Does corruption attract foreign direct investment inflows? Evidence from Tanzania

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ABSTRACT

Corruption remains a prominent institutional barrier that hampers foreign direct investment (FDI) inflow in developing countries. However, the specific impact of corruption on FDI inflows in Tanzania remains largely unexplored. This research aims to contribute to the existing body of knowledge by examining the consequences of corruption on FDI inflows in Tanzania between 1996 and 2021. The analysis utilizes time series institutional data obtained from the World Bank governance indicators and FDI inflow data from the Bank of Tanzania (BOT). Given the consideration of multiple variables, a multiple regression model is employed to analyze the data. Unit root tests such as the expanded Dickey-Fuller and Johansen cointegration tests are utilised to assess whether the variables are cointegrated and whether the data exhibits stationarity or nonstationarity. The findings of this study unequivocally demonstrate that corruption (CC) has a significant adverse effect on both short-term and long-term FDI inflows. The data from 1996 to 2021 consistently indicate a noteworthy influence of corruption (CC) on FDI inflows. Consequently, this research recommends concerted efforts to combat corruption in order to improve the investment climate and attract foreign investors.

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Introduction

Due to their numerous benefits, foreign direct investment (FDI) inflows play a crucial role for many governments, particularly those in developing or emerging market economies. Developing countries have implemented liberalisation policies and structural changes to attract FDI (Bayar and Alakbarov, 2016). Castro and Nunes (2013) suggest that nations welcome FDI, expecting it to stimulate employment, income, technology transfer, knowledge acquisition, managerial expertise, local market competition, and overall economic growth. FDI has become the dominant capital flow in developing nations (Adeleke, 2014). However, corruption hinders FDI inflows in most emerging economies (Brada et al., 2012; Ofori et al., 2015).

Hill (2000) defines FDI as the investment made by a corporation in foreign production and marketing facilities. Punnett and Ricks (1997) characterised FDI as the overseas investment of capital, often involving the transfer of management, technical expertise, specialised personnel, and technology and equipment. According to the World Bank (2014) and Almfraji & Almsafir (2014), FDI refers to a net inflow of investment by an investor acquiring a managerial ownership stake of 10% or more in a company operating in a foreign country. FDI is typically measured as a percentage of GDP, and its presence positively impacts the economy, while corruption is a deterrent to foreign investors (Wei, 2000; Morisset and Neso, 2002).

Corruption is defined by Ofori et al. (2015) as the exploitation of public office for personal gain, resulting in a transaction that benefits a few individuals at the expense of the majority. The World Bank defines corruption as the misuse of public power for private benefit, while Transparency International (1996) describes it as the improper and illicit enrichment of public sector personnel, including politicians and civil servants. According to the Tanzania Chamber of Commerce, Industry, and Agriculture (TCCIA,2015), corruption is characterised by a lack of integrity, involvement in bribery, and its institutionalisation or endemic nature, signifying the erosion of moral and ethical values that underpin society and reflect its highest aspirations.

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Numerous studies conducted worldwide have yielded conflicting results regarding the impact of corruption on foreign direct investment (FDI). Kersan-Skabic (2013) discovered that among various institutional factors, corruption had a significant negative influence on FDI inflows. Surprisingly, government effectiveness, rule of law, and political stability did not exhibit a significant impact on FDI inflows, despite expectations of their influential role.

In contrast, Maric and Kristina (2017) observed that in countries with strict regulations and high levels of bureaucracy, corruption could potentially alleviate barriers and expedite the investment process in the host country. Kaufmann and Wei (1999) conducted a study involving over 2000 firms and found that firms experienced lengthier negotiation periods with authorities in countries characterized by higher levels of corruption, while negotiations were shorter in countries with lower levels of corruption. Conversely, Massawe (2017) highlighted corruption as a significant obstacle to FDI inflows in many low-income countries. These findings contradict the theory of governance or institution

An example of a valuable framework for understanding the relationship between FDI and corruption is Dunning's theory of institutional factors. According to Dunning's eclectic paradigm, the location of FDI is determined by three types of advantages: ownership advantages, internalization advantages, and location advantages (Dunning, 1980). Institutional factors, falling under location advantages, play a crucial role in attracting or deterring FDI. These factors encompass the quality of governance, rule of law, political stability, and absence of corruption.

Dunning (2001) argues that countries with strong institutions and a low level of corruption are more likely to attract FDI. This is because corruption increases transaction costs, creates uncertainty, and diminishes the perceived safety of investments. Furthermore, Dunning's theory emphasizes the importance of the institutional environment in facilitating knowledge transfer and safeguarding intellectual property rights, which are pivotal for attracting FDI.

Given these contradictory findings, a lingering question remains unanswered: Does corruption attract FDI in Tanzania?

The paper is structured as follows: it begins with an introduction that provides a comprehensive and contextual overview of global issues pertaining to Foreign Direct Investment (FDI) and corruption. This section also briefly outlines the theoretical background relevant to FDI and corruption. The second part of the paper consists of a thorough theoretical review, featuring a comprehensive and critical discussion of various theories and their associated propositions or constructs. The third part of the paper focuses on the research methodology employed in the study. Subsequently, the analysis and discussion of the findings are presented, followed by the conclusion, recommendations, and implications derived from the study's results

**Literature review**

According to Grant and Osanloo (2014), research projects are guided by theoretical frameworks based on research theory and supporting a study's hypotheses. These frameworks serve as the foundation for research. Dunning's (2006) institutional factors theory serves as the underlying framework in the present study. This theory posits that the attractive institutional elements of the host nation influence foreign direct investment (FDI) inflow. The institutional components of this theory include voice and accountability (VA), political stability and lack of violence (PSV), rule of law (RL), regulatory quality (RQ), corruption control (CC), and government effectiveness (GE) (Kurul and Yalta, 2017; Kaufmann, 2010; Erkekoglu and Kilicarslan, 2016; Wernick et al., 2014). This study focuses on Corruption in Tanzania, which reflects how public power is exploited for personal gain. Indicators of corruption control, as identified by Kaufmann (2010), Erkekoglu and Kilicarslan (2016), Wernick et al. (2014), and Kurul and Yalta (2017), include perception, bribery, bureaucratic misconduct, and illegal payments to public officials.

FDI inflows are influenced by business facilitation and the institutional framework. Castro and Nunes (2013) argue that corruption impacts FDI inflows. Pupovic (2012) and Brada et al. (2012) have found a negative correlation between Corruption and FDI, suggesting that corruption reduces foreign direct investment. Corruption increases uncertainty and business costs due to the time and money spent dealing with bureaucracy, rules, and bribes. Consequently, countries with lower levels of corruption tend to attract more FDI compared to those with higher levels of Corruption (Castro and Nunes, 2013; Kurul and Yalta, 2017; Keefer and Knack, 1996; Mauro, 1995; Brada et al., 2019; Chamisa, 2020).

Additionally, corruption reduces property rights, a competitive environment, and transparency while increasing costs (Shaari et al., 2022; Al-Sadiq, 2009; Bekoe et al., 2021; Brada et al., 2012; Pupovic, 2012; Kersan-Skabic, 2013; Castro and Nunes, 2013; Quazi, 2014). However, a few studies (Bellos and Subasat, 2011; Helmy, 2013; Lestari et al., 2022) found that corruption had a statistically insignificant effect on FDI inflows. Furthermore, according to supplementary research, corruption has a positive effect on FDI inflows since it can resolve problems brought on by weak institutions and regulations (Bellos and Subasat, 2012a; Contractor et al., 2020; Bellos and Subasat, 2012b; Gutierrez, 2015; Maric & Shukarov (2017)). The economic environment is harmed by corruption, and FDI inflows are deterred (Brada et al., 2019; Wang and Swain, 1997). Researchers like Morisset and Wei (2000) concluded that corruption had a detrimental impact on capital structure and volume in addition to reducing FDI. According to Morisset (2000), corruption increases administrative costs, which lowers FDI inflow. Both Gani (2007) and Nguyen et al. (2021) concluded that some countries in Latin America and Asia benefited from greater efforts to eliminate corruption. In a different study, Alam et al. (2005) discovered that Bangladesh could not attract foreign direct investment due to its ineffectiveness in combating corruption.
Asiedu (2005) discovered that eliminating corruption had a favourable impact on FDI inflows and a negative impact on FDI flow in Africa using panel data for 22 countries between 1984 and 2000. According to Jensen (2003) and Chamisa (2020), corruption has a detrimental effect on FDI. Smith-Hilman and Omar (2005) found that FDI flowed less freely to countries with weak and corrupt administrations. Another study by Busse and Hefeker (2007) between 1984 and 2003 in 83 developing countries examined the link between political risk, corporatizations, and FDI; the results showed that corruption reduced FDI inflow. Nilsson-Hakkala et al. (2008) employed panel regression in their study on the effect of corruption on foreign direct investment (FDI) and found that corruption had a negative effect on FDI inflows. Regression analysis was used by Al-Sadig (2009) to examine how corruption affected FDI inflows in 117 countries between 1984 and 2004. He found that FDI inflows are negatively impacted by corruption. Woo (2010) examined how corruption affects FDI inflows in 90 countries between 1984 and 2004 using a panel regression model. The findings indicated that corruption had a negative impact on FDI inflows. Samini and Monfared (2011) examined how corruption affects FDI inflows in 16 countries connected to the Organisation of Islamic Cooperation between 2002 and 2008. They concluded that there was a bad association between FDI inflows and corruption.

According to Mengistu and Adhikary (2011) and Sutherland (2020), corruption was a factor in FDI location. Brada et al. (2012) looked into the connection between Corruption and FDI in 84 nations between 2000 and 2003 in a different study. They found that FDI inflows are negatively impacted by corruption. On the other hand, Popovic (2012) found that corruption had a negative impact on FDI inflows in Montenegro after using a questionnaire to assess the issue. A second study by Alemu (2012) used panel regression to examine how corruption affected FDI inflows in 16 Asian countries between 1996 and 2009 revealed that corruption negatively influences FDI inflows. Another study by Kersan-Skabic (2013) analysed institutional determinants affecting foreign direct investment in eight countries in South Eastern Europe between 2001 and 2010, and it concluded that corruption significantly affected FDI inflows. Castro and Nunes (2013) investigated the connection between Corruption and FDI inflows in 73 nations between 1998 and 2008. They discovered that FDI inflows were higher in nations with lower levels of corruption.

However, after performing studies on the topic in 14 South and Eastern Asian countries and the OECD countries, respectively, between 1995 and 2011, Quazi (2014) and Brazys & Kotsadam (2020) discovered that corruption had a negative impact on FDI inflows. In a different study, Nwanko (2013) and Nwanko (2014) asserted that corruption is a major contributor to poverty and has a negative impact on economic progress. Corruption is a concern because it increases the long-term costs of business operations and investment for both the public and commercial sectors, according to Ofori, Ato-Mensah, and Jinsheng (2015) (Azam & Haseeb, 2021). Peres, Ameer, and Xu (2018) observed that corruption is one of the most important institutional factors that deter FDI inflows, despite Yalta and Kurul's (2018) emphasis that FDI grows when corruption decreases. According to Wei (2000), Gastanaga, Nugent, and Pashamova (1998), Compos, Asiedu, and Villamil (2000), and Lien and Pradhan (1999), the majority of investor surveys revealed that corruption was one of the key institutional issues blocking FDI inflows. According to Cuerzo-Cazura, countries with lower levels of corruption have a positive correlation with investment inflows because these countries would have lower levels of corruption. He also claims that countries with higher levels of corruption receive fewer FDI inflows. According to Henisz (1998), Wei (2000), and Jensen (2003), institutional factors—particularly corruption—were among the most important determinants of multinational investment and FDI inflows.

Contrary to Bradhan's (1997) assertion that corruption had a major positive impact on FDI inflows, Bellos and Subbasat (2011) found that corruption had no statistically significant impact on FDI inflows in 15 transition economies between 1990 and 2005. FDI inflow was not significantly harmed by corruption, according to Bellos and Subbasat (2012a, 2012b), Basemera and Mutenyo (2012), and Gutierrez (2015).

In 55 nations between 1985 and 2000, Mudambi et al. (2013) researched the relationship between government legislation and corruption. They concluded that corruption had no independent impact on FDI inflows.

Helmy (2013) conducted a study on 21 Middle Eastern and North African (MENA) countries between 2003 and 2009 and concluded that corruption had minimal or no impact on foreign direct investment (FDI) inflows. Similarly, Bayar and Alakbarov (2016) examined 23 developing markets and found no statistically significant effect of reducing Corruption on FDI. Contrarily, Brada et al. (2012) explored 84 countries from 2000 to 2003 and revealed that corruption negatively affected FDI. Popovic (2012) focused on Montenegro and found that corruption had an adverse impact on FDI inflows based on a questionnaire study. Alemu (2012) investigated 16 Asian countries between 1996 and 2009 and found that corruption hindered FDI inflows. Kersan-Skabic (2013) analysed eight South and Southeast European countries from 2001 to 2010 and found a significant relationship between Corruption and FDI inflows. Castro and Nunes (2013) examined Corruption and FDI inflows in 73 countries between 1998 and 2008, revealing that countries with lower corruption levels attracted more FDI.

Quazi (2014) and Nguyen et al. (2021) studied 14 South and Eastern Asian countries from 1995 to 2011 and found that corruption had a detrimental impact on FDI. Ofori, Ato-Mensah, and Jinsheng (2015) suggested that corruption increased operating and investment costs for private and public sector businesses. Yalta and Kurul (2018) observed that FDI increased when corruption decreased, while Peres, Ameer, and Xu (2018) identified corruption as a major institutional barrier to FDI. On the other hand, some studies, including Bradhan (1997), Marie & Shukarov (2017), Bellos and Subbasat (2012a, 2012b), Basemera and Mutenyo (2012), Contractor et al. (2020), and Gutierrez (2015), found a positive correlation between Corruption and FDI inflows. However, they concluded that corruption had a negligible impact on FDI. Similarly, Mudambi et al. (2013) and Helmy (2013) found no significant
effect of Corruption on FDI inflows in 21 MENA countries between 2003 and 2009. Bayar and Alakbarov (2016) also found that reducing corruption did not affect FDI in 23 developing markets. Bellos and Subasat (2011) concluded that corruption did not significantly impact FDI inflows statistically. The existing empirical research presents inconsistent findings regarding the relationship between Corruption and FDI inflows. This inconsistency leaves a gap in the literature. To address this gap, the present study utilizes time series data from 1996 to 2021 to examine the impact of Corruption on FDI inflows into Tanzania (www.govindicators.org).

Methodology

This study chose the Multiple Linear Regression Model as the analytical framework. The regression analysis was conducted using EVIEWS 10 software. The selection of this model is supported by the works of Greene (2002) and Gujarati (2009), who argue that the Multiple Linear Regression Model is suitable for estimating the relationship between a dependent variable and one or more independent variables. The strength of the Multiple Linear Regression Model lies in its ability to capture the simultaneous influence of multiple independent variables on a dependent variable. It allows for examining the individual effects of each independent variable while controlling for the effects of other variables in the model. This helps to identify the unique contribution of each independent variable to the dependent variable.

Furthermore, the Multiple Linear Regression Model provides a framework for assessing the statistical significance of the estimated relationships. It allows researchers to test the null hypothesis of no relationship between the independent and dependent variables and determine whether the observed relationships are statistically significant. The Multiple Linear Regression Model offers a robust and widely accepted approach for analysing the relationship between variables in a quantitative research study. Its ability to handle multiple independent variables and assess their contributions makes it a valuable tool for investigating complex relationships in various research fields.

Specification of the econometric model

In this research stage, a model is formulated to provide a practical, informative, and reasonably accurate representation of the system under investigation. Several considerations must be taken into account when defining the model, such as the types of variables to be included, the number of explanatory variables needed, the required data, the feasibility of obtaining the desired data, the desired functional relationship, the expected outcomes, and the purpose of the estimated model, Greene (2002) and Gujarati (2009).

This study employs a multiple regression model to assess the relationship between foreign direct investment (FDI) and institutional factors in Tanzania. The analysis encompasses data from 1996 to 2021. To mitigate the issue of multicollinearity, subsequent regressions are conducted using the first difference approach. This technique helps alleviate the problem by reducing the correlation among the independent variables, which can otherwise lead to imprecise estimation by inflating the standard errors. Additionally, the regression equation is formulated in natural logarithm form to address the potential impact of outliers and heteroscedasticity, which can affect the reliability of the results.

The variables used in the model are sourced from reputable data providers such as the World Governance Indicators, World Bank Kaufmann (1996), and Kurul (2017). These sources ensure the reliability and credibility of the data used in the analysis. By employing a multiple regression model and considering these methodological choices, the study aims to provide valuable insights into the association between FDI and institutional factors in Tanzania. The model specification and data sources are carefully selected to enhance the findings' accuracy, robustness, and relevance.

Variables in the model have been adopted from the World Governance Indicators, the World Bank, Kaufmann (1996), and Kurul (2017). The model used for this study is well shown in the equation below: FDI is a function of institutional factors:

$$ FDI = F(CC, RL, RQ, GE, PV, VA) $$

Model one cannot be measured since it is a mere mathematical function; then, we transformed it into an econometrics model to simplify the measurement of the variables.

$$ FDI_{it} = \alpha_0 + \beta_1 CC_{it} + \beta_2 RL_{it} + \beta_3 RQ_{it} + \beta_4 GE_{it} + \beta_5 PSV_{it} + \beta_6 VA_{it} + \epsilon_t $$

Where;
- CC=Control of Corruption
- RL=Rule of Law
- RQ=Regulatory Quality
- GE=Government Effectiveness
- PSV=Political Stability
- VA=Voice and Accountability
- T=Time period,
- $\epsilon$ = Error term
- $\beta_1, \beta_2, \beta_3 ... \beta_n$=Coefficients of independent variables.
The rule of law (RLt), government effectiveness (GEt), regulatory quality (RQt), political stability and non-violence (PVt), and voice and accountability (VAt) are institutional factors that serve as control variables in the analysis. These variables represent a set of determinants for foreign direct investment (FDI) other than corruption. The selection of these control variables was influenced by the study conducted by Castro and Nunes (2013).

In the regression analysis, the sign of the coefficient (CC) for an independent variable indicates the direction of the relationship between that variable and the dependent variable (FDI). A positive coefficient implies a positive relationship, while a negative coefficient implies a negative relationship. The regression model estimates each independent variable's constant term and coefficients.

The dependent variable of interest in this analysis is FDI, which represents the value of FDI without any independent variables. The predicted partial regression coefficients, also called slope coefficients, range from 1 to 7. These coefficients measure the change in FDI when the corresponding independent variable (CC) changes by one unit, assuming all other factors remain constant. Therefore, a coefficient of 1 indicates the partial impact of a one-unit change in CC on FDI.

The natural logarithm (Ln) is used in the analysis to address concerns related to outliers. The error term (represented as an error term) accounts for unexplained variation in the model, and the variable t represents the passage of time. To address issues related to spurious regression, the time series data underwent several checks. One of these checks involved conducting a unit root test to assess the stationarity or non-stationarity of the data. This step was taken to ensure the reliability of the analysis and reduce the potential problems associated with spurious regression.

**Analysis of data and data**

This study used time series data for the institutional variable (Independent variable) that was obtained from the Kaufmannet al. 1999; govindicators.org), which is the main source of data for research on institutional factors, to analyse the impact of Corruption on FDI inflows in Tanzania. Each indicator uses a scale with values between 2.5 and +2.5; higher values denote higher institutional quality.

Time series data for FDI inflows (Dependent variable) were utilised in the study; they were collected from the Bank of Tanzania (BOT), which is also accessible online at (w.w.w.bot-tz.org).

**Unit Root Test**

The Dickey-Fuller Test was based on linear regression, in which case the Augmented Dickey-Fuller test (ADF) was used.

\[
\Delta Y_t = \alpha Y_{t-1} + \sum_{j=1}^{p} \phi_j \Delta Y_{t-j} + \varepsilon_t
\]

The Phillips-Perron (PP) Test, a modification of the Dickey-Fuller test, was applied to check and correct for autocorrelation and heteroscedasticity in error.

The economic series data are often nonstationary, suggesting that their mean does not fluctuate around their fixed mean. Whenever the stationary time series mean fluctuates around its fixed mean, the mean moves away from its fixed mean and returns quickly to the fixed mean.

Testing for unit root was undertaken to avoid "spurious regressions". Regression of nonstationary time series on another nonstationary time series gives spurious regression implying meaningless results; for this reason, the unit root test is absolutely important.

Moreover, the test for unit root is essential to know if variables in the study are integrated in the same order. When variables are integrated in the same order, I(0) means stationary time series, and its regression output will not be spurious.

**Unit Root Test Results**

After defining the model, the study conducted unit root tests for all of the variables under consideration, including government effectiveness, regulatory quality, rule of law, control of corruption, voice and accountability, political stability, and lack of violence; FDI is in natural logarithms for all other variables. The study evaluated each of these variables at the level and in the first difference after running the unit root test to determine whether they are stationary at the first difference as predicted. The Augmented Dickey-Fuller (ADF) test, which is more effective than standard Dickey-Fuller (DF) testing, was used for the research. According to Table 2 below, this study investigated unit root at the level and initial difference under three conditions: without constant and linear trend, with constant, and with constant and linear trend.
The Augmented Engle-Granger (AEG) and Johansen Co-integration tests conducted the cointegration test. The Johansen test of cointegration was used to conduct the cointegration test. The study investigates whether the variables are cointegrated after proving they are nonstationary. As previously noted or discussed, this is a crucial step in the regression analysis since it stops the study from performing pointless or erroneous regression scenarios is a cointegration test. The Johansen test of cointegration was used to conduct the cointegration test.

$$J_{max} = -T \sum_{r=1}^{\infty} \ln(1 - \lambda_r)$$

Any time series economic regression should consider cointegration analysis. These variables are cointegrated when the error term’s mean fluctuates around a fixed mean (zero mean). Variables are considered nonstationary if their order one integrated form is I(1). Variables are stationary if their order zero integration value equals I(0).

Table 2: Unit root test results at the level and first difference

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Order of integration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At Level</td>
<td></td>
</tr>
<tr>
<td>FDI</td>
<td>-0.095075 with a constant trend</td>
<td>I(1)</td>
</tr>
<tr>
<td>GE</td>
<td>-0.829047 with a constant trend</td>
<td>I(1)</td>
</tr>
<tr>
<td>RQ</td>
<td>-0.546389 with a constant trend</td>
<td>I(1)</td>
</tr>
<tr>
<td>RL</td>
<td>-0.525860 with a constant trend</td>
<td>I(1)</td>
</tr>
<tr>
<td>CC</td>
<td>-0.990298 with a constant trend</td>
<td>I(1)</td>
</tr>
<tr>
<td>VA</td>
<td>-2.520006 without a constant</td>
<td>I(1)</td>
</tr>
<tr>
<td>PV</td>
<td>-1.647288 without a constant</td>
<td>I(1)</td>
</tr>
</tbody>
</table>

First Difference

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Order of integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDI</td>
<td>-5.55956 with a constant trend</td>
<td>I(0)</td>
</tr>
<tr>
<td>GE</td>
<td>-4.731109 with a constant trend</td>
<td>I(0)</td>
</tr>
<tr>
<td>RQ</td>
<td>-4.817341 with a constant trend</td>
<td>I(0)</td>
</tr>
<tr>
<td>RL</td>
<td>-3.934138 with a constant trend</td>
<td>I(0)</td>
</tr>
<tr>
<td>CC</td>
<td>-4.472285 with a constant trend</td>
<td>I(0)</td>
</tr>
<tr>
<td>VA</td>
<td>-5.154702 without a constant</td>
<td>I(0)</td>
</tr>
<tr>
<td>PV</td>
<td>-4.552371 without a constant</td>
<td>I(0)</td>
</tr>
</tbody>
</table>

Source: Researcher's, 2023

Without a pattern or constant, 1%, 5%, and 10% were used as the test critical values, with a constant: 1%, 5%, and 10% are the test critical values, with constant and trend: 3 crucial test values: 1, 5, and 10 percent. Notes: Variables are nonstationary if their order one integrated form is I(1). Variables are stationary if their order zero integration value equals I(0).

Since the computed absolute values of tau statistics do not exceed the critical tau values of 2.86154, the unit root test at level reveals that all variables are nonstationary and are integrated of order one. On the other hand, because the computed values of the tau statistics surpass the critical tau values, all variables at the initial difference are stationary as such and are integrated of order zero I(0). Consequently, the proposed model has been properly formulated.

Test for Cointegration

The study investigates whether the variables are cointegrated after proving they are nonstationary. As previously noted or discussed, this is a crucial step in the regression analysis since it stops the study from performing pointless or erroneous regression scenarios is a cointegration test. The Johansen test of cointegration was used to conduct the cointegration test. The Johansen test of cointegration was used to conduct the cointegration test. The Johansen test of cointegration was used to conduct the cointegration test.

$$J_{max} = -T \sum_{r=1}^{\infty} \ln(1 - \lambda_r)$$

Any time series economic regression should consider cointegration analysis. These variables are cointegrated when the error term’s mean fluctuates around a fixed mean (zero mean). Variables are considered nonstationary if their order one integrated form is I(1), as they are not cointegrated. Long-run equilibrium refers to the tendency of cointegration variables to move in tandem (Gujarat 2009; Greene, 2003; Watson and Teelucksingh, 2002). Only when the variables involved in the regression are "integrated of order zero" do model estimation and hypothesis testing using the Ordinary Least Square (OLS) approach become feasible. Macroeconomic time series data are typically nonstationary, meaning they are 'integrated of order one' and that linear combination 'violates the essential requirements for OLS estimation.' The Augmented Engle-Granger (AEG) and Johansen Co-integration tests conducted the cointegration test.

The Augmented Engle-Granger (AEG) test operated in accordance with two protocols. The first phase used ordinary least squares to do cointegration regression on nonstationary variables at the level and integrated of order one (1). The second stage was employing the unit root approach, Dickey-Fuller or Augmented Dickey-Fuller (ADF), to assess the residuals from step one's cointegrating regression. The null hypothesis of no cointegration was rejected once the regression residuals had become stable. However, the investigation would not disprove the null hypothesis that the variables were not cointegrated if they were nonstationary (Granger, 1986; Granger and Engle, 1987).
Cointegrating regression equation:

$$F_{DIt} = \alpha_0 + \beta_1 CC_{it} + \beta_2 RL_{it} + \beta_3 RQ_{it} + \beta_4 GE_{it} + \beta_5 PSV_{it} + \beta_6 V_{Ai} + \epsilon_t$$

Residual estimation equation:

$$\Delta U_t = \alpha U_{t-1} + \epsilon_t$$

H0: \(\alpha1=0\); no cointegration (unit root), Variables are not cointegrated
H1: \(\alpha1 \neq 0\); Co integrated (no unit root, variables are cointegrated.

Decision Criteria:

Rejecting H0 implies residuals are stationary. If the regression residuals are stationary, then included variable must be cointegrated (Zivot, 2012; Gujarati, 2009). Therefore, where residuals of equation (4) are stationary, then cointegrating regression in step one is not meaning less (spurious) even if variables individually are nonstationary (Granger and Engle, 1987, Gujarati, 2009).

Moreover, given that this study has cross-checked or gone through the residuals from cointegration regression 'integrated of order zero' meaning 'stationary' thus, the normal regression technique, which includes the t statistic and F statistic test, are valid in data that are also nonstationary. Engle and Granger (1987) held or alleged that the valuable contribution of the concept of unit and cointegration is to force us to find out if the regression residuals are stationary. According to Gujarati (2009), a cointegration test can be considered a pre-test to avoid spurious or meaningless regression situations. Equation (4) in step one is called cointegrating regression, whereas \(\alpha’s\) are called integrating parameters.

The Johansen Cointegration Test;

Furthermore, the Johansen method (1988) can be utilized to assess the "long run and short run" parameters through the utilization of Ordinary Least Square (OLS) estimators. When testing for cointegrating "r" rank, it is common for Johansen (1988) to estimate the cointegration among the variables based on rank. It is assumed that the parameter \(\beta\) has a clear rank of \(r\).

$$\varphi_r + 1 = \varphi_1 + 2 = \ldots \varphi_p = 0$$

Where \(\varphi\) is the population parameter associated with \(\varphi_1\). If \(\varphi_1 = 0\) then \(r=0\).

Therefore, there are no integrating vectors. If \(\varphi2=0\) and \(\varphi1\neq0\), then \(r=1\). Therefore 'one cointegrating vector' is obtained. Hence the process of testing goes on and on.

If the test,

$$H_0 = \varphi_1 = 0$$

$$H_1 = \varphi_1 \neq 0$$

For \(i = r + 1, r + 2\)

Johansen proposes a test based on the trace statistics; the computation applies the following formula:

$$\text{Trace} = -T \sum_{i=r+1}^{p} \ln (1 - \tilde{\varphi}_i)$$

Moreover, Johansen proposes another test called the 'Maximum eigenvalue' statistic to determine the cointegrating vectors among variables. The computation is based on the following formula:

$$\text{LRMAX} = -t \ln (1 - \tilde{\varphi}_1)$$

The largest eigenvalue under the Johansen method (1988) is denoted as \(\tilde{\varphi}\). Johansen (1988) developed the distribution of the two statistics under the null hypothesis that \(r\) represents the cointegrating rank. Additionally, Osterwald-Lenum (1992), as cited in Watson and Teelucksingh (2002), computed the critical values at various significance levels through simulation methods.

It is worth noting that Osterwald-Lenum (1992) provides only two critical values, namely one percent (1%) and five percent (5%), which are available in EViews 10 (Watson and Teelucksingh, 2002: 270-271). This study benefits from using EViews 10 to compute cointegration using the Johansen method (1988), as it allows access to these critical values. Consequently, the Johansen (1988) cointegration test yields two sets of results: one based on trace statistics and the other based on the maximum eigenvalue statistic. This test is considered one of the most powerful tests for cointegration compared to other competing methods. Numerous tests have been conducted and have established that the variables under examination are indeed cointegrated.

In the present study, the estimation of short-run coefficients is conducted based on the assumption that the equation is stationary. However, it is crucial to acknowledge that estimating long-run coefficients may precede the computation of short-run coefficients (Granger and Engle, 1987). Regression residuals must be cointegrated to estimate long-run coefficients using variables at the level. 

210
Failure to meet this condition may result in spurious outcomes in the regression analysis (Granger and Engle, 1987; Gujarati, 2009; and Utkulu, 2012).

Once it was confirmed through several tests that the variables under examination were cointegrated, it became evident that an error correction model (ECM) could be formulated to be incorporated into the regression equation, considering that the variables were integrated of order I(0). Including an error correction term in the short-run behavior is essential because the short-run behavior is expected to be disequilibrium. Thus, the error term links the short-run dynamics to their long-run values, making the regression analysis meaningful by incorporating information about the long run (Granger and Engle, 1987; Watson and Teelucksingh, 2002; Gujarati, 2009). Consequently, to derive the short-run equation (equation 6), the study transforms equation (5) into the first difference, considering the presence of the error correction term.

\[ \Delta \ln FDI_t = \alpha_0 + \alpha_1 \Delta CC_t + \alpha_2 \Delta RL_t + \alpha_3 \Delta GE_t + \alpha_4 \Delta PV_t + \alpha_5 \Delta VA_t + \epsilon_t \]

### Findings and Discussions

#### Descriptive Statistics

The Foreign Direct Investment (FDI) analysis reveals a small difference between the maximum and minimum values, while the mean and median values are nearly identical. Additionally, the standard deviation for FDI is small (0.241170), and both the skewness (0.531923) and kurtosis (2.16641) fall within the recommended range. The distribution of FDI is considered normal due to its low skewness and kurtosis values, making the regression analysis meaningful.

Regarding the Control of Corruption (CC) variable, there is a notable difference between the maximum and minimum values, whereas the mean and median values exhibit a small disparity. Nevertheless, the distribution of CC is also considered normal due to its low standard deviation (0.241170) and the fact that both skewness (0.531923) and kurtosis (2.16641) fall within the recommended range of -2 and +2, as recommended by Hair et al. (2014) and Evans (2017). These characteristics indicate a normal distribution for FDI.

#### Table 1: Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>LNFDI</th>
<th>GE</th>
<th>RQ</th>
<th>RL</th>
<th>CC</th>
<th>VA</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>6.393636</td>
<td>-0.503000</td>
<td>-0.403500</td>
<td>-0.351000</td>
<td>-0.725000</td>
<td>-0.351000</td>
<td>-0.415500</td>
</tr>
<tr>
<td>Median</td>
<td>6.197110</td>
<td>-0.450000</td>
<td>-0.405000</td>
<td>-0.375000</td>
<td>-0.785000</td>
<td>-0.280000</td>
<td>-0.445000</td>
</tr>
<tr>
<td>Maximum</td>
<td>7.664300</td>
<td>-0.340000</td>
<td>-0.250000</td>
<td>0.390000</td>
<td>-0.220000</td>
<td>-0.130000</td>
<td>-0.020000</td>
</tr>
<tr>
<td>Minimum</td>
<td>5.001258</td>
<td>-0.730000</td>
<td>-0.560000</td>
<td>-0.550000</td>
<td>-1.030000</td>
<td>-0.740000</td>
<td>-0.850000</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.850285</td>
<td>0.127696</td>
<td>0.070208</td>
<td>0.196627</td>
<td>0.241170</td>
<td>0.204139</td>
<td>0.252680</td>
</tr>
<tr>
<td>Skewness</td>
<td>-0.032217</td>
<td>-0.435545</td>
<td>-0.076888</td>
<td>2.732117</td>
<td>0.531923</td>
<td>-0.570080</td>
<td>0.002887</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>1.880635</td>
<td>1.665310</td>
<td>3.343749</td>
<td>11.33487</td>
<td>2.732117</td>
<td>0.531923</td>
<td>-0.570080</td>
</tr>
</tbody>
</table>

Source: Researcher's 2023

### Cointegration Test Results

This study section utilized two primary cointegration tests: the Johansen cointegration test and the Engle-Granger Residuals (EG) or Augmented Engle-Granger residuals (AEG) cointegration test.

#### Results of the Johansen Cointegration Test

After establishing that all variables exhibit non-stationarity at the level but stationarity at the first difference, the study proceeded to estimate the Johansen cointegration test. The empirical findings indicate the presence of cointegration among the variables. The trace statistic, which is a robust test, confirms the existence of five cointegrating equations at the 0.05 critical level. Similarly, the Max-Eigen statistic test reveals the presence of three cointegrating equations at the 0.05 critical level.
Table 2: Johansen Cointegration Test Result

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Trace Statistic</th>
<th>0.05 P-values</th>
<th>Rank Test (Maximum Eigenvalue)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hypothesized No. of CE(s)</td>
</tr>
<tr>
<td>None *</td>
<td>117.5269</td>
<td>69.81889</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 1*</td>
<td>74.74299</td>
<td>47.85613</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 2*</td>
<td>42.49624</td>
<td>29.79707</td>
<td>0.0010</td>
</tr>
<tr>
<td>At most 3 *</td>
<td>16.16727</td>
<td>15.49471</td>
<td>0.0396</td>
</tr>
<tr>
<td>At most 4*</td>
<td>4.913990</td>
<td>3.841466</td>
<td>0.0266</td>
</tr>
</tbody>
</table>

Source: Researcher's, 2023

Note: The trace test indicates there are five cointegrating equations at the 0.05 critical levels whereas the Max-Eigen statistic test indicates three cointegrating equations at the 0.05 critical levels. * denotes rejection of the hypothesis at the 0.05 critical level under MacKinnon-Haug-Michelis’s (1999) p-values.

Engle-Granger Residuals (EG) or Augmented Engle–Granger residuals (AEG) cointegration Results

Similarly, the study estimates the Engle-Granger residuals cointegration test using the Augmented Dickey-Fuller tests. Findings reveal that the computed value of the tau statistic (-4.251410) in absolute value exceeds the Engle–Granger critical tau values (-2.86154) at a 5 percent level (MacKinnon, 2010) then the study rejected the null hypothesis means residuals are stationary and variables are cointegrated. Since the tau statistic obtained is (-4.251410) and is significant at a 5 percent significance level. Thus, research concludes that the regression outputs obtained in nonstationary variables (at level) are no longer spurious as such the empirical results representing the long-run relationships amongst the variable see Table 3 below

Table 3: Engle-Granger Residuals (EG) or Augmented Engle–Granger residuals (AEG) cointegration Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>61.08873</td>
<td>81.13557</td>
<td>0.752922</td>
<td>0.4618</td>
</tr>
<tr>
<td>RESID02</td>
<td>-0.820093</td>
<td>0.192899</td>
<td>-4.251410</td>
<td>0.0005</td>
</tr>
</tbody>
</table>

Source: Researcher's, 2023

Discussion

The present study utilised time series data to investigate the influence of the Control of Corruption (CC) variable on the inflow of Foreign Direct Investment (FDI) in Tanzania. Both long-run and short-run coefficients were examined to assess the impact. The statistical analysis revealed that the CC variable exhibited statistical significance at a 5% significance level in the long run, with a negative coefficient of -1.567183 in the following table 4.

Table 4: Long Run Coefficients Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>8.339260</td>
<td>0.821610</td>
<td>10.14990</td>
<td>0.0000</td>
</tr>
<tr>
<td>GE</td>
<td>-0.345463</td>
<td>0.887772</td>
<td>-0.389135</td>
<td>0.7035</td>
</tr>
<tr>
<td>RQ</td>
<td>3.746330</td>
<td>1.268678</td>
<td>2.957135</td>
<td>0.0111</td>
</tr>
<tr>
<td>RL</td>
<td>0.111570</td>
<td>0.554516</td>
<td>0.201202</td>
<td>0.8437</td>
</tr>
<tr>
<td>CC</td>
<td>-1.567183</td>
<td>0.601616</td>
<td>-2.604956</td>
<td>0.0218</td>
</tr>
<tr>
<td>VA</td>
<td>4.426003</td>
<td>0.702916</td>
<td>6.296633</td>
<td>0.0000</td>
</tr>
<tr>
<td>PSV</td>
<td>0.364062</td>
<td>0.411848</td>
<td>0.883970</td>
<td>0.3928</td>
</tr>
</tbody>
</table>

Adjusted R-squared: 0.560861
These findings indicate that corruption has an adverse effect on FDI inflows, discouraging or reducing the amount of FDI entering Tanzania. Furthermore, the short-term analysis demonstrated a strong negative impact of CC on FDI inflows (-1.567183) in Table 5. Therefore, CC exerts a comparable influence in both the short and long terms, negatively affecting the influx of FDI in Tanzania. This effect is substantial.

Table 5: Short Run Coefficients Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DGE</td>
<td>-0.556387</td>
<td>1.303899</td>
<td>-0.426711</td>
<td>0.6771</td>
</tr>
<tr>
<td>DRQ</td>
<td>4.501375</td>
<td>1.346486</td>
<td>3.343054</td>
<td>0.0059</td>
</tr>
<tr>
<td>DRL</td>
<td>0.135295</td>
<td>0.344103</td>
<td>0.393183</td>
<td>0.7011</td>
</tr>
<tr>
<td>DCC</td>
<td>-1.683905</td>
<td>0.761992</td>
<td>-2.209873</td>
<td>0.0473</td>
</tr>
<tr>
<td>DVA</td>
<td>3.743725</td>
<td>1.441352</td>
<td>2.597370</td>
<td>0.0233</td>
</tr>
<tr>
<td>DPSV</td>
<td>0.546887</td>
<td>0.335215</td>
<td>1.631450</td>
<td>0.1287</td>
</tr>
<tr>
<td>ECT-1</td>
<td>-0.911184</td>
<td>0.348217</td>
<td>-2.616713</td>
<td>0.0225</td>
</tr>
</tbody>
</table>

DGE=Government effectiveness  
DGQ=Regulatory effectiveness  
DPV=Political stability and Non-Violence  
DVA=Voice and Accountability  
DPSV=Political stability and absence of violence  
DRQ=Regulatory quality

These findings are consistent with prior research conducted by Brada et al. (2012), who examined 84 countries from 2000 to 2003 and observed a negative relationship between Corruption and FDI inflows. Similarly, Pupovic (2012) conducted a study in Montenegro and found a significant negative impact of Corruption on FDI inflows. Several other studies, including those by Ameer and Xu (2018), Kersan-Skabic (2013), Nwanko (2013, 2014), and Quazi (2014), have also demonstrated the detrimental effects of Corruption on FDI inflows. Collectively, these findings suggest that countries with higher levels of corruption are likely to experience a decrease in FDI inflows, while efforts to reduce corruption are likely to attract more FDI.

Conclusion

The current study aimed to investigate the impact of corruption control (CC) on foreign direct investment (FDI) inflows in Tanzania. The findings of this study have important theoretical implications for understanding the relationship between Corruption and FDI. The results indicate that corruption has a negative effect on FDI inflows, suggesting that corruption acts as a deterrent and reduces FDI inflows in Tanzania. These findings contribute to the existing literature by providing empirical evidence of the detrimental impact of Corruption on FDI inflows in the context of Tanzania.

The theoretical implications of these findings are significant. The negative relationship between Corruption and FDI inflows supports the argument that corruption creates an unfavorable business environment that hampers foreign investment. The study’s findings align with the theoretical framework that posits corruption as a barrier to economic development and foreign investment. Theoretically, countries with lower levels of corruption are expected to attract more FDI due to a more conducive business environment. Therefore, the study highlights the importance of reducing corruption levels in Tanzania to enhance its attractiveness to foreign investors.

Moreover, the contradictory results of this study compared to some earlier studies, such as those conducted by Kersan-Skabic (2013), Nwanko (2013), and Quazi (2014), have theoretical implications. These inconsistencies suggest that the relationship between Corruption and FDI inflows may vary across different contexts and periods. Further research is needed to explore the underlying mechanisms and contextual factors contributing to these divergent findings. This study opens the door for future research to investigate the relationship between Corruption and FDI inflows in Tanzania and other countries, particularly in the East African region, to gain a more comprehensive understanding of this complex relationship.

In conclusion, this study’s findings provide theoretical implications by demonstrating the detrimental impact of Corruption on FDI inflows in Tanzania. The results support the notion that reducing corruption is crucial for attracting more FDI. Compared to earlier studies, the contradictory findings call for further research to explore the contextual factors that influence the corruption-FDI relationship. This study contributes to the theoretical understanding of the relationship between corruption and FDI inflows and provides a basis for future research in Tanzania and other similar contexts.

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All authors have read and agreed to the published version of the manuscript. 

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to restrictions.

Conflicts of Interest: The authors declare no conflict of interest.

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215

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