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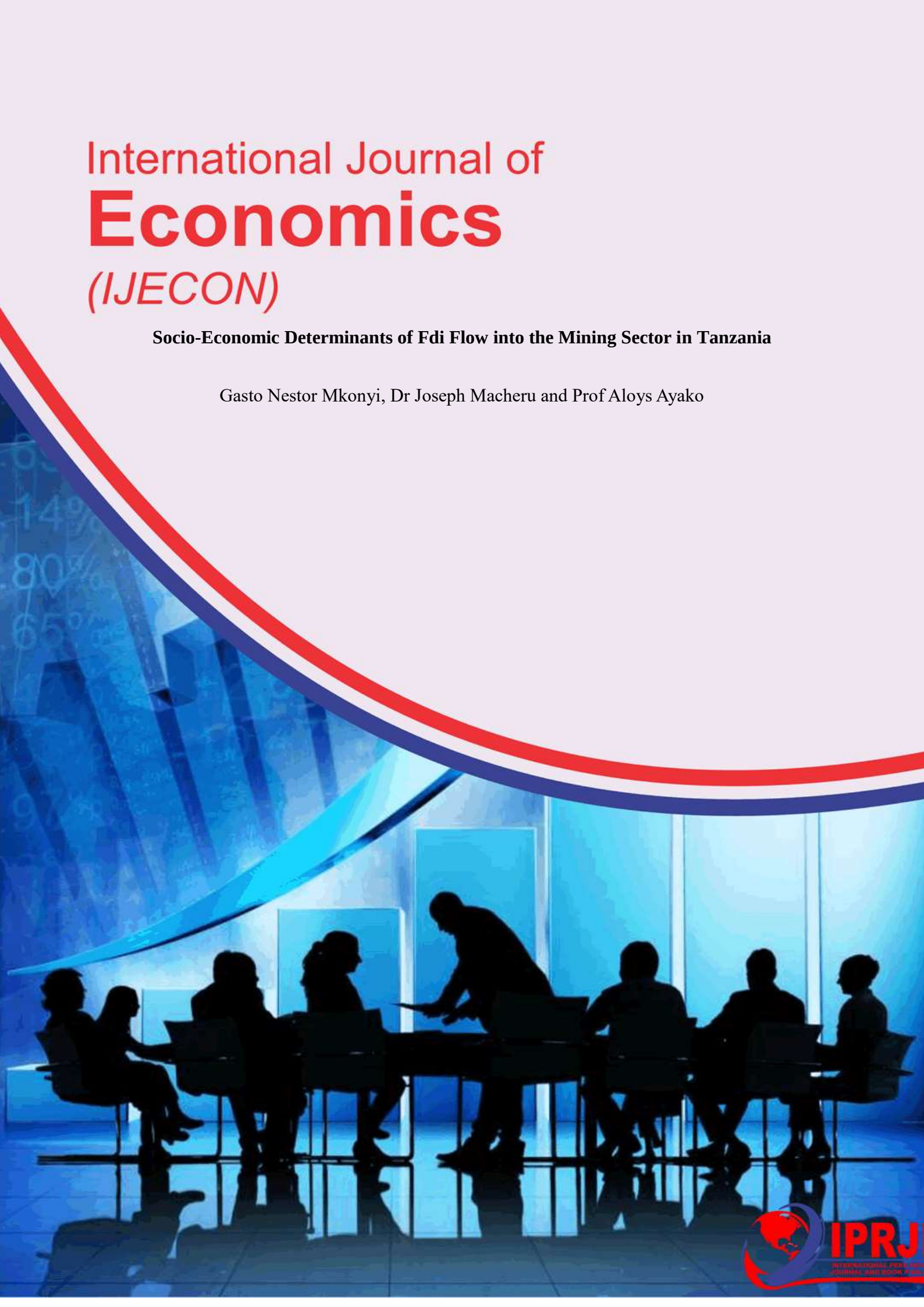

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Socio-Economic Determinants of Fdi Flow into the Mining Sector in Tanzania

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Abstract

Purpose: Tanzania is one of the mineral-rich countries giving corporate income tax (CIT) concessions to encourage foreign direct investment (FDI). Tanzania's mining industry remains enticing to investors, owing to its expanding diversity. The study's overarching objective is to evaluate the effects of the socio-economic drivers of foreign direct investment in the Mining Sector in Tanzania. The paper also sought to analyse the impact of the determinants of FDI namely, Corporate income tax, Total Reseves, Natural Resource Endowment, Human capital and Infrastructure on FDI inflow in the mining sector.

Methodology: The study utilized secondary annual time series data collected from World Bank (WB), Bank of Tanzania (BOT), and Foundation for studies and Research on International Development (FERDI). The Autoregressive Distribution of Lags (Ardl) estimating approach was used to analyse the short run and long run relationship between FDI and corporate income tax as well as aforementioned variables.

Findings: The results drawn from the ARDL analysis show that corporate income tax is statistically significant in the longrun, total reserves and natural resource endowment have a significant impact on FDI inflows, while human capital quality is not statistically significant in both short run and long run. Lastly, Infrastructure was found to have short-run effects but no long-run effects on FDI inflow in the mining sector.

Unique Contribution to Theory, Practice and Policy: The study adopts the Eclectic paradigm as its anchoring theory, which is a well-established framework for understanding FDI motivations. By applying this theoretical framework, the study contributes to the existing literature on FDI by demonstrating how various factors, such as corporate income tax, total reserves, natural resource endowment, human capital quality, and infrastructure, influence FDI inflows in the mining sector. The empirical evidence enriches the understanding of the determinants of FDI in Tanzania's mining sector, providing a basis for further research and theoretical advancements. Practically, the study offers valuable recommendations to Tanzania's government on policy measures to encourage FDI inflows into the mining industry. By focusing on maintaining competitive tax rates, managing risks through adequate reserves, investing in relevant human capital training, and improving infrastructure quality, Tanzania can create a more enticing investment climate, attract more foreign investors, and foster sustainable economic growth in its mining sector.

Keywords: *Mining Sector, FDI Determinants, ARDL*

INTRODUCTION

Foreign Direct Investments (FDIs), as demarcated by the International Monetary Fund (IMF), are investments outside of the country where the investor owns more than 10% of the stock (UNCTAD, 2002). FDIs are investments made by multinational firms in entities under foreign control, such as subsidiaries or affiliates. This demonstrates that the investor has substantial control over the organization's administration in the destination nation (FoEh et al., 2020). MNEs participate in FDI projects for a variety of strategic factors. Four primary elements influence foreign direct investment (FDI): Markets, assets, natural resources, and efficiency-seeking. Ownership enables a company to take full advantage of its competitive advantages abroad. Exploiting geographical advantages globally is part of location advantages (e.g., supply of human capital or natural resources). Only the most productive businesses can make international investments, so high productivity is essential. Accessibility of company benefits that are crucial to the company's production and challenging to transfer to outside parties, as well as a relatively strong market position in the home nation, are other criteria to take into account (Jayarah & Adewele, 2013) (Senkuku & Gharleghi, 2015).

The mining sector in Africa is a vital contributor to the continent's economy, with abundant mineral resources fueling economic growth and development. Countries in East Africa, including Tanzania, possess significant mineral wealth, attracting both domestic and foreign investments and making the mining sector a crucial source of foreign direct investment (FDI). The mining sector in Tanzania has experienced remarkable growth since 1990, with significant potential due to abundant natural resources like gold, diamonds, and nickel. This potential has attracted foreign investors to the sector, leading to a notable surge in FDI inflow over the years (Bouterige et al., 2020).

Tanzania's government enacted economic reforms in the 1990s to attract foreign investment, including in the mining sector. The introduction of a mining code in 1997 provided a stable and predictable legal framework for investors, leading to an increase in FDI inflows. However, the sector faced challenges in the following years, such as changes in mining legislation and resource nationalism, which negatively impacted FDI inflows (Woodroffe et al., 2017).

Despite challenges, Tanzania's mining sector continued to grow steadily, contributing significantly to the country's GDP and export earnings. Gold remains the leading mineral produced, attracting the lion's share of FDI, but there is increasing interest in other minerals like nickel, copper, and coal. The sector has also invested heavily in infrastructure and has embraced sustainable mining practices, technological integration, and local content development to boost efficiency, productivity, and job opportunities. Several foreign companies, including AngloGold Ashanti, Barrick Gold Corporation, and Acacia Mining, have made substantial investments in Tanzania's mining sector, with a focus on gold mining. Tanzania's government has provided various FDI promotion incentives, such as tax holidays, capital allowances, VAT exemptions, and import duty exemptions, to attract and retain foreign investors. (Casey, 2019; Emel et al., 2012).

In recent years, the trend in FDI promotion incentives has been towards greater liberalization, simplification of investment procedures, and increased marketing efforts to attract foreign investment. However, changes in laws and regulations have created uncertainty for investors. Despite this, the mining sector's growth potential and the government's efforts to enhance the investment climate suggest that Tanzania's mining sector will continue to be an important destination for FDI inflow.

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The Determinants of FDI Inflow in the Mining

The determinants of Foreign Direct Investment (FDI) inflow in Tanzania's mining sector are multifaceted and influenced by various factors. One crucial aspect is the Corporate Income Tax Policy, which can have a significant impact on FDI inflows. Changes in tax legislation, such as increased royalty rates and more government control, can deter foreign investors from the mining sector. Tax planning also plays a role as foreign investors seek to minimize their tax liabilities (Asih, 2020; Magai & Márquez-Velázquez, 2011; Petro, 2009).

Moreover, total reserves which comprises of foreign exchange and gold reserves, can affect FDI inflows indirectly. High foreign reserves signal economic stability and confidence, attracting foreign investors, especially when the mining sector contributes significantly to export earnings (Hossain, 2021; IMF, 2016; Tocar, 2018). Additionally, the presence of abundant natural resources, such as gold, diamonds, and natural gas, makes Tanzania an attractive destination for FDI in the mining sector. However, the management and utilization of these resources are crucial to avoid the "resource curse" and ensure sustainable economic benefits (Magai & Márquez-Velázquez, 2011).

Human capital, particularly skilled workers, is essential for the mining sector development. Tanzania's education and training policies have aimed to improve human capital, but there is still a shortage of skilled personnel, leading to companies relying on expatriates to fill key roles. Lastly, it is worth mentioning that, Infrastructure development is vital for the mining industry, especially in remote areas with limited infrastructure. The government's efforts to modernize infrastructure, such as roads, ports, railways, and telecommunications, can improve the attractiveness of the mining sector to foreign investors (Majer, 2014; OECD, 2002; Unctad, 2018).

In conclusion, a combination of factors, including tax policies, reserves, natural resource endowment, human capital, and infrastructure development, collectively influence FDI inflow in Tanzania's mining sector. To attract more FDI, the government needs to strike a balance between providing incentives for investors and ensuring that the country benefits from its valuable mineral resources sustainably.

Statement of the Problem

One of the major problems facing the mining sector FDI flows in Tanzania is the inconsistency in policy and regulatory frameworks. The government of Tanzania has been criticized for

frequently changing its tax policies and regulations, which can create uncertainty and discourage foreign investors (Oecd, 2013). As previously stated, the government has been introducing significant changes to mining laws that increased the tax burden to the mining companies. These changes led to a decline in FDI inflows and caused concerns among investors about the stability of the investment climate.

According to the Bank of Tanzania, the country's foreign exchange reserves were estimated to be around $5.2 billion as of September 2021. The mining sector contributes significantly to the country's foreign exchange reserves, accounting for a significant portion of Tanzania's exports and generating significant revenue in foreign currency. However, Tanzania's mining sector has faced challenges in recent years, including a decline in foreign investment due to changes in the country's regulatory environment and the disputes with mining companies. These challenges have put a strain on Tanzania's foreign exchange reserves, emphasizing the importance of effective management of these reserves.

Furthermore, Tanzania has also faced challenges with infrastructure development, particularly in remote mining areas. Inadequate infrastructure can increase the cost of doing business, reduce the competitiveness of Tanzanian minerals in the global market, and discourage foreign investors from entering the market. Tanzania has also experienced shortcomings of skill development and the availability of qualified human capital. Foreign mining companies generally bring experienced employees and technology, constraining local prospects and producing social and economic problems such as unemployment and inequality. This paper aims to evaluate the effects of the socio-economic drivers of FDI in the Mining Sector in Tanzania.

LITERATURE REVIEW

Theoretical Review

Neoclassical Investment Theory

This theory began its development by Jorgenson (1963) and further developed by Tobin (1969). When considering how taxes affect investment, neoclassical investment theory is likely to be the most frequently mentioned. It should be noted that the theory tries to account for all sorts of investments, not simple domestic investments. However, because of the link between recipient nations and FDI, the Neoclassical investment theory has been adopted in explaining FDI.

According to neoclassical investment theory, maximizing a company's market value is its main goal hence, a company must always maximize profit, both now and in the future. The difference between income and costs is referred to as profit, Costs include all expenses associated with producing outputs, such as taxes and levies, the cost of current assets (manufacturing equipment and machinery), and human capital expenses. As a result, a profitable investment is one in which the current value of projected impending income outweighs the expenses.

According to neoclassical investment theory, an organization's investments are determined by its real revenue and cost of capital. Taxation affects investment by influencing the cost of capital (Obradović, 2017). The cost of capital, according to Auerbach (1983), is the cost of utilizing assets over a specific period. It takes into consideration both direct expenses such as asset pricing and taxes, as well as the potential cost of foregoing other investments. The annual return on investment that investors are expected to get is frequently stated as the cost of capital percentage (Harrington & Grabowski, 2014; Rosen & Gayer, 2014).

Consequently, the cost of capital is the lowest rate of return required for an investment to become sustainable (Federici & Parisi, 2015). Three variables, affect the cost of capital: finance costs, tax laws, and asset depreciation. Depreciation is the expense of assets losing value over time as a result of being used. It also includes any profits or losses resulting from a rise or reduction in the asset's market value.

The cost of financing is connected to the funding source for the asset, and it is the component of the cost of capital. When financing an asset with loans, the company must pay interest to the lenders. This is referred to as the cost of financing. The opportunity cost of not earning interest on the money put in the bank is the cost of financing if the asset is funded with cash on hand.

Finally, because a company must pay income tax on its profits, tax regulations impact the cost of capital. To be more specific, Corporate Income Tax lowers net profit and raises the cost of capital. The following equation can be used to illustrate the cost of capital in its most basic form (Rosen & Gayer, 2014):

$$C = \frac{r + \delta}{(1 + \theta) + (1 + t)}$$

where C stands for capital costs, r for finance costs, δ for depreciation rates, θ for CIT rates, and t for individual income tax rates. Equation 2.1 demonstrates the relationship between an increased tax rate and an increased cost of capital. A higher tax rate will raise the cost of capital, all else being equal because it affects the denominator. Increasing corporate and individual income tax rates necessitate a higher return rate to entice investors to invest. Tax policies that reduce the cost of capital encourage investment as well. According to this theory, governments frequently use tax laws to encourage investment, mainly when tax breaks are in effect to lower the cost of capital.

O-L-I Theory

Various factors, such as government laws and asymmetric information, may influence market pricing, making it difficult to predict. As a result, more recent FDI theories are established on inaccurate market assumptions, arguing that FDI arises due to market imperfections. Market imperfections such as risk, uncertainty, and asymmetric information, according to Homer (1976), can considerably influence businesses' investment behaviour. Consequently, when a company invests overseas, it must have certain benefits that outweigh the drawbacks of investing at home. Hymer's hypothesis set the groundwork for several subsequent FDI theories, incorporating Dunning's OLI paradigm or the eclectic paradigm (J. H. Dunning, 1998, 2016).

According to Hymer (1976), firms must have special advantages to engage in cross-border economic operations. According to Dunning (1977), since these advantages are exceptional and unique to the companies, competitors find it difficult to replicate them. Each country's factor endowments differ, so a company will choose the best location for its investment (J. H. Dunning, 1977; Hymer, 1976).

Referring to Dunning (2000), the four main reasons a company enters a foreign market are market seeking, efficiency-seeking, resource seeking, and strategic asset seeking (Srun, 2019). When the goal of the FDI incentive is to expand into new markets or satisfy the demand of global markets, market seeking occurs. Resource-seeking FDI occurs when MNEs attempt to access certain materials in the receiving nation, such as agriculture goods and mineral wealth. Strategic asset seeking is the process through which an FDI seeks to increase present ownership advantages through the acquisition of strategic assets. Efficiency-seeking FDI is defined as FDI

that attempts to increase MNEs' overall efficiency by utilizing regional disparities in factor endowments, such as through production fragmentation. As a result, each FDI rationale requires a unique combination of geographical benefits (S. M. Lundan, 2017). As a result, the comparative benefits of each site will vary depending on the company.

The next concern for MNEs is how to effectively use the Ownership and Location benefits that they have. Export, franchising, licensing, and FDI are some choices accessible to service the markets. In this situation, FDI will only occur if the firm believes that keeping the O and L benefits within the firm's limits is preferable to entering into a binding contract with other parties (S. Lundan, 2010). In a different context, FDI occurs when internalizing cross-border activities within a firm's hierarchies offer advantages over entry modes. MNEs can lower their high Internalizing the market reduces expenses such as commissions and levies imposed by host governments (Asih, 2020; Rugman, 2006). Additionally, transacting with external parties may include a lot of risk and uncertainty, including the potential for unfair selection or contract violations. Internalisation is also required to guarantee complete control over the company's competitive advantages, notably intangible assets like as marketing strategy and unique technologies (Qian & Delios, 2008). As a result, MNEs are more motivated to internalize the market if there is a greater Ownership advantage.

When it comes to taxation and FDI, geographical benefits that a firm may consider when making FDI decisions are a result of fiscal policies laid down by the host nation. Low corporate tax rates and tax incentives, for example, can boost profitability and attract investment (Bellak & Leibrecht, 2009). Furthermore, among the motives for internalization, there is a probable transfer pricing advantage, and tax policy may influence internalization decision-making (J. Dunning & Lundan, 2008). By adjusting the pricing of intra-firm transactions, multinational enterprises can transfer profits across borders and reduce their global tax burden.

Gravity Model

This notion has been widely used in FDI research. The hypothesis was largely influenced by Newton's gravitational law, which stipulates that forces of attraction between two particles vary with their magnitude and distance from one other (Adam & Chaudhry, 2014). Tinbergen (1962), claims when adopting this model to explain international trade, flow among nations is relative to the magnitude of their economies and inversely proportionate on a location basis. Gravity theory has been criticized for lacking a theoretical basis (Tinbergen, 1962).

The increased popularity of the gravity theory is a result of scholars being able to connect it to trade theories, including those of Bergstrand (1990), and Eaton and Kortum (2002). Because of the theory's accuracy in predicting trade flows, this theory has been applied in a variety of economic fields, including regional economics and international trade analyses. According to gravity theory on FDI research, trade streams are impacted by the magnitude of the host and home nations, as well as the distance between them (Bergstrand, 1990; Eaton & Kortum, 2002; Ghosh, 2011).

In this situation, the compromise between closeness and specialization results in FDI. If a corporation is willing to set up manufacturing facilities in other nations to relocate output away from one location and closer to its consumers, only under specific conditions can FDI occur. According to this theory, distance acts as a stand-in for transportation costs, hence the more apart two markets are from one another, the greater the incentive for FDI since businesses may be able to save money on costly trade charges (Loungani et al., 2002). However, prior research has found a negative association between distance and FDI, suggesting that distance may

reflect information costs rather than transportation costs, which hinders FDI flows. As a result, the gravity model frequently uses distance as a gauge of economic friction between home and host countries, taking into account factors like taxation (Bergstrand & Egger, 2011).

The Internalization Theory

The existence of the firm is explained by internalization theory because this method of coordinating a group of businesses is more structured than market exchange. When a company can occupy a market, it expands, and it will do so even if drawbacks offset advantages. To support the location of businesses and their relative success, this theory links to trade and innovation principles. It has proven to be primarily helpful in explaining the growth and sustainability of (MNEs) in tandem with concepts of entrepreneurship and culture. Most recent theories separate operational internalization from knowledge internalization and make the empirical case that while knowledge internalization is growing, operational internalization is declining (Buckley, 2018).

The development of this theory included contributions from Casson (1976) and Rugman (1981). According to theory, MNEs have an advantage in the firm stage when it comes to theoretical, information-based, firm-explicit resources and can exercise restrictive control (responsibility for them). According to the disguise hypothesis, all firm-explicit rewards are competency-based. The notion is covered up by the application of asset-based views and exchange-cost financial elements. MNEs have the theoretical, information-based benefit of tight control (responsible for) (Buckley & Casson, 1976; Rugman, 2010).

MNEs explain why organizations invest resources in various situations and how they turn natural advantages into advantages based on their internal advantages. A brand advantage, an executive's skill, and authoritative limits are a few examples of many types of firm-explicit benefits that are proficiency-based and predictable. When these factors are taken into consideration, the premise is concealed using an asset-based perspective and transaction costs.

It is clear from the FDI theories that have been examined so far that each theory has a unique set of advantages and disadvantages. Profit as the primary motivator for FDI is something that all of these ideas have in common. As a result, corporate income tax impacts FDI by affecting a firm’s profitability. As stated by Faeth (2009), only a portion of FDI can be explained by each theory. FDI should therefore be viewed from a variety of theoretical perspectives. However, because it incorporates the advantages of OLI theory, the eclectic paradigm is liable to provide a more comprehensive viewpoint (Faeth, 2009).

Review of Empirical Studies

The empirical research on how tax policy influences FDI is divided (Abbas & Klemm, 2013; Ali Nakyea & Amoh, 2018; Babatunde & Adepeju, 2012; and Coulibaly et al., 2020). A large body of empirical research has demonstrated that tax cuts improve FDI net inflows (Abbas & Klemm, 2013; Coulibaly et al., 2020). Gaya (2021) analyzed foreign direct investment flows in East African nations, focusing on corporate withholding tax rates, double tax treaties, and investment deductions. The study used optimal and normative tax theory and explanatory research design. Secondary data from 2002-2019 was collected for five state partners, and panel regression methods were used to evaluate the relationship between corporate tax policy and foreign direct investment. The findings suggest a significant relationship between corporate tax policy and foreign direct investment among East African Community partner nations.

Obeng (2014) discovered a negative association between FDI inflow and CIT; the study quantified the impact of corporate tax on FDI influx to Ghana's various sectors of the economy. As a result, the study investigated the impact of corporation tax reduction on sector-specific FDI inflows in Ghana. The study focused on the impact of company taxation on FDI into the mining, manufacturing, and service sectors of the economy. To obtain the aforementioned results, the Johansen cointegration approach was utilized, and the study advised that the government maintain a low corporate tax rate in order to stimulate FDI.

Cassou (2016) links and obtains the impact of tax rates to FDI, by means of individual time series data as an alternative to panel data. The study identifies factors influencing remittances, a component of FDI. Corporate income taxes in both host and host nations significantly impact investment flows, while personal income taxes are comparable in importance.

Hossain's (2021) study gave empirical light on the relationship between FDI and other macroeconomic parameters in Bangladesh. The study was a time series, and ARDL bound testing and an error correction model were used to determine that FDI influx has a long-term relationship with a number of regressors. According to the study, interest rates and foreign reserves have little impact on foreign direct investment (FDI). This study indicates a substitutionary effect of export on FDI and recommends utilizing the Heckscher-Ohlin model to minimize redundant exports by producing only goods in which the nation has a competitive edge in order to make more room for FDI.

Kang (2018) studied the impact of natural resource endowment and institutional variables on the location choice of multinational enterprises in emerging markets. The results showed that the attractiveness of a host country's natural resource endowment depends on institutional constraints in both host and home countries.

Cleeve et al. (2015) used panel data to investigate FDI in 35 Sub-Saharan African countries during 1980-2012. Their results showed that there was a positive relation between FDI and human capital, the market size, the natural resource endowments and public infrastructure Various versions of an FDI model were estimated and the results show that all measures of human capital have a significant influence on FDI, as are the traditional variables. There is no evidence of the increasing importance of human capital on FDI over time, probably reflecting the type of FDI flowing into SSA.

Mollick, Ramos, and Silva (2006) examined determinants of FDI inflows into Mexican states between 1994 and 2001. Telephone lines were found to be highly important, with significant coefficients for industrialization ranging from 0.62 to 0.67. According to dynamic GMM panels that account for the endogeneity of FDI and real production, telephone lines have consistent effects on foreign direct investment. Therefore, it appears that international infrastructure, such as interstate and secondary highways, is more favourable to foreign direct investment (FDI) than local infrastructure. Their data corroborate the premise that infrastructure encourages FDI.

Knowledge Gap

There is a dispute in empirical studies about how taxes affect FDI. According to some scholars, the reduction of taxes improves net Inflows of FDI (Abbas & Klemm, 2013; Boly et al., 2020). On the other hand, Hunady and Orviska (2014) and Van Parys argue that taxation has no substantial effect on FDI inflow. Therefore, this study takes the general to specific approach by first identifying the determinants of FDI in the mining sector. Saidu's (2015) study focus on Nigeria from 1970-1980 may limit the generalizability of its findings to time periods. The study did not examine the potential impact of global economic conditions, such as changes in

international tax rules or economic shocks, on the relationship between corporate tax rates and FDI inflows in Nigeria. This study fills the aforementioned gap by using the appropriate tax measure. In addition, the present study emphasises the importance of determinants of FDI which may affect the tax elasticity of FDI. The study also spans 31 years which is sufficient to cover the lags of the variables.

Another conceptual issue in Hossain's study from 2021 and Gaya (2021) would be the study's limited attention to non-macroeconomic factors that might influence FDI inflows. For instance, the study may have overlooked the importance of human capital quality, and resource endowment in attracting FDI. Eregha's (2019) study may have a theoretical shortcoming in that it failed to consider other significant variables that could have an impact on FDI flows in the West African Monetary Zone in addition to exchange rate regimes. For instance, the variables that may have an impact on FDI inflows, and their exclusion from the study may make it more difficult to draw firm findings. Similarly, to Saidu's (2015) study is that it focused solely on the relationship between corporate tax rates and FDI and did not explore other factors that may influence FDI inflows. For instance, the study did not investigate the potential impact of political stability, infrastructure, and market size on FDI inflows, which are also important determinants of FDI. On the other hand, Slemrod (2016) study was conducted in the United States, which is a developed country with a developed economic environment, necessitating such research in the developing nation like Tanzania.

METHODOLOGY

Research Philosophy

The research philosophy adopted for this study on the socio-economic determinants of FDI flow into Tanzania's mining sector is positivism. Positivism aligns with the principles of quantitative research, aiming to establish causal relationships between variables through the systematic collection and analysis of empirical data. The study seeks to identify and understand the cause-and-effect relationships between various socio-economic factors and FDI inflows in the mining sector. A key aspect of positivism is the focus on hypothesis testing and the use of deductive reasoning. The study will begin with well-defined hypotheses based on existing theories and prior research. Through rigorous data collection and statistical analysis, the study will test these hypotheses, allowing for the objective evaluation of relationships between the independent and dependent variables. This approach ensures that the conclusions drawn from the study are grounded in evidence and contribute to the empirical understanding of the factors influencing FDI inflows in Tanzania's mining sector. By adopting a positivist approach, the research aims to provide objective and reliable findings, enhancing the generalizability of results and contributing to the existing body of knowledge on FDI determinants in the mining sector.

Research Design

In performing the research and evaluating the acquired data, this study used a causal research design, which was obtained from secondary sources. The study employed the ARDL model to ascertain whether there are short run or long-run effects of corporate income tax, total reserves, natural resource endowment, human capital quality and infrastructure on FDI inflow in Tanzania's mining sector.

Samples

To analyse FDI inflow in the mining sector, the annual aggregate FDI inflow in the gold sector was chosen as a sample because it represents more than 90% of minerals export of the country. Effective average tax rate was chosen as a sample for corporate income Tax levied in the gold sector it reflects differences in tax laws and corporate tax planning. Other samples collected are political stability index, enrolment of students in tertiary education, and mobile phone subscribers from the target population of political stability, human capital quality and infrastructure respectively.

Description of Research Instruments

A time series model is built from the standpoint of location because the Current research focuses on the reaction of FDI inflows in the mining sector to fluctuations in the recipient nation's corporate income tax rate, total reserves, natural resource endowment, human capital quality, and infrastructure. The study used secondary data which are sourced from various reputable institutions.

Data Collection Procedures

The data was collected on an annual basis between 1990 and 2020. The World Bank and Ferdi ("fondation pour les études et Recherche's sur le développement international") provided the data for the variables under study namely FDI inflow in the gold mining sector of Tanzania, Corporate income tax, total reserves, natural resource endowment, human capital quality, and infrastructure. Quantitative data collection method was used through the extraction of data from the above institutional database websites. Given that one of the intended contributions of this research is to give insights and suggestions for FDI and variables under study, it is critical to get a familiarity of the aggregate drivers of FDI.

The results and the estimation of diagnostics test and analysis of short run and long run dynamics were done in Eviews version 10; Additionally, the results and the estimation of the unit root test, optimal lag lengths of the variables and cointergration test were obtained and done from Stata version 13.

Logarithm Transformation of Variables

Whenever possible, variables are converted to natural logarithms to facilitate comprehension and remove anomalies. By changing the variables to logarithms, it is possible to quickly interpret the regression coefficients. Other variables such as EATR, and NR are not transformed because they have either small values or are in percentage.

Logarithm transformation to FDI variable.

LFDI = log (FDI), where LFDI is the natural logarithm of FDI.

Logarithm transformation to Total reserves.

LTR= log (Total reserve), where LTR is the natural logarithm of Total reserves.

Square transformation to EDU variable and MOB variable.

EDU2 = EDU^2, where EDU is the square of Human capital quality.

MOB2 = MOB^2, where MOB is the square of Infrastructure.

Analytical Framework

Steps for Analysis

The ARDL Approach

- The augmented Dickey-Fuller test is used to determine the stationarity of the variables.
- The cointegration test is used. It should be noted that the ARDL model works for I (0), I (1), or both.
- The Akaike Information Criterion (AIC) is used to identify an acceptable ARDL model.
- The ARDL model's long-term parameters are calculated using the ordinary least squares approach.
- The ARDL model's error correlation models (ECM) are used to estimate the short-term coefficients.
- Model diagnostic testing is performed to assess for correlation, normalcy, and heteroskedasticity.
- The model's stability is evaluated.

The ARDL Model Specification

The Autoregressive Distributed Lag (ARDL) model created by Pesaran and Pesaran (1997) (Ben Jebli et al., 2022), was used to ascertain whether there are long-term effects of social economic factors on FDI inflow in Tanzania's mining sector. Compared to Johansen's cointegration approach, this methodology has numerous benefits. Simply said, the ARDL model is the most effective technique for finding cointegration in small samples, whereas Johansen techniques necessitate a large data sample, which the majority of emerging nations do not have.

Another advantage when employing the ARDL approach is that, unlike other cointegration techniques, the ARDL model may be applied whether the variables in the regression are predominantly I (I), exclusively I (0), or a mixture of the two. This indicates that the pre-testing problem that traditional cointegration suffers from, necessitates the classification of the variables into I (I) (Pesaran et al., 2001). Thirdly, the Autoregressive Distributed Lag (ARDL) technique of cointegration is superior to the Johansen approach because it addresses the setback of the Johansen method's excessive number of options (Musa et al., 2014). Among them is the appropriate lag length to use, how to handle deterministic factors and the Vector Autoregressive (VAR) order. Finally, variables in the ARDL technique can have varying lag lengths, but the Johansen method does not permit that.

The ARDL approach consists of two phases. In the first phase, an F-test is conducted to determine whether the variables of interest have any long-term connections. In the second stage, the associations between the explanatory and dependent variables are estimated and valued, and the error correction model is utilized to calculate the variables' short-run effect. The Error Correction Model (ECM) version is used to gauge how quickly the body reaches equilibrium. The following functional form can be used to express how the explanatory factors (Corporate income tax policy, Total reserve, Natural resource endowment, Human capital quality and Infrastructure) affect the dependent variable (Foreign Direct Investments in the mining sector)

$$LFDI = f(EATR, LTR, NR, EDU2, MOB2) \quad (3.1)$$

Cointegration Test

The ARDL co-integration test, also known as the bound test, was used to empirically assess the aforementioned functional form. It is used to show the long-run effects on Foreign Direct Investments (FDI) by explanatory factors. Equations (3.2) show that the ARDL model definition of the functional link between corporate income tax, total reserves, natural resource endowment, human capital quality, infrastructure, and foreign direct investments (FDI), is as follows:

$$\Delta LFDI_t = \beta_0 + \sum_{i=1}^{p} \delta_{1i}\Delta LFDI_{t-i} + \sum_{i=1}^{q_1} \delta_{2i}\Delta EATR_{t-i} + \sum_{i=1}^{q_2} \delta_{3i}\Delta LTR_{t-i} + \sum_{i=1}^{q_3} \delta_{4i}\Delta NR_{t-i} + \sum_{i=1}^{q_4} \delta_{5i}\Delta EDU2_{t-i} + \sum_{i=1}^{q_5} \delta_{6i}\Delta MOB2_{t-i} + \beta_1 LFDI_{t-1} + \beta_2 EATR_{t-1} + \beta_3 LTR_{t-1} + \beta_4 NR_{t-1} + \beta_5 EDU2_{t-1} + \beta_6 MOB2_{t-1} + e_t \ldots \ldots (3.2)$$

Where: Δ: Represents the first difference operator.

LFDI: Represent FDI in the mining sector while.

t represents the period from 1990 to 2020.

β_0 : Represents the constant.

$\delta_1, \delta_2, \delta_3, \delta_4 \delta_5$ *and* δ_6 : Represents the coefficients of the short-run dynamics of the model.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_{5:}$ *and* $\beta_{6:}$ Represents the parameters of the long-run relationship.

EATR: Represents Corporate income tax policy.

LTR: Represents Total Reserves.

NR: Represents Natural resources endowment.

EDU2: Represents Human Capital quality.

MOB2: Represents Infrastructure.

e_t: Represents the error term.

The ARDL bounds testing approach uses Ordinary Least Square (OLS) to estimate equation (3.2) for long-run relationship among variables. The F-test is then used to evaluate the combined significance of the coefficients of the variables' lagged levels. This indicates that:

$H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$ (There is no long − run relationship)

$H_1 = \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0$ (There is a long − run relationship)

We refer to the test that normalizes on $F_{FDI}(FDI|EATR, LTR, NR, EDU2, MOB2)$.

A cointegration test uses two asymptotic critical value boundaries for independent variables I, d (where 0≤d≤1). Lower values represent I (0) regressors, whereas higher values represent I (1) regressors. If the F-statistic is larger than the upper critical value, regardless of integration order, the long-run connection H_0 can be rejected. When the test statistic is smaller than the lower critical value, the null hypothesis cannot be rejected. The statistic is inconclusive if it lies between the minimum and maximum critical levels (Khan, 2022; Parjiono et al., 2012). If the foreign direct investment inflow and other variables discovered through the cointegration test show evidence of long run cointegration, then the indicated $ARDL(p, q_1, q_2, q_3, q_4 q_5, q_6)$ model for FDI_t can be assessed as:

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$$LFDI_t = \beta_0 + \beta_1 FDI_{t-1} + \beta_2 EATR_{t-1} + \beta_3 LTR_{t-1} + \beta_4 NR_{t-1} + \beta_5 EDU2_{t-1} + \beta_6 MOB2_{t-1} + e_t \ldots\ldots (3.3)$$

This necessitates choosing the orders of the ARDL($p, q_1, q_2, q_3, q_4, q_5, q_6$) model using the AIC of the five variables. Next, estimating an error correction model (ECM) related to the long-run estimates yields the short-run dynamic parameters (Muruko, 2013; Pillay, 2015). Thus, ECM is described as:

$$\Delta LFDI_t = \beta_0 + \sum_{i=1}^{p} \delta_{1i} \Delta LFDI_{t-i} + \sum_{i=1}^{q_1} \delta_{2i} \Delta EATR_{t-i} + \sum_{i=1}^{q_2} \delta_{3i} \Delta LTR_{t-i} \sum_{i=1}^{q_3} \delta_{4i} \Delta NR_{t-i} + \sum_{i=1}^{q_4} \delta_{5i} \Delta EDU2 + \sum_{i=1}^{q_5} \delta_{6i} \Delta MOB2 + \delta_7 ECM_{t-1} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.4)$$

Where $\delta_1, \delta_2, \delta_3, \delta_4 \delta_5$ *and* δ_6 are the coefficients of the short-term dynamic coefficients of the model convergence while δ_7 is the speed of the modification which exists in the interval of -1< δ_7 <0 and significant, also known as long-term effects.

RESULTS AND DISCUSSION

Diagnostics Test

Table 1: Diagnostics Test

Diagnostics Test	Result	Conclusion
Normality Test	The statistics for the Jarque Bera had a probability value of 0.138494 which is greater than 5 %.	The regression model had a normality distributed error term
Heteroskedasticity Test	Breusch-Pagan-Godfrey test indicated that the probability value is greater than 5%	No problem of heteroskedasticity in the model
Serial Correlation Test	Breusch-Godfrey Serial Correlation LM Test indicated that probability of observed R-squared was greater than 5%	No serial correlation
Multicollinearity Test	The mean VIF is less than 10 and therefore within the permitted range.	Mean VIF is 9.13, indicating an overall moderate level of multicollinearity among the independent variables.
Model Stability	The CUSUM test, which is based on the cumulative sum of the recursive residuals, revealed that the estimates are within an acceptable range at a significance level of 5%.	Coefficients of ARDL model are stable

Source: Author

Before using estimate findings to address research objectives, diagnostic and stability tests were performed to ensure that ARDL model was acceptable.

Descriptive Statistics

These descriptive statistics provide an overview of the central tendencies, variability, and distribution of each variable. The mean values represent the typical or average levels, while the minimum and maximum values indicate the range of the data. The standard deviation measures the spread of the data points around the mean, giving insights into the data's dispersion and variability. These statistics are crucial for understanding the characteristics of the variables and their potential implications for the study on the socioeconomic determinants of FDI flows in the Tanzanian mining sector.

Table 2: Descriptive Statistics

Variable	Observations	Mean	Minimum	Maximum	STD.DEV
LFDI	29	18.50488	15.53828	20.62885	1.300293
EATR	29	21.97552	1.800000	47.90000	16.81930
LTR	29	21.06546	19.07716	22.49616	1.136284
NR	29	6.944827	3.611597	14.04667	2.891820
EDU2	29	6.313563	0.062916	39.04913	9.836524
MOB2	29	1458.066	0.000000	5966.226	2130.047

The following explanations cater for Table 2 above:

LFDI (Foreign Direct Investment): The variable LFDI has 29 observations. On average, the FDI flows into the Tanzanian mining sector stand at approximately 18.50 units. The minimum recorded value is 15.54 units, while the maximum is 20.63 units. The standard deviation is relatively low at 1.30, suggesting that the FDI flows are relatively consistent around the mean.

EATR (Effective Average Tax Rate): There are 29 observations for the EATR variable. The mean effective average tax rate is approximately 21.98%. The minimum recorded tax rate is 1.80%, while the maximum is 47.90%. The relatively high standard deviation of 16.82 indicates considerable variability in the effective average tax rates across the observations.

LTR (Foreign Reserve): The variable LTR has 29 observations. On average, the foreign reserve for the Tanzanian mining sector is approximately 21.07 units. The minimum value recorded is 19.08 units, and the maximum is 22.50 units. The standard deviation of 1.14 suggests a relatively small dispersion of data points around the mean.

NR (Natural Resource Endowment): There are 29 observations for the NR variable. On average, the natural resource endowment is approximately 6.94 units. The data range from a minimum of 3.61 units to a maximum of 14.05 units. The standard deviation of 2.89 indicates some variability in the endowment levels.

EDU2 (Human Capital Quality): The EDU2 variable has 29 observations. The mean human capital quality is approximately 6.31 units. The minimum value recorded is 0.06 units, while the maximum is 39.05 units. The relatively high standard deviation of 9.84 suggests considerable diversity in human capital quality across the observations.

MOB2 (Infrastructure): There are 29 observations for the MOB2 variable. The average infrastructure level stands at approximately 1458.07 units. The data range from a minimum of 0.00 units to a maximum of 5966.23 units. The standard deviation of 2130.05 indicates substantial variability in infrastructure levels across the observations.

Unit Root Test

In this investigation, the Augmented Dickey-Fuller (ADF) test was used to look for unit roots. The results were provided in terms of levels and the first difference. It allowed for the identification of the unit root among the time series in comparative terms, as well as establishing more robust conclusions.

Table 3: Unit Root Test Results

Variable	T statistics	P value	Include in the test equation	Test for a unit root in;	Level Lags
D(LFDI)	-6.692991	0.0000	Intercept	At first difference	1
D(EATR)	-4.570942	0.0011	Intercept	At first difference	0
D(TR)	-4.459883	0.0079	Trend and Intercept	At first difference	1
D(NR)	-6.561111	0.0000	Intercept	At first difference	0
D(EDU2)	-3.310951	0.0262	Intercept	At level	7
D(MOB2)	-6.568284	0.0000	Trend and Intercept	At level	1

Source: Author

In summary, all the variables (D(LFDI), D(EATR), D(TR), D(NR), D(EDU2), and D(MOB2)) show evidence of stationarity after differencing, as indicated by the significant negative T-statistics and low p-values. Therefore, differencing these variables once makes them suitable for further time series analysis and modeling.

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Cointegration Analysis

Lag Length Selection for Co-Integration Test

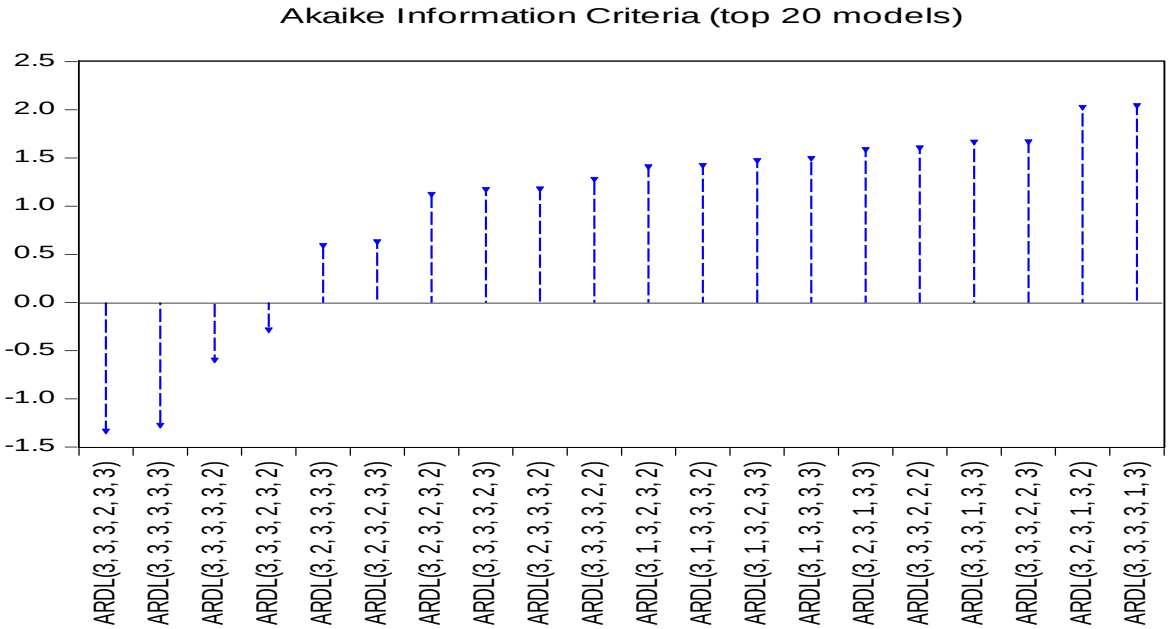

Figure 1: Akaike Information Criterion

The optimal lag criteria were Akaike Info Criterion (AIC). ARDL is shown to be the most effective model with the lowest AIC value of (3,3,2,3,3) which is automatically selected by the statistical package EViews

Cointegration Test Results

The co-integration test assumes interdependent variables and compares results with the F distribution's critical values to reject or accept H_0. If F-statistics are less than the I (0) constraint, H_0 is rejected, and if they exceed the I (1) bound, H_0 is rejected. Cointegration suggests a long-term relationship between the variables, meaning they move together over time, even if short-term fluctuations might cause temporary deviations from this relationship. The F-statistics for each variable are higher than the critical values at the 10%, 5%, and 1% significance levels, indicating that the null hypothesis of no cointegration can be rejected in favour of the alternative hypothesis of cointegration.

Table 4: Results from the Co-Integration Test

Variable	F-Statistics	Level	Bound I (0)	Bound I (1)	Cointegration
F_{LFDI} (LFDI/EATR, LTR, NR, EDU2, MOB2)	136.0973	10%	2.26	3.35	YES
		5%	2.62	3.79	
		1%	3.14	4.68	
F_{EATR} (EATR/LFDI, LTR, NR, EDU2, MOB2)	8.939538	10%	2.26	3.35	YES
		5%	2.62	3.79	
		1%	3.14	4.68	
F_{LTR} (LTR/EATR, LFDI, NR, EDU2, MOB2)	40.69380	10%	2.26	3.35	YES
		5%	2.62	3.79	
		1%	3.14	4.68	
F_{NR} (NR/EATR, LTR, LFDI, EDU2, MOB2)	32.73208	10%	2.26	3.35	YES
		5%	2.62	3.79	
		1%	3.14	4.68	
F_{EDU2} (EDU2/ EATR, LTR, NR, LFDI, MOB2)	81.30964	10%	2.26	3.35	YES
		5%	2.62	3.79	
		1%	3.14	4.68	
F_{MOB2}(MOB2/LFDI, EATR, LTR, NR, EDU2)	137.0698	10%	2.26	3.35	YES
		5%	2.62	3.79	
		1%	3.14	4.68	

Source: Author

Since there is a long-run relationship between the variables, therefore we can proceed with the ARDL model estimation.

Estimation Results of ARDL Model

Table 5: Short Run ARDL Model Results

Variable	Coefficient	Standard Error	t-stat	p-value
EATR	-0.102816	0.033074	-3.108652	0.0529
LTR	-4.645832	0.460177	-10.09576	0.0021
NR	-0.424030	0.064899	-6.533722	0.0073
EDU2	0.076471	0.104395	0.732508	0.5169
MOB2	0.002866	0.000375	7.636668	0.0047
C	-82.18888	16.65446	-4.934946	0.0160
R-squared	0.998282	AIC	-1.335802	
Adjusted R^2	0.985681	F-statistics	79.22681	
Prob(F-statistics)	0.002000	DW- Value	3.394659	

Source: Author

The short-run ARDL model shows some statistically significant relationships between FDI flows in the Tanzanian mining sector and certain determinants (LTR, NR, and MOB2), while the relationships with EATR is slightly above 0.05 and EDU2 is not statistically significant at the 5% level. The high R-squared value indicates that the model provides a good fit to the data. However, further analysis and interpretation may be required to understand the economic implications of these relationships fully.

Analysis of Long Run Dynamics

Since there existed a long run relationship among variables, a long run ARDL technique was established, and the results are shown in Table 5

Table 6: Long-Run Coefficient

Variable	Coefficient	Standard Error	t-stat	p-value
EATR	-0.057122	0.005702	-10.01714	0.0021
LTR	1.774837	0.192786	9.206240	0.0027
NR	0.109749	0.020304	5.405274	0.0124
EDU2	-0.075732	0.053439	-1.417183	0.2514
MOB2	2.49E-05	0.000239	0.104326	0.9235

Source: Author's Estimation

EC = LFDI - (-0.0571*EATR + 1.7748*LTR + 0.1097*NR - 0.0757*EDU2 + 0.0000*MOB2)

The long-run ARDL model indicates that the effective average tax rate, foreign reserve, and natural resource endowment are significant determinants of FDI flows into the Tanzanian mining sector. However, human capital quality and infrastructure do not appear to have a statistically significant impact on FDI in the long run, based on the available data. These results can be used to inform policymakers and investors seeking to promote FDI in the Tanzanian mining sector and develop strategies to enhance the country's investment climate.

CONCLUSION AND RECOMMENDATION

Conclusion

The study concluded that corporate income tax policy has a significant impact on FDI inflow in the mining sector in both shortrun and longrun. The results implies that an increase in tax rate would decrease FDI inflow in the mining sector. Higher corporate income tax rates may lead to investors shifting their investments to other sectors or countries with lower tax rates and rates may deter potential investors from investing in the mining sector due to the increased cost of doing business.

The study further concluded that, total reserves had a negative and significant effect in the shortrun and a positive and a significant effect on FDI inflow in the mining sector in the longrun. The implication is that a decrease in total reserves will diminish FDI inflow in the mining sector while an increase in total reserve will increase the inflow of investment in the mining sector. This is certain since investors prefer economic environment which foreign currency can be easily availed to them in order to affect transaction.

The study also concluded that natural resource endowment had a negative and significant effect in the shortrun and a positive and a significant effect on FDI inflow in the mining sector in the longrun. The implication is that in the shortrun the depletion of natural resources will result to

a limited flow of investors whereas in the long run the positive effect is unexpected since natural resource endowment and FDI inflow have an inverse relationship. It is worth noting that foreign investors keen on investing in mining activities usually seek for location that are endowed with mineral deposits.

The study concluded that human capital quality had a positive and insignificant effect in the shortrun and a positive and insignificant effect in the longrun. These results are not expected since foreign investor especially efficiency seeking investor tend to prefer locations with efficient human capital.

Lastly the study concluded that infrastructure has a positive and significant effect on FDI inflow in the mining sector whilst in the longrun it has a positive and insignificant effect. The shortrun results imply that foreign investors are more likely to invest in location with available and working infrastructure. However, the results are not significant in the longrun.

Recommendation

The study reveals that corporate income tax policy significantly impacts FDI inflows into the mining sector in the long run. However, lowering CIT rates may attract FDI, but it should not be interpreted as the only means of attracting FDI. Tanzania's government, through the ministry of finance and the TRA, should strike a balanced corporate income tax rate and implement strategies to enhance compliance and prevent tax evasion. As a result, Tanzania must strike a balance between generating tax income and luring FDI. Tanzania can improve its competitiveness and promote FDI inflows into the mining sector by enacting specific policies and providing an enabling environment for foreign investors, all while assuring a fair return on investment for the country.

The study also found that total reserves had a negative and significant short-run influence on FDI inflows into the mining sector, but a positive and significant long-run effect. The Tanzanian government, according to the report, should limit potential risks linked with external shocks such as commodity price variations or global economic downturns. Tanzania should boost investor confidence and create a more enticing investment climate by mitigating such risks with enough reserves, hence encouraging FDI inflows into the mining industry.

The study found that natural resource endowment had a negative and significant effect in the shortrun and a positive and a significant effect on FDI inflow in the mining sector in the longrun. The study recommends that the government should promote policies that encourage environmental and social responsibility in the mining sector. Also, implement robust environmental regulations, promote responsible mining practices, and enforce compliance with international standards. Demonstrating commitment to sustainable mining and social welfare can enhance the reputation of Tanzania's mining industry and attract responsible investors.

The analytical results reveal that human capital quality to be statistically insignificant in influencing FDI inflow. These results do not hold in practice to those MNE’s seeking efficient investments and for this case mining sector does not only fit in to resource seeking MNE’s but also efficiency seeking MNE’s. Efforts and initiatives have been made by the government of Tanzania such as collaborating with companies in terms of corporate social responsibility, but the mining sector faces a shortage of skilled personnel forcing companies to hire expatriates to beyond domestic territory to cover for senior roles and roles. The government should, therefore, invest in courses and training that are relevant to the sector needs so as to mitigate this barrier.

According to the study, infrastructure had a positive and substantial short-term influence on FDI inflows into the mining industry and a positive and insignificant long-term impact. To

promote FDI, governments should prioritize improving infrastructure quality, Infrastructure supporting product and service production, distribution, transportation, energy, and information technology. Improving infrastructure quality is especially important for provinces with low investment levels, because proper infrastructure is essential to develop agglomeration economies that can attract further FDI. To continue to profit from the flow of FDI mining sector, the government must ensure that infrastructure is upgraded or create a conducive environment for the development of new infrastructure through its bodies and authorities such as TANROADS, Tanzania Ports Authority, and Tanzania Communication Regulatory Authority (TCRA). Infrastructure wise, there has been major advancement as compared to a decade ago and ongoing constructions of standard gauge railway, Mtwara port cargo terminal, Bagamoyo port will ease the bulk transportation of minerals.

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Appendix

Raw Data

YEARS	FDI	EATR	TOTAL_RESERVE	NR	EDU	MOB
1990	21,600,000.00	1.8	193,000,000.00	11.49974	0.25083	0
1991	24,400,000.00	2	204,000,000.00	10.01639	0.33206	0
1992	26,500,000.00	2.2	327,000,000.00	11.41063	0.34248	0
1993	28,800,000.00	2.4	203,000,000.00	10.72643	0.38663	0
1994	31,500,000.00	2.6	332,000,000.00	11.61313	0.41656	0.001289
1995	34,700,000.00	2.8	270,000,000.00	14.04667	0.49074	0.011805
1996	41,900,000.00	3.2	440,000,000.00	11.29902	0.552	0.029687
1997	45,800,000.00	3.7	622,000,000.00	8.873321	0.64137	0.064758
1998	53,500,000.00	4.5	599,000,000.00	5.729641	0.55709	0.118844
1999	296,500,000.00	4.9	775,000,000.00	3.768207	0.64116	0.155895
2000	5,600,000.00	5.2	974,000,000.00	3.755336	0.685	0.329913
2001	36,000,000.00	11.4	1,160,000,000.00	4.044125	0.70506	0.801376
2002	231,300,000.00	9.8	1,530,000,000.00	4.857474	0.73785	1.717455
2003	77,100,000.00	21.7	2,040,000,000.00	6.862737	0.94552	3.57204
2004	84,500,000.00	35.12	2,300,000,000.00	5.354294	1.27401	5.195324
2005	130,550,000.00	35.12	2,050,000,000.00	4.993588	1.48849	7.708648
2006	170,650,000.00	35.12	2,260,000,000.00	5.521964	1.49951	14.18253
2007	57,030,000.00	35.12	2,890,000,000.00	6.206103	1.50964	20.28445
2008	669,800,000.00	35.12	2,860,000,000.00	5.076595	1.52111	31.07662
2009	385,100,000.00	35.12	3,470,000,000.00	5.536257	1.91423	40.55707
2010	909,900,000.00	36.06	3,900,000,000.00	5.559458	2.14805	47.31792
2011	406,500,000.00	36.06	3,730,000,000.00	7.336462	2.96114	56.19549
2012	889,300,000.00	36.18	4,050,000,000.00	6.83252	3.96553	57.8481
2013	520,400,000.00	36.18	4,670,000,000.00	5.767235	3.6758	56.60283
2014	418,900,000.00	36.18	4,390,000,000.00	5.046906	4.84903	63.77562
2015	217,700,000.00	36.18	4,080,000,000.00	5.301939	4.01016	77.04656
2016	116,300,000.00	35.79	4,350,000,000.00	5.616038	4.07057	75.48495
2017	202,500,000.00	47.9	5,890,000,000.00	5.136168	5.12054	73.09479
2018	234,600,000.00	47.84	5,050,000,000.00	3.611597	6.24893	77.24135
2019	148,900,000.00	47.84	-	3.53145	3.0925	82.20817
2020	132,100,000.00	47.84	-	3.851695	7.83072	85.74689

Descriptive Statistics

	LFDI	EATR	LTR	NR	EDU2	MOB2
Mean	18.50488	21.97552	21.06546	6.944827	6.313563	1458.066
Median	18.57168	35.12000	21.44051	5.616038	1.623101	26.99139
Maximum	20.62885	47.90000	22.49616	14.04667	39.04913	5966.226
Minimum	15.53828	1.800000	19.07716	3.611597	0.062916	0.000000
Std. Dev.	1.300293	16.81930	1.136284	2.891820	9.836524	2130.047
Skewness	-0.128354	-0.064543	-0.499192	0.949305	1.828996	1.125545
Kurtosis	2.219209	1.287241	1.795242	2.652868	5.702466	2.727767
Jarque-Bera	0.816270	3.564835	2.958256	4.501305	24.99344	6.212665
Probability	0.664889	0.168231	0.227836	0.105330	0.000004	0.044765
Sum	536.6414	637.2900	610.8985	201.4000	183.0933	42283.91
Sum Sq. Dev.	47.34136	7920.886	36.15197	234.1535	2709.202	1.27E+08
Observations	29	29	29	29	29	29

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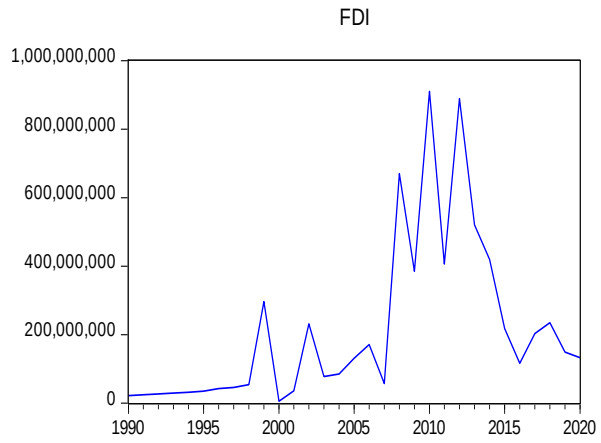
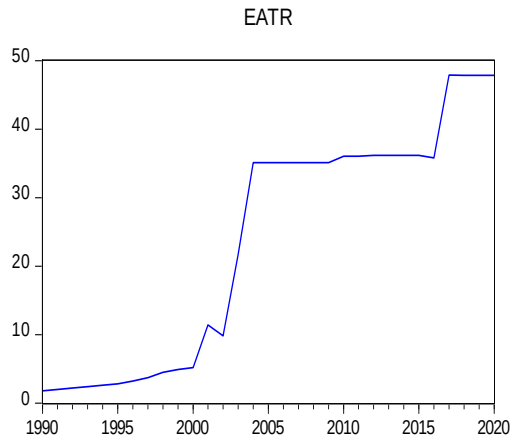
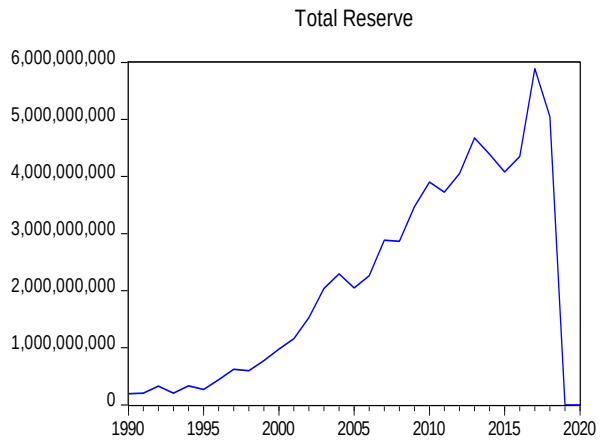
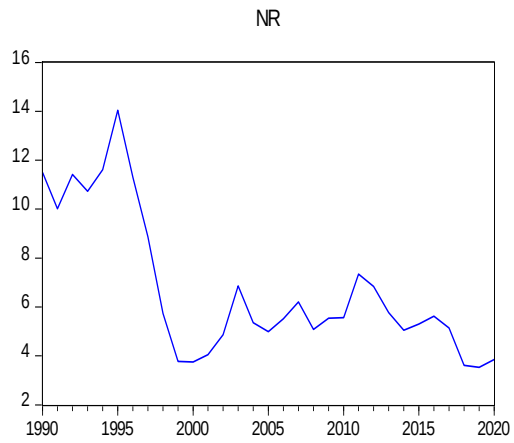
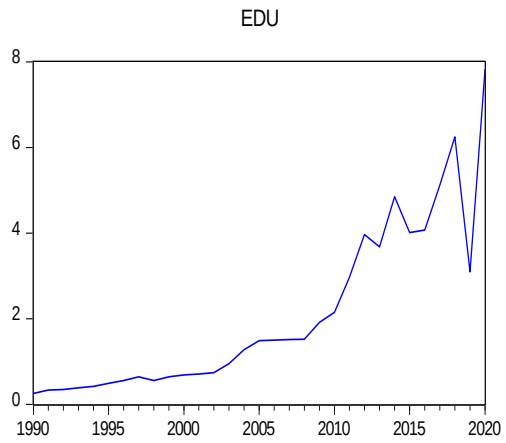
Trend of the Variables

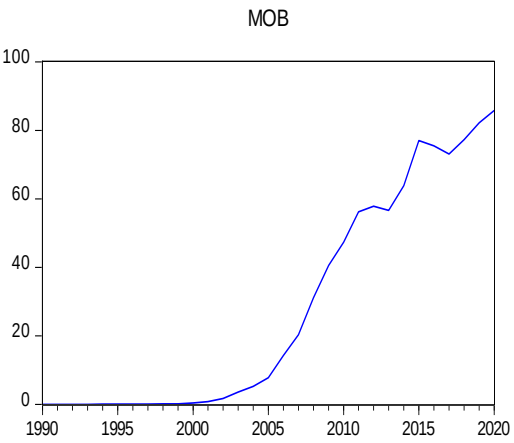












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Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.398795	Prob. F(22,3)	0.9146
Obs*R-squared	19.37494	Prob. Chi-Square(22)	0.6221
Scaled explained SS	0.249750	Prob. Chi-Square(22)	1.0000

Multicollinearity Test

```
. vif
```

Variable	VIF	1/VIF
logTotalRe~e	16.82	0.059448
EATR	10.59	0.094434
mob_100sqr	8.09	0.123577
Edusqr	6.81	0.146736
TotalNatur~s	3.31	0.301879
Mean VIF	9.13	

Serial Correlation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.350087	Prob. F(2,1)	0.5199
Obs*R-squared	18.97330	Prob. Chi-Square(2)	0.0001

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Regression Output

Shortrun Output

Dependent Variable: LFDI
Method: ARDL
Date: 06/10/23 Time: 13:07
Sample (adjusted): 1993 2018
Included observations: 26 after adjustments
Maximum dependent lags: 3 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (3 lags, automatic): EATR LTR NR EDU2 MOB2
Fixed regressors: C
Number of models evalulated: 3072
Selected Model: ARDL(3, 3, 3, 2, 3, 3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LFDI(-1)	-1.218061	0.064370	-18.92291	0.0003
LFDI(-2)	-1.198225	0.090205	-13.28340	0.0009
LFDI(-3)	-1.162072	0.098769	-11.76550	0.0013
EATR	-0.102816	0.033074	-3.108652	0.0529
EATR(-1)	-0.049185	0.033864	-1.452420	0.2423
EATR(-2)	-0.178667	0.024097	-7.414603	0.0051
EATR(-3)	0.069144	0.015410	4.487059	0.0206
LTR	-4.645832	0.460177	-10.09576	0.0021
LTR(-1)	0.163570	0.399535	0.409401	0.7097
LTR(-2)	6.151316	0.621236	9.901743	0.0022
LTR(-3)	6.456784	0.559400	11.54234	0.0014
NR	-0.424030	0.064899	-6.533722	0.0073
NR(-1)	0.575001	0.070708	8.131996	0.0039
NR(-2)	0.351499	0.044612	7.879067	0.0043
EDU2	0.076471	0.104395	0.732508	0.5169
EDU2(-1)	0.001864	0.101007	0.018459	0.9864
EDU2(-2)	-0.065827	0.052525	-1.253246	0.2989
EDU2(-3)	-0.359237	0.045543	-7.887934	0.0042
MOB2	0.002866	0.000375	7.636668	0.0047
MOB2(-1)	-0.003115	0.000317	-9.815787	0.0022
MOB2(-2)	0.004050	0.000424	9.555295	0.0024
MOB2(-3)	-0.003687	0.001473	-2.503916	0.0874
C	-82.18888	16.65446	-4.934946	0.0160

R-squared	0.998282	Mean dependent var	18.67886
Adjusted R-squared	0.985681	S.D. dependent var	1.260348
S.E. of regression	0.150813	Akaike info criterion	-1.335802
Sum squared resid	0.068234	Schwarz criterion	-0.222870
Log likelihood	40.36542	Hannan-Quinn criter.	-1.015318
F-statistic	79.22681	Durbin-Watson stat	3.394659
Prob(F-statistic)	0.002000		

*Note: p-values and any subsequent tests do not account for model selection.

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Longrun Output

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LFDI)
Selected Model: ARDL(3, 3, 3, 2, 3, 3)
Case 2: Restricted Constant and No Trend
Date: 06/10/23 Time: 13:26
Sample: 1990 2020
Included observations: 26

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-82.18888	16.65446	-4.934946	0.0160
LFDI(-1)*	-4.578359	0.194683	-23.51696	0.0002
EATR(-1)	-0.261523	0.024566	-10.64576	0.0018
LTR(-1)	8.125839	0.787882	10.31352	0.0019
NR(-1)	0.502469	0.085110	5.903743	0.0097
EDU2(-1)	-0.346729	0.238250	-1.455318	0.2416
MOB2(-1)	0.000114	0.001092	0.104534	0.9233
D(LFDI(-1))	2.360297	0.146798	16.07850	0.0005
D(LFDI(-2))	1.162072	0.098769	11.76550	0.0013
D(EATR)	-0.102816	0.033074	-3.108652	0.0529
D(EATR(-1))	0.109523	0.019195	5.705851	0.0107
D(EATR(-2))	-0.069144	0.015410	-4.487059	0.0206
D(LTR)	-4.645832	0.460177	-10.09576	0.0021
D(LTR(-1))	-12.60810	1.016862	-12.39903	0.0011
D(LTR(-2))	-6.456784	0.559400	-11.54234	0.0014
D(NR)	-0.424030	0.064899	-6.533722	0.0073
D(NR(-1))	-0.351499	0.044612	-7.879067	0.0043
D(EDU2)	0.076471	0.104395	0.732508	0.5169
D(EDU2(-1))	0.425064	0.048656	8.736172	0.0032
D(EDU2(-2))	0.359237	0.045543	7.887934	0.0042
D(MOB2)	0.002866	0.000375	7.636668	0.0047
D(MOB2(-1))	-0.000363	0.001188	-0.305371	0.7800
D(MOB2(-2))	0.003687	0.001473	2.503916	0.0874

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EATR	-0.057122	0.005702	-10.01714	0.0021
LTR	1.774837	0.192786	9.206240	0.0027
NR	0.109749	0.020304	5.405274	0.0124
EDU2	-0.075732	0.053439	-1.417183	0.2514
MOB2	2.49E-05	0.000239	0.104326	0.9235
C	-17.95160	3.922260	-4.576852	0.0196

EC = LFDI - (-0.0571*EATR + 1.7748*LTR + 0.1097*NR -0.0757 *EDU2 + 0.0000*MOB2 -17.9516)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	118.7017	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Actual Sample Size	26		Finite Sample: n=35	
		10%	2.331	3.417
		5%	2.804	4.013
		1%	3.9	5.419
			Finite Sample: n=30	
		10%	2.407	3.517
		5%	2.91	4.193
		1%	4.134	5.761