize updated data and analytical techniques, provide policy implications, and contribute to the existing knowledge (Hobbs et al., 2021). Secondly, literature on the variables of GDP, FDI inflow, trade and their relationship with COVID-19 were reviewed to gain insights into the pandemic's impact and inform decision-making processes. It provides a foundation for understanding the economic dynamics during these exceptional times and helps in formulating effective strategies for recovery and resilience. To understand the dynamic interaction of the short- and long-run, data from the World Bank were used from 1990 to 2019 for the study. Using econometric analysis, the ADF unit root test, Johansen co-integration test, vector error correction model, and Granger causality test were applied.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

The review is in three phases. The first part of the review captured empirical studies on the impact of COVID-19 on FDI, GDP, export, and import, whereas the second aspect considered the impact of FDI on economic growth. The last part covers the effect of exports on economic development. The separation of the literature generates a great foundation and much insight into the selected variables (GDP, import, inflation, and FDI).

The Impact of the Covid-19 pandemic on FDI, GDP, and Trade

The virus that causes COVID-19 has been spreading globally since the outbreak of the SARS-CoV-2 virus. Several variants have emerged and have been identified in many countries. This has posed a serious risk and health challenge to people and the world economies, which has also affected the world's supply chain and has had great effects on countries' imports and exports, FDI, and gross domestic product. As the impact of the COVID-19 pandemic in the long term remains uncertain, the short term continues to be disruptive to global economics (Akyuz, 2022). However, it has been more disruptive in the North-South Americas and Europe than in developing economies in Asia-Oceania (Fang et al., 2021). The FDI inflows to Central, East, and Southeast Europe (CESEE-23 economies) contracted by 58% in the second quarter of 2020, compared to the same time in 2019, but this is smaller than the contraction of 75% faced by developed economies (Europe, 2020). FDI flows are expected to fall by between 30% and 40% in 2020–2022 due to increasing trade costs due to disruptions in transportation, logistics, and

supply chains, as well as trade restrictions (Handoyo, 2020). Aside from the rising cost of trade, the public and private sectors are faced with reduced working hours and employee layoffs, respectively, which have had a toll on production and incomes, and reduced household spending, which in effect has seen a decline in aggregate demand.

Consequently, the severity of the pandemic on FDI in both developed and developing economies requires compatible infrastructure to live and survive in the new scenario (Mehar, 2021) as a platform for a competitive business atmosphere. According to Ciobanu et al (2020), FDI serves as a source of long-term stability for an economy despite the growing concern that FDI may affect the local market. The inflows of more foreign capital support the positive performance of a local stock market and reduce the rising pressure on the exchange rate (Nwosa, 2021). Foreign companies help the host country develop on several levels, including adopting new technologies, managerial ideas, and capital inflow (Mehar, 2021). In the face of the post-COVID-19 pandemic, attention is drawn to policymakers' ability to create a competitive advantage by shifting towards formulating and implementing policies that reduce legislative burden, digitalize investment boards and economic development agencies, and create the needed infrastructure and human resource capabilities Sharma (2021) to increase economic growth. Given the high uncertainty created by the COVID-19 pandemic Havrlant et at (2021) designed three scenarios that reflected the severity of the shock, its sectoral distribution, and the time needed for recovery and applied them to the Saudi economy. They reported a negative impact on headline GDP in 2020, ranging from -4.8% to 9.8% compared to the baseline level. (Rakha, et al., 2021) used artificial intelligence to assess the economic impact of COVID-19 in the United Kingdom. Their study indicated that GDP growth in 2021 will remain steady, but at around a contraction of -8.5% compared to the baseline figures before the pandemic.

Notwithstanding, Soava et al (2021) confirmed that the shock of declining activity due to COVID-19 severely impacted electricity and GDP in the first half of 2020, followed by a slight recovery. The pandemic is expected to harm economic growth and poverty alleviation (Asare and Barfi, 2021). The effects of the pandemic include a severe impact on exports, which are also an integral part of every economy's ability to build a positive balance of payment, earn more foreign exchange, and build a strong reserve. Lin and Zhang (2020) investigated the pandemic's impact on agricultural export companies in China using unique firm-level survey data. They discovered that average agricultural businesses experienced declines in exports. Even though the pandemic in China has had a substantial negative effect on the country's export trade, the situation of trading partners because of the same COVID-19 pandemic has significantly affected China's total exports (Zhao et al., 2021). This indicates how the Chinese government effectively managed the COVID-19 pandemic strategically and acted earlier than the rest of the world. Vidya and Prabheesh (2020) also used trade networks and artificial neural networks to measure trade interconnectedness among countries and found a drastic reduction in trade interconnectedness and a visible change in the structure of trade networks after the COVID-19 outbreak. Interestingly, China's "center" position in the trade network is unaffected.

Impact of FDI on Economic Growth

The outcomes showed that FDI inflows had influenced GPD growth (Francis et al., 2013). By employing cointegration analysis, the factors influencing FDI inflows indicate that natural resources have a negative long-run relationship with FDI inflows (George et al., 2016). Investigating the relationship between economic growth and FDI inflows in a dynamic framework by (Baba, 2013). The elasticity of economic growth regarding FDI had a positive sign. It was also significant at the 1% level, and the effect of a three-year lag of FDI on economic growth had an adverse sign and was significant at the 5% level. The effect of FDI on economic growth and the role of human capital development in FDI inflow by Onyeagu (2013) revealed that FDI significantly positively affects the economy in the long run and human capital. Conversely, Eldin et al (2013) used Prais-Winsten regression with panel-corrected standard error for the preferred estimation model. The main research outcome was that FDI positively affects economic growth. According to Trang (2019) FDI helps stimulate economic growth in the long run, although it negatively impacts nations in the short run. FDI has a positive and significant effect on economic growth, and variables such as human capital, economic infrastructure, and capital formation positively impact GDP (Mehdi, 2012). Re-evaluating the effect of FDI on economic growth, the findings prove that FDI positively impacts economic development (Liming, 2014). Also, identifying and measuring the differential impact of sector-wise (primary versus secondary versus tertiary sector) FDI inflow showed that the effect of FDI is indeed influenced by the sectoral composition of FDI (Saswata et al., 2020). According to Donny (2018), no form of FDI seems beneficial to the host economies, but some sectors provide a positive correlation to economic growth, and others produce a negative effect. Assessment of the growth effect of FDI when controlling for other growth determinants obtained that past FDI inflows significantly affect growth (Argiro, 2003). An outcome indicated that FDI and trade boost economic growth in developing countries Shiva and Agapi, (2004), and FDI and international trade are related to economic growth. FDI and export positively and statistically significantly influence economic growth (Hieu, 2020).

The effect of Import on economic growth.

Importing goods and services helps countries concentrate on what they can produce best. Some studies found imports to support economic growth through empirical research. For instance, Uğur (2008) identified bidirectional inter-dependencies between GDP and investment goods import and raw material imports. The author's findings further revealed a unidirectional relationship between GDP and consumption of goods imported and other goods imported. However, the findings of Panta et al (2022) found no evidence that foreign trade supports economic growth. Consequently, a study by Kartikasari (2017) through empirical results, revealed that imports harmed the Indonesian economy. Furthermore, Ali and Li (2016), also found an optimistic impact of importation and its determinants on economic growth in Pakistan. Conversely, Reddy (2020) provided evidence that imports increase economic advancement in India. However, an analysis by Pindiriri et al (2014) discovered a long-run relationship between imports and economic growth in Zimbabwe. Their results further revealed that expansion of imports of capital goods

could also help the economy achieve its long-term level of economic development, whiles importation of consumable goods is detrimental to economic growth. Overall, the review emphasizes the complex interactions between GDP, FDI, imports and Covid-19 and their implications for economic growth and how these vary across different countries and contexts. While some studies have found a positive impact of imports on GDP and economic advancement, others have found negative effects or no significant relationship. The type of imports, such as investment goods or consumable goods, also plays a role in determining their impact on economic growth.

RESEARCH METHODOLOGY

Studying the dynamic relationship between macroeconomic indicators and economic growth has sparked a lot of controversies. Arabi (2014) used secondary data to assess the impact of financial development on economic growth using the Johansen test and Vector Error Correction Model (VECM). The VECM model gives long-term relationships and short-term dynamics of endogenous variables (Soana and Olta, 2013). Many studies have used secondary data to investigate the impact of micro and macroeconomics on economic development through modern econometricians' view. Modern econometricians point to a nonstructural strategy for establishing a relational model among economic variables (Zou, 2018). Among researchers who used FDI, export, and GDP to investigate economic growth include (Sunde 2017; Marinko et al., 2020; Manikandan and Rajarathinam 2019; Tanoe 2021; Popovici and Călin, 2016; Andrei and Andrei 2015; Hobbs et al., 2021). Consequently, in our case, we used data from the World Bank from 1990-2019 to examine the effect of FDI, import, and inflation on economic growth in Ghana. All the analyses were performed using Gretl software.

Model Specification

In assessing the impact of FDI inflow, import, and inflation on economic growth, one must understand whether the selected variables affect economic development in the short or long run. For this reason, we employed the Johansen co-integration test, VECM, and the Granger causality test to achieve the objective of this study. The Johansen co-integration test determines if there is a stable long-term relationship between variables. If it is detected, the variables are mutually influenced by a common set of factors. The Vector Autoregressive (VAR) model includes cointegration and allows for analyzing both short-term dynamics and long-run relationships. The Granger Causality test determines the direction of causality between variables, indicating if one variable causes changes in another or if the relationship is bidirectional..

The model equation estimated is written below:

1. $GDP_t = (GDP_t,\ FDI_t,\ Import_t,\ inflation_t)$
2. $FDI_t = (FDI_t, GDP_t, lnimport_t, inflation_t)$
3. $import_t = (lnimport_t, GDP_t, FDI_t, inflation_t)$
4. $inflation_t = (inflation_t, GDP_t, FDI_t, import_t)$

FDI also represents foreign direct investment inflows, and imports represent the cross-border trade of goods and services.

In contrast, inflation indicates the changes in the prices of goods and services over time. GDP is used as a proxy for economic growth. All the variables are measured in USD billions. However, they are transformed into natural logarithms. Conversely, the VECM can for equations 1-4 can be written as follows:

1. $$\Delta lnGDP_t = \theta_1 + \sum_{g=1}^{m} \alpha_{1g}\, \Delta lnGDP_{t-g} + \sum_{g=1}^{m} \alpha_{2g}\, \Delta lnFDI_{t-g} + \sum_{g=1}^{m} \alpha_{3g}\, \Delta lnimport_{t-g} + \sum_{g=1}^{m} \alpha_{4g}\, \Delta lninflation_{t-g} + \alpha_5 ECT_{t-1} + \varepsilon_{1t}$$

2. $$\Delta lnFDI_t = \theta_2 + \sum_{g=1}^{m} \alpha_{11g}\, \Delta lnFDI_{t-g} + \sum_{g=1}^{m} \alpha_{12g}\, \Delta lnGDP_{t-g} + \sum_{g=1}^{m} \alpha_{13g}\, \Delta lnimport_{t-g} + \sum_{g=1}^{m} \alpha_{14g}\, \Delta lninflation_{t-g} + \alpha_{15} ECT_{t-1} + \varepsilon_{2t}$$

3. $$\Delta lnimport_t = \theta_3 + \sum_{g=1}^{m} \alpha_{21g}\, import_t + \sum_{g=1}^{m} \alpha_{22g}\, \Delta lnGDP_{t-g} + \sum_{g=1}^{m} \alpha_{23g}\, \Delta lnFDI_{t-g} + \sum_{g=1}^{m} \alpha_{24g}\, \Delta lninflation_{t-g} + \alpha_{25} ECT_{t-1} + \varepsilon_{3t}$$

8. $$\Delta lninflation_t = \theta_4 + \sum_{g=1}^{m} \alpha_{31g}\, \Delta lninflation_{t-g} + \sum_{g=1}^{m} \alpha_{32g}\, \Delta lnimport_{t-g} + \sum_{g=1}^{m} \alpha_{33g}\, \Delta lnGDP_{t-g} + \sum_{g=1}^{m} \alpha_{34g}\, \Delta lnFDI_{t-g} + \alpha_{35} ECT_{t-1} + \varepsilon_{4t}$$

θ_s is the constant attached to each equation and 〖ECT〗_(t-1) is one period lagged in the error correction term. However, M indicates the lag length, where α_s are the coefficients to be estimated. The ε_s is the disturbance term, and they are serially uncorrelated. The term error correction relates to the fact that the previous time deviation from the long-term equilibrium impacts the short-run variable. The coefficient of the ECT is the rate of deviations and adjustment because it measures the speed at which the target variable returns to equilibrium after a change in the dependent variable.

We tested for the assumption of the unit-root presence in the time series variables. This test helps to identify whether the time series data is stationary or non-stationary. The method of testing whether a time series has a unit root or equal value is that the variable follows a random walk (Dickey and Fuller, 1979). It is well-known that time-series analysts have a different approach to analyzing economic data (Granger, 1981). The objective behind cointegration is to match the degree of non-stationary in time series so that residuals become stationary and spurious regression is avoided (Vaclav, 2014)

RESULT AND DISCUSSIONS

ADF unit root test

The ADF test was applied to determine whether the time series data used is stationary or not. Stationarity is a crucial assumption in econometric analysis, and non-stationarity can lead to spurious results. The null hypothesis for every time series was as follows: there is a unit root existence; therefore, it is non-stationarity. The alternative hypothesis states that there is no unit root presence in the series; therefore, it is stationarity. The ADF t-statistic must be more negative than 5% significance level. However, usually for unit root presence in a series equal to one. The test was performed using the variant with constant under the ADF test. The null hypothesis at the level cannot be rejected for each variable because, as Table 1 indicates, the t-statistic is greater

than the critical value of 5%. Therefore, unit root(non-stationarity) exists in the variables at levels.

Table 1: ADF Unit root test at levels and first difference

Variables	Sample period	ADF T-Stat	p-value	Critical Value (5%)	ADF T-Stat	p-value	Critical Value (5%)
GDP	1992-2019	-2.04416	0.576	-0.135	-0.962	0.003	-0.073
FDI inflow	1992-2019	-2.342	0.410	-0.3378	-4.626	0.000	-0.789
Import	1992-2019	-2.107	0.540	-0.289	-4.498	0.000	-0.877
Inflation	1992-2019	-1.031	0.272	-0.060	-4.305	0.000	-3.281

Source: Authors calculations

As a result of not rejecting the null hypothesis for each time series, the selected variables were differenced to obtain stationarity at the first-order difference, as indicated in Table 1. The ADF t-statistic was greater and their p-values were less than 5%. Hence, it means the variables are stationarity at first difference. They were integrated first-order (1).

Johansen Cointegration

The Johansen co-integration test was used to determine whether there is a long-run linkage between GDP, import, FDI inflow, and inflation variables due to all variables being integrated of the first order (1). The trace rank test and the loglikelihood maximum test are two co-integration tests. The first null hypothesis is that co-integration does not exist (r = 0). According to the alternative hypothesis, there is at least one co-integration equation. According to the second null hypothesis, only one (r = 1) exists. The adjusted sample size of all the tests conducted under the co-integration was from 1994-2019. Table 2 shows a co-integration test between FDI and GDP. The tests were conducted using zan available constant.

Table 2: Johansen Co-integration test between FDI inflow and GDP

Rank	Eigenvalue	Trace test	p-value	Lmax test	p-value
0	0.34788	11.209	0.2020	11.116	0.1502
1	0.0035688	0.092955	0.7605	0.092955	0.7605

Source: Authors calculations

The first null hypothesis in Table 2 cannot be rejected. However, in the rank (r = 1), the trace and log likelihood maximum tests produced the same p-value, showing at most one co-integration equation between these variables. Therefore, rank 1 will be used under VECM estimation. Co-integration with FDI as a dependent variable can be written as FDI = 1.546(GDP)-75.6

The co-integration shows that GDP positively impacts FDI inflows, a percentage increase in GDP will lead to a percentage change in FDI inflows. Table 3 tests for co-integration between FDI inflow and import.

The trace rank 0 test and the log likelihood maximum test show that the null hypothesis, which states that there is no co-integration equation between FDI and import, cannot be rejected because the trace statistic is greater. Its p-value is higher than 5%.

Table 3: Johansen Co-integration test between FDI inflow and import

Rank	Eigenvalue	Trace test	p-value	Lmax test	p-value
0	0.458	17.175	0.026	16.550	0.019
1	0.022	0.624	0.429	0.624	0.429

Source: Authors calculations.

The second null hypothesis cannot be rejected because the log likelihood maximum and trace test generated the same probability at the same rank (r = 1). Therefore, rank 1 is preferred over rank 0. It means that there is a long-term relationship between these variables. The co-integration equation between FDI and import with FDI as a dependent variable can be written as follows: FDI = 1.711 (import)- 82.1. The co-integration equation shows that FDI and imports have a positive relationship in the long run.The co-integration test between FDI inflows and inflation is shown in Table 4. The outcome indicates that the first null hypothesis is not rejected because the trace test is greater than the critical value of 5%.

Table 4: Johansen Co-integration test between FDI inflow and Inflation

Rank	Eigenvalue	Trace test	p-value	Lmax test	p-value
0	0.38882	12.893	0.1191	12.801	0.0831
1	0.0035044	0.091276	0.7626	0.091276	0.7626

Source: Authors calculations

The second null hypothesis is also not rejected. The second hypothesis is preferred because the trace and likelihood maximum test outcomes have the same p-values. The co-integration equation between FDI and inflation can be written as follows: FDI = -3.865 (inflation)- 40. The cointegration equation between FDI and inflation shows that inflation has a negative long-run relationship with FDI inflows. It means that a percentage change in inflation will lead to a decrease in FDI inflows. Table 5 shows the Johansen test between inflation and GDP. The first null hypothesis is rejected because the trace and log likelihood maximum test probabilities are below the critical value of 5%. Hence, the rank (r = 0) shows no co-integration between the variables.

Table 5: Johansen Co-integration test between Inflation and GDP

Rank	Eigenvalue	Trace test	p-value	Lmax test	p-value
0	0.54167	20.368	0.0074	20.284	0.0039
1	0.0032008	0.083356	0.7728	0.083356	0.7728

Source: Authors calculations

The second null hypothesis is not rejected because the trace and log likelihood tests found probabilities greater than 5%. Therefore, there is a long-run relationship between inflation and GDP. The co-integration with inflation as dependent variable can be written as: inflation = - 0.444 (GDP)- 60.4. The equation above means that GDP has a negative relationship with inflation. The Johansen test between import and GDP is indicated in Table 6. The first null hypothesis is not rejected because the p-values for the trace and log likelihood tests were greater than 5%.

Table 6: Johansen Co-integration test between import and GDP

Rank	Eigenvalue	Trace test	p-value	Lmax test	p-value
0	0.31060	10.345	0.2597	10.042	0.2133
1	0.011161	0.30305	0.5820	0.30305	0.5820

Source: Authors calculations

The second null hypothesis is not rejected because the trace and log likelihood found the same p-value is greater than 5%. Hence, there is a long-run relationship between GDP and imports. The co-integration equation at a rank (r =1) is the most preferred. The co-integration with import as dependent variable can be written as:

Import = 1.7638 (GDP)- 171.2

The equation between imports and GDP above shows that GDP has a positive long-run relationship with imports. Table 7 shows the co-integration test between import and inflation. The first null hypothesis is rejected because the traces and log likelihood test probabilities are lower than the 5% critical value.

Table 7: Johansen Co-integration test between import and Inflation

Rank	Eigenvalue	Trace test	p-value	Lmax test	p-value
0	0.43290	16.846	0.0294	15.315	0.0319
1	0.055142	1.5315	0.9214	1.5315	0.2159

The second null hypothesis is not rejected because the trace and loglikelihood test found the same p-values at the rank(r=1). It means that there is a long-term relationship between these variables. The cointegration equation between import and inflation with import as an explained variable can be written as follows:

Import = - 2.229 (inflation)- 69.5. The co-integration equation shows that inflation harms imports. A percentage increase in inflation will lead to a decrease in imports. The overall co-integration test shows that the variables have a long-run relationship. However, inflation negatively impacts GDP, while imports and FDI have a positive impact.

Vector Error Correction Model

After the Johansen co-integration analysis on the long-run relationship between GDP, FDI inflows, inflation, and imports, there is a need to perform a VECM in case any shock occurs. The speed of change in the variables to a long-run equilibrium following a shock is evaluated using the error correction term (ECT). The ECT must be negative and statistically significant to be interpretable. Therefore, a positive ECT value shows no causal relationship. The VECM between FDI and GDP is shown in Table 8. Using GDP as a dependent variable produced a positive ECT coefficient Therefore, a long-run interdependence was not confirmed.

Table 8: Vector error correction model-First difference between FDI inflow and GDP

Error Correction	**d_l_FDIinflow**	**d_l_GDP**
ECT (-1)	−0.530	0.006
T-ratio	−3.243	0.886
d_l_FDIinflow (-1)	0.356	2.937
T-ratio	1.875	0.561
d_l_FDIinflow (-2)	0.179	3.742
T-ratio	1.010	0.736
d_l_GDP (-1)	−0.008	0.489
T-ratio	−1.038	2.205
d_l_GDP (-2)	0.002	−0.116
T-ratio	0.337	−0.539
Constant	−5.649	0.097
T-ratio	−3.110	1.267

Adjusted sample size 1993-2019; Source: Authors calculations

However, when FDI was used the explained variable found a long-run interdependency with GDP. The ECT coefficient of FDI was negative and statistically significant. The ECT coefficient (−0.530) means that in the case of any deviation, the variables will converge to equilibrium by adjusting the time's disequilibrium at over 53% in the following year. Table 9 shows the VECM between FDI and inflation. With FDI inflows as a dependent variable, found no long-term inter-dependency with inflation. The ECT coefficient of FDI was negative but not statistically significant at 5%. Hence, a long-term relationship is confirmed.

Table 9: Vector error correction model-First difference between FDI inflow and Inflation

Error Correction	**d_l_FDIinflow**	**d_l_Inflation**
ECT (-1)	−0.057	−0.381
T-ratio	−0.610	−2.865
d_l_FDIinflow (-1)	0.028	0.051
T-ratio	0.147	0.156
d_l_FDIinflow (-2)	0.004	−0.431
T-ratio	0.023	−1.479
d_l_Inflation (-1)	0.047	0.609
T-ratio	0.172	1.304
d_l_Inflation (-2)	0.253	0.605
T-ratio	0.991	1.471
Constant	0.727	3.697
T-ratio	0.740	2.667

Adjusted sample size 1993-2019; Source: Authors calculations

However, inflation as an explained variable confirmed a long-run interdependency with FDI inflows. The ECT coefficient of inflation was (−0.381), which means that in terms of any shock, the variable will converge to equilibrium by 38.1% disequilibrium in the preceding year. The VECM between inflation and imports is shown in Table 10. With inflation as a dependent variable detected a long-term inter-dependency with import. The ECT was statistically significant and had a negative sign attached. The ECT coefficient (−0.815) means that in the case of any change, the variable will meet at equilibrium by adjusting over 82% in the following period.

Table 10: Vector error correction model-First difference between Inflation and import

Error Correction	d_l_Inflation	d_l_import
ECT (-1)	−0.815	0.019
T-ratio	−3.987	0.466
d_l_Inflation (-1)	0.837	−0.053
T-ratio	2.135	−0.047
d_l_Inflation (-2)	0.656	0.411
T-ratio	1.743	0.394
d_l_Import (-1)	−0.070	0.128
T-ratio	−0.884	0.5626
d_l_Import (-2)	0.037	0.032
T-ratio	0.484	0.153
Constant	6.587	−0.080
T-ratio	3.947	−0.235

Adjusted sample size 1993-2019; Source: Authors calculations

With imports as the explained variable found a positive ECT coefficient (0.019), which indicates no causal relationship. Table 11 shows the VECM FDI and import. Using import as a dependent variable produced an ECT coefficient (−0.016), which is insignificant at a 5% level. It means no long-term inter-dependency was found with FDI inflows.

Table 11: Vector error correction model-First difference between FDI inflow and import

Error Correction	d_l_FDIinflow	d_l_Import
ECT (-1)	−0.768	−0.016
T-ratio	−4.037	−0.256
d_l_FDIinflow (-1)	0.340	0.102
T-ratio	1.819	0.139
d_l_FDIinflow (-2)	0.246	0.221
T-ratio	1.535	0.3086
d_l_Import (-1)	−0.038	0.143
T-ratio	−0.622	0.587
d_l_Import (-2)	−0.005	0.063
T-ratio	−0.093	0.265
Constant	−3.061	0.021
T-ratio	−4.002	0.086

Adjusted sample size 1993-2019; Source: Authors calculations

However, with FDI inflows as an explained variable found, an ECT coefficient (−0.768), which means in terms of any deviation, the variables will converge to equilibrium by adjusting at the time of disequilibrium of over 77% in the following period. Conversely, the VECM between inflation and GDP is shown in Table 12. With GDP, the dependent variable detected a negative ECT coefficient (−0.004) but is non-significant at the 5% level.

Table 12: Vector error correction model-First difference between Inflation and GDP

Error Correction	d_l_Inflation	d_l_GDP
ECT (-1)	−0.753	−0.004
T-ratio	−3.783	−0.070
d_l_Inflation (-1)	0.760	−0.110
T-ratio	1.909	−0.144
d_l_Inflation (-2)	0.628	0.239
T-ratio	1.687	0.315
d_l_GDP (-1)	0.002	0.153
T-ratio	0.021	0.692
d_l_GDP (-2)	0.055	0.015
T-ratio	0.515	0.071
Constant	6.893	0.111
T-ratio	3.730	0.209

Adjusted sample size 1993-2019

However, with inflation as an explained variable, the ECT coefficient is statistically significant at 5%. The ECT coefficient (−0.753) indicates that variables will converge at equilibrium by over 75.3% over the preceding period. Furthermore, Table 13 indicates the VECM between import and GDP. Using import as explained variable produced a positive ECT coefficient. It means there is no causal relationship with GDP.

Table 13: Vector error correction model-First difference between import and GDP

Error Correction	d_l_Import	d_l_GDP
ECT (-1)	−0.243	0.035
T-ratio	−1.259	1.212
d_l_Import (-1)	0.341	−0.732
T-ratio	1.284	−0.425
d_l_Import (-2)	0.073	1.373
T-ratio	0.300	0.821
d_l_GDP (-1)	0.014	0.314
T-ratio	0.366	1.222
d_l_GDP (-2)	0.028	−0.035
T-ratio	−0.771	−0.140
Constant	−0.921	0.177
T-ratio	−1.122	1.441

Adjusted sample size 1993-2019

However, using GDP as a dependent variable detected a positive ECT coefficient which indicates no causal relationship with import in the long run.

Granger Causality Test

The long-term link between Ghana's FDI inflows, exports, inflation, and GDP was demonstrated using the Johansen co-integration test and the VECM. The Granger causality tests can be used to explore the link between the three variables further and provide evidence of short-run causality. As indicated in Table 14, the first null hypothesis, which states that the GDP does not Granger cause the FDI, is not rejected because its probability is significant at 5% but can be rejected at 10%. This means that there is a short-run effect from GDP to FDI inflows.

Table 14: Granger causality test between FDI inflow and GDP

Null Hypothesis	Observations	F-Statistic	P-value
GDP does not granger cause FDI inflow	27	2.429	0.095
FDI inflow does not granger cause GDP	27	0.433	0.731

Source: Authors' calculations

However, the second null hypothesis, which states that FDI inflows do not influence GDP, is not rejected because the p-value is greater than 5%. It means that in the short run, FDI does not have any impact on GDP. Conversely, table 15 shows the Granger causality test between FDI and import. The hypothesis, which states that import does not granger cause FDI, is rejected because its p-value is significant at 5%. It means that there is a short-run influence from export to FDI inflow.

Table 15: Granger causality test between FDI inflow and import

Null Hypothesis	Observations	F-Statistic	P-value
Import does not granger cause FDI inflow	27	5.4266	0.0068
FDI inflow does not granger cause import	27	0.31176	0.8166

Source: Authors calculations

The second null hypothesis is not rejected because the p-value of the F-test is greater than the critical value of 5%. It indicates that there is no short-term effect from FDI inflows on imports. Conversely, the hypothesis of the Granger causality test between FDI and inflation in Table 16 is not rejected. The p-value is not significant at 5% but at 10%. It indicates that inflation has a short-term impact on FDI inflows.

Table 16: Granger causality test between FDI inflow and Inflation

Null Hypothesis	Observations	F-Statistic	P-value
Inflation does not granger cause FDI inflow	27	2.5608	0.0837
FDI inflows does not granger cause Inflation	27	3.0263	0.0535

Source: Authors calculations

The hypothesis, which states that the FDI inflows impacts inflation, is rejected. It means that there is short-run impact from FDI inflows on inflation. Table 17 shows the causality test between import and GDP. The hypothesis is not rejected because GDP does not have a short-run impact on exports.

Table 17: Granger causality test between import and GDP

Null Hypothesis	Observations	F-Statistic	P-value
GDP does not granger cause import	27	0.65121	0.5914
import does not granger cause GDP	27	0.57576	0.6376

Source: Authors calculations

The hypothesis, which states that imports do not affect GDP, is not rejected. It indicates that exports do not have a short-term influence on GDP. Furthermore, Table 18 shows the Granger causality test between imports and inflation. The hypothesis, which states that inflation does not Granger cause import, is not rejected. This shows that inflation has no short-run impact on imports.

Table 18: Granger causality test between import and Inflation

Null Hypothesis	Observations	F-Statistic	P-value
Inflation does not granger cause import	27	1.0543	0.3905
import does not granger cause Inflation	27	4.5422	0.0139

Source: Authors calculations

The second null hypothesis, which states that export does not influence inflation is rejected. The F-test p-value is significant at 5%. It indicates that imports have a short-term effect on inflation. The causality test between inflation and GDP is indicated in table 19. However, the first null hypothesis is rejected at a 5% significant level. This indicated that GDP has a short-run relationship with inflation.

Table 19: Granger causality test between Inflation and GDP

Null Hypothesis	Observations	F-Statistic	P-value
GDP does not granger cause Inflation	27	7.6472	0.0013
inflation does not granger cause GDP	27	0.46795	0.7079

Source: Authors calculations

The second null hypothesis, which states that inflation does not granger cause GDP, is not rejected because the probability of the F-test is greater than 5%. It means that inflation has no influence on GDP in the short run.

Discussions

Assessing whether FDI inflows, imports, and inflation support economic growth in Ghana help to understand these

variables' dynamics. That is to answer if there is a short-term or long-term influence on economic growth in Ghana. The Johansen co-integration test indicated a long-run relationship between the variables used in this study. However, under the co-integration test, the co-integration equation between GDPs, FDIs, and imports with inflation shows a negative long-term relationship. On the other hand, a study by Amoah et al (2015) found a positive relationship between FDI and inflation on economic growth. The Granger causality test shows that inflation has a short-run effect on FDI inflows and imports at a 5% significance level. Conversely, there was evidence that GDP influences inflation in Ghana at 10%. The causality test further confirmed that there is a short-run influence from imports on inflation. It shows a unidirectional causality between inflation and import. Conversely, the Johansen test between FDI and GDP indicated a positive long-run relationship. The VECM also confirmed long-run inter-dependencies between these variables, with FDI inflows as a dependent variable. Consequently, the causality test between FDI and GDP shows that GDP has a short-term impact on FDI inflow, whereas there was no trace of FDI influencing GDP in the short run. The VECM also shows that FDI inflows have a strong long-term dependency on GDP. Furthermore, the co-integration test found a positive long-term relationship between imports and GDP, but the VECM did not confirm the long-run inter-reliance. On the contrary, the Granger causality found no short-run impact from unidirectional and bidirectional import and GDP. Finally, the study found a long-term relationship and inter-dependency between FDI and import through the co-integration test and the VECM. However, there was a short-term effect between these variables from a unidirectional.

CONCLUSION

This study found a long-term dependency on exports, FDI inflows, inflation, and economic growth. ADF test showed a unit root presence in the selected variables at levels. Johansen tests established a long-run relationship between the three variables. VECM found FDI inflows to be more effective. The granger causality test indicated a short-run effect of inflation on economic growth. The vector error correction model established FDI inflows to stimulate economic growth than import and inflation in the Ghanaian economy. Sustainable FDIs and imports have a huge positive impact on a country's GDP, hence the need for a national policy in growing economies to increasingly attract sustainable FDIs and invest in sustainable importing commodities. Policymakers can use the findings of this study to create policies that encourage sustainable FDI and imports in the long run. This can be achieved by providing incentives for companies that invest in sustainable projects and promoting the use of sustainable materials in the importation of goods. Additionally, policymakers should focus on addressing inflation in the short run, as it can have a negative impact on economic growth.

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