



FDI, Institutions and ICT Infrastructure in the Context of African Countries

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Abstract: Our preliminary research reveals that a significant emphasis has been placed by foreign direct investors on the institutional quality of host countries. Previous studies have primarily concentrated on investigating the correlation between Foreign Direct Investment (FDI) and institutional factors. In parallel, numerous studies have explored the connection between FDI and a critical determinant—ICT (Information and Communication Technology) infrastructures. However, there lies a gap in the existing research landscape. Despite the wealth of studies, none have investigated the conditional relation between ICT infrastructures, FDI, and institutional quality. This study tries to examine the role of ICT infrastructure in negotiating the role of Institutions in bringing FDI flows. The strength of our study lies in the fact that we try to measure the joint impact of institutions and ICT infrastructure on FDI inflows for 20 African countries over the period 2000-2019. The hypothesis of the study indicates that countries with strong institutional quality and good ICT infrastructure would attract more FDI. On the contrary, countries with low ICT infrastructure and low quality of institutions will struggle to bring FDI into the country. The results of the model strongly support our hypothesis. Our results are robust to the alternative measures of quality of institutions and ICT infrastructure. From the policy point of view, countries are expected to improve their quality of ICT infrastructure and institutions in the country to get more FDI.

Keywords: FDI, Institutions, ICT infrastructure, African Continent

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1. INTRODUCTION

FDI and Information and Communication Technology (ICT) are two significant aspects of the global economy, and they often interact and influence each other. FDI refers to the investment made by a multinational company or by an individual from the source country in to host country. The investment can take various forms, from acquiring a foreign company to establishing a subsidiary or investing in a joint venture company. FDI plays a fundamental role in promoting economic growth, the creation of jobs and technology and knowledge transfer between two countries. FDI allows companies to expand their presence in foreign markets and access new customer bases through access to new markets; it allows resource acquisition where companies invest in countries rich in natural resources or skilled labour to gain a competitive advantage (see Kar and Sinha, 2014). There are plenty of studies that analyse the advantages of FDI on the host country (see Lee *et al.*, 2020; Linh *et al.*, 2019; Orbes *et al.*, 2019). In a study by Gorg (2000), it has been shown that the electronic sector in Ireland has an indirect impact due to MNC activity. Ritchie (2002) showed the spillover effect of MNC activities on human capital formation in Asia and Latin America. Moreover, Foreign investors often bring advanced technologies and managerial practices, benefiting the host country's economy. In addition to this, job creation is a major benefit received by the host economy. FDI often leads to the creation of jobs, reducing unemployment and improving the standard of living of the FDI-receiving country. The location choice of multinational companies depends on the availability of raw materials, cheap labour, business and political environment and contract enforcement capacity or property rights protection of the host country (see Sen and Sinha, 2017; Sinha *et al.*, 2024). FDI can contribute to the overall economic development of a country by fostering industrial growth and productivity. On the other hand, ICT encompasses a wide range of technologies used for communication, information processing, and storage. It includes hardware (computers, smartphones, networking equipment), software (applications, operating systems), and services (internet, cloud computing). ICT has revolutionised the way individuals, businesses, and governments interact, communicate, and conduct various activities. ICT has made communication faster and more efficient, enabling real-time interactions and collaboration across the globe. ICT tools and software streamline processes and boost productivity in various sectors, such as manufacturing, finance, and

healthcare. The internet and ICT have democratized access to information, empowering people with knowledge and education. E-commerce and digital services: ICT has facilitated the growth of e-commerce, online banking, and digital services, transforming the business landscape. ICT enables innovation and automation in industries, leading to the development of cutting-edge technologies and services (see Sinha and Saha, 2022).

The objective of this study is to explore the relationship between FDI, Institutions and ICT infrastructure for a set of African nations. Africa is rich in natural resources, and the continent's integration into the global market has given extraordinary opportunities to foreign investors to invest here. The rise of the global pandemic, economic uncertainty, and international trade-related uncertainty has induced manufacturers at the world level to diversify their production locations. Africa has huge potential to integrate with the high technology sectors such as automobiles, mobile telephones, renewable energy and health care. On the other hand, some of the African countries are going through institutional changes. They are more towards democratisation and avoiding coups. These things make an important contribution to take African countries for this study. The catch of this study is to analyse the joint impact of ICT infrastructure and institutions on attracting inward FDI flows for some of the African countries. In this regard, we have taken 20 African countries for a panel data set over the period 2001-2019.

2. THE INTERPLAY BETWEEN FDI AND ICT

FDI often targets countries with a strong ICT infrastructure and skilled workforce, as these factors facilitate business operations and enhance market potential. In turn, FDI inflows can contribute to the development and expansion of the host country's ICT sector through technology transfer and increased investment in the industry. ICT, in conjunction with FDI, also aids in improving business efficiency, market access, and global competitiveness. Overall, the relationship between FDI and ICT is symbiotic, with each influencing and complementing the other to drive economic growth and technological advancement on both national and global scales.

The moderating role of ICT on FDI inflow refers to the impact of ICT investments made by a country on the relationship between FDI inflows and other economic factors. In this context, the level of ICT of a country can

act as a catalyst or a barrier in influencing the magnitude and direction of FDI inflows. The relationship between FDI and ICT is increasingly gaining attention in the academic literature. Studies suggest that countries with higher ICT levels are more likely to attract FDI, particularly in sectors related to technology and digital services. Advanced ICT infrastructure makes a country an attractive location for companies seeking to leverage digital technologies for their business operations. ICT expenditure can act as an enabler for FDI by improving a country's overall business environment, reducing transaction costs, and facilitating market access. A well-developed ICT ecosystem can enhance the efficiency and competitiveness of businesses, making the host country more appealing to foreign investors. ICT expenditure can moderate the relationship between FDI inflows and other factors. Countries that invest in ICT infrastructure can have enhanced digital infrastructure, improved business environment, technological advancement and innovation, knowledge transfer, and increased market size, but they might suffer from increased risk of cyber-attacks, digital divide. Countries that invest significantly in ICT infrastructure, such as high-speed internet, data centres, and digital communication networks, create an attractive environment for foreign investors. An advanced digital infrastructure makes it easier for businesses to operate efficiently, access global markets, and manage their operations remotely, thus positively influencing FDI inflows. ICT investments can contribute to creating a business-friendly environment by streamlining administrative processes, reducing bureaucracy, and promoting e-governance. This improved business climate may attract more FDI as it reduces operational complexities and costs for foreign investors. Moreover, higher ICT expenditure often leads to technological advancements and innovation within the domestic economy. These innovations can drive competitiveness and attractiveness for FDI, as investors are drawn to countries with a well-developed technology ecosystem. In addition to the above, knowledge transfer becomes easy for the countries when they invest in ICT infrastructure. When a country invests in ICT, it fosters knowledge-sharing platforms and educational opportunities related to technology and digital skills. This can lead to a better-equipped local workforce, which, in turn, can be appealing to foreign investors seeking a skilled labour pool (see Gorg, 2000; Zhao and Wang, 2009). ICT investments can expand a country's market potential and improve market access for businesses. With increased internet penetration and

connectivity, foreign companies may see larger growth opportunities, leading to a potential increase in FDI inflows. However, an abundance of ICT can be harmful for a country if no security measures are taken. On the other hand, high ICT expenditure may also expose a country to increased risks, such as cyber threats and data breaches. Countries with weak cybersecurity measures and vulnerabilities may deter FDI as investors may perceive potential risks to their investments. One more harmful effect that can be found is the digital divide. High ICT expenditure may widen the digital divide within a country, where certain regions benefit from ICT advancements while others lag. This divide could deter FDI in regions with inadequate digital infrastructure and access.

It is essential to note that the moderating role of ICT expenditure on FDI inflows is not universal and can vary depending on the specific economic, political, and technological context of each country. Countries need to strike a balance between ICT investments and other economic policies to create an attractive and sustainable environment for foreign investors.

This study indicates the moderating effects of institutional quality on the marginal effects of ICT infrastructure on FDI inflows, grounded on a panel data analysis of 20 African countries over the period 2001 to 2019, according to the availability of secondary data. The core hypothesis of our study is that ICT infrastructure positively and significantly affects FDI inflows to countries that are institutionally strong. In other words, improving institutional quality positively moderates the ICT infrastructure's marginal effect on FDI inflows. The next section discusses the reason for selecting the African continent. In Section 3, we take up the literature review. Section 4 discusses the objective of the study, the research gap and hypothesis building. The empirical model has been discussed in Section 5. Section 6 discusses the results of the empirical model, and Section 7 concludes.

3. WHY AFRICA?

Africa is the world's second-largest continent in area and population after Asia. The world's youngest population lives in Africa, and this raises the concern for more employment generation, more jobs and a market for the industries. Moreover, this continent is subject to severe climate change. Severe climate change can have a negative impact on agriculture, food and water security, and this may lead to negative consequences on people's lives and sustainable

development (see UNCTAD, 2023). The African continent has huge potential to capture the market of the global supply chain, thus integrating the knowledge with the new labour force adaptable to wage rate and technological innovation in the high technology sectors. The global supply chain has recently gone through immense pressure from unprecedented trade instability, economic uncertainty, geopolitical events, natural disasters, the 2008-2009 economic slowdown and Covid-19 (UNCTAD, 2023). Positive factors or comparative advantages of the African continent lie in the fact that it has a surplus of critical minerals. Critical minerals are needed for high-tech and green products, and a young population that is eager to have large consumer demand and the appetite for learning new technological skills and adaptable wages. Secondly, the African continental free trade area –easy entry to regional markets, improving production chains across the continent, and domestic industries becoming more willing to the global business. In addition, the world’s fastest-growing population- about 60 per cent of Africans are under the age of 25- makes it an attractive destination for supply chains (see UNCTAD, 2023).

Why the global players are likely to invest in Africa?

Global players, from manufacturers to distributors to consigners, are searching for new avenues to diversify the sources in the supply chain to minimise the risk. Africa can reap the benefits of being one of the world's largest natural repositories of high technology metals, improving its position of Africa in terms of the global scenario. For Example, semiconductor supply chains for microchip production in the electronics, automotive, pharmaceuticals and medical instruments and robotics. The figure below shows the top industries in Africa where ICT is used extensively (see UNCTAD, 2023).

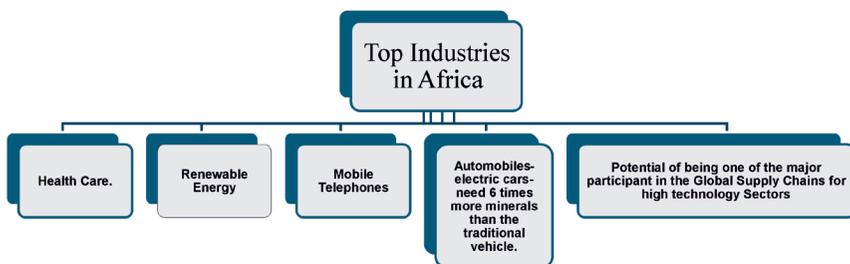


Figure 1: Top Industries in Africa

Source: UNCTAD and Authors' Calculation

Africa's Top Industries, Challenges Faced by Them and Some Positive Ways to Mitigate the Challenges:

Africa has fastest fastest-growing population, and 60 % of the population is under 25 years of age (see UNCTAD, 2023). Another comparative advantage of Africa is that the continent has a vast reserve of critical minerals (e.g. aluminium, cobalt, copper, lithium, manganese, etc) that are needed for the high technology sector and green production (see UNCTAD, 2023). The top industries that have the potential to contribute to the supply chain and employment generation are the mining industry, the automotive industry, solar panels, the mobile telephone industry, the health care sector, etc. However, despite lots of FDI and mineral wealth Mining sector is not able to transform the wealth and resources into sustainable economic and social development. Unequal terms of mining contract and exploration licences, absence of long-term capital, restricted access to production technologies, lack of full quality control of production foreign participation compared to the domestic. 17 African Nations have local content regulation-Angola, Botswana, Zambia, Zimbabwe, Democratic Republic of Congo, Ghana, Mali etc. 17 African Nations have local content regulation-Angola, Botswana, Zambia, Zimbabwe, Democratic republic of Congo, Ghana, etc. In Zambia, 96% participation comes from the international investors/suppliers in the mines (see UNCTAD, 2023). Only 4% (see UNCTAD, 2023) of the local in the service sector (catering, security and office maintenance). Most of the benefit would come from the sector by strengthening the local participation in the supply chain. This can range from pick-up trucks, tyres, drills, conveyor belts and specific replacement parts, to services, such as catering, surveying and human resource management. Sound local procurement policies, need for institutional reforms. This has led many governments of the continent to review their mining law and regulations to harness business opportunities for domestic enterprises and better reap the benefits of large-scale capital-intensive mining for inclusive growth. The continent has large reserves of Cobalt, Copper, Graphite, Lithium, Manganese and nickel that benefit the production of telephone batteries, circuit boards and other components (the main ingredient in the manufacturing of battery components is cathode precursors-nickel-manganese-cobalt oxide). This is estimated that building a 10,000-ton precursor facility in the Democratic Republic of Congo costs \$39 million (see UNCTAD, 2023). It increases quite

a bit if the industry is located in a region where there are no metals. The industry can benefit from AFTA and increased investment in the infrastructure. In addition to the above, Africa has a vast solar energy potential. Recent growth in renewable energy can help African countries to reap the benefits of providing solar power to the nations that do not have the potential to produce it. Strategies should be formed to involve the local entrepreneurs and the local people to create the possibility of more job creation. Not all African countries have the potential to produce solar panels due to the market, but they can contribute to additional employment generation through the development of projects and advisory and repair services. Moreover, the high reserve base of critical minerals makes the country a prominent manufacturer of high-tech electric vehicles. According to the UNCTAD (2023) report, Morocco is a good example of a domestic automotive industry where manufacturing is moving towards high-value added. This industry has gone through a huge transformation since 1957. In the initial days, it was only assembling the automobile parts. Later, it was transformed into full full-fledged production unit. The production growth created jobs in the industry (see UNCTAD, 2023).

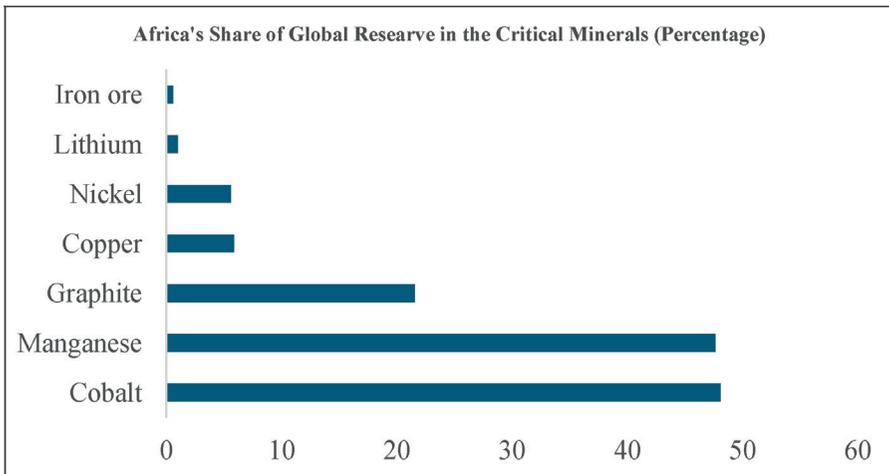


Figure 2: Africa's share of Global reserves of critical Minerals in percentage

Source: UNCTAD (2023) and Authors' Calculation

What Should be Done to Achieve These Goals

To seize these comparative advantages, African countries need to improve their productivity and their technical adaptation (More ICT orientation). They

should leverage trade agreements, invest in the continent's infrastructure-ports, roads and rail (Africa 2063) and south-south partnership and improve. To facilitate the production, distribution, logistics and procurement of high-tech sectors and complex products like medical devices and electric equipment, modern technology (automation, machine learning, artificial intelligence and blockchain) is needed. The figure below gives the range of logistics Performance Index (LPI, UNCTAD, 2023) for African countries in the year 2018, which has a minimum value of 1 and a maximum value of 5. The African average is 2.47, which is below the global average of 2.87.

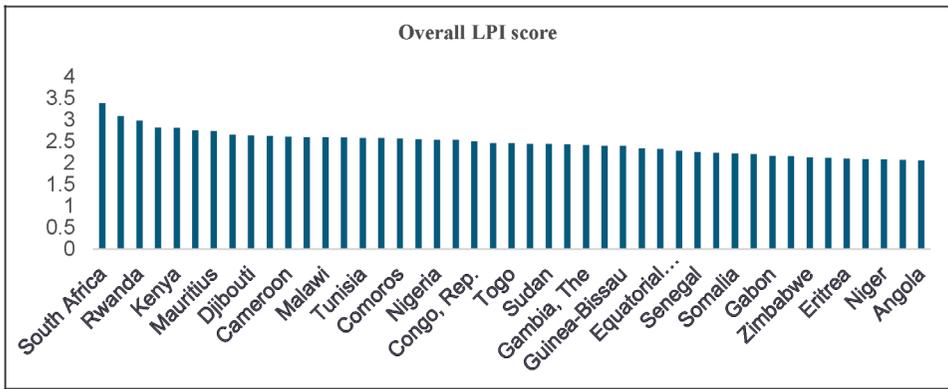


Figure 3: Overall LPI score 2018

Source: UNCTAD (2023) and Authors' Calculation

In addition to the above, a more equal partnership between the private and the government sectors is invited, along with institutional control on contracts and improvement in the institutional quality of the African countries. To optimise the supply chain, the continent needs to go Digital-hence the need for ICT. Kenya made a huge improvement in this regard by acquiring digital skills. Emphasis should be given to improve access to supply chain finance; Automation, Machine Learning, Artificial Intelligence and blockchain –necessary for highly digitalised medical devices and electrical equipment; and improve the SME. The SME are not part of the global supply chain due to limited use of digital technologies and lack of skills-funding gaps. There is a need for vertical and horizontal integration-there can be mergers and collaboration between the small firms and the large firms to take advantage of large-scale production and new technologies. Financial needs can be solved by

Digital technologies example, blockchain can improve financing for the SMEs by adopting digital audits and thus avoiding physical audits. Africa's supply chain finance market increased by 40 per cent from 2021 to 2022. Sound policies and regulatory environment –scale up the programme to endorse the widespread adoption of digital technologies. Better financing solutions will provide African countries and businesses with the needed liquidity. Financial Institutions and the Government should take control over the financial risk faced by the African companies and help in debt relief, as African countries face a higher borrowing rate than the developed world. African nations can bring stability to the government by avoiding coups.

Democratisation of African Nations

Democracy and African coups reflect uncertainty with the governments. Africa has been hit hard by a series of coups that threaten to take it back to the Military era. Burkina Faso, Guinea, Mali and Sudan have seen the government being overthrown and replaced by a military dictatorship. In 2023, the governments of Niger and Gabon were overthrown. Broader democratic decline has been seen in Benin, Comoros, Mauritius and Tunisia. During the late 1980s, the African continent saw a wave of democratisation, which was characterised by liberalisation of the political system and a move away from authoritarian regimes. As a part of the process, multiparty elections were held, and there was a widespread move towards inclusive governance formations from military regimes. The new system tried to establish democratic institutions and practices, the rule of law and civil liberties (Huntington, 1991). Many African nations tried to form democratic governments after they gained independence in the 1960s. However, their attempts faced severe scepticism as the process of democratisation was severely disrupted the coups, military rule and civil wars (Bratton and Van de Walle, 1997). But it would be a mistake to interpret that democracy in Africa is lost in this process. Even the citizens of the countries where a coup has taken place, people wanted a democratic government and rejected authoritarian rule. The end of the Cold War and the fall of the Soviet Union helped spread market reform in Africa (Kaloudis, 2003). In this effort, Western countries supported the political transition of the African countries. As a result, Ghana and South Africa successfully made the transition to democracy in 1990, while Zimbabwe was

still in authoritarian rule. The momentum of Nigeria was slowed down due to corruption.

4. LITERATURE REVIEW

Numerous studies have examined the link between FDI and institutional quality. Institutions encompass a country's political, legal, and economic framework, which includes the rule of law, property rights protection, contract enforcement, and regulatory environment.

Studies have shown that countries with better institutional quality tend to attract more FDI. Investors prefer countries with stable political systems, transparent regulations, and strong property rights protection, as these factors reduce uncertainty and risks. High-quality institutions not only attract more FDI but also contribute to its positive impact on economic development. FDI can stimulate growth and development in countries with strong institutions by fostering technology transfer, enhancing productivity, and creating jobs. The related literature attempts to find out whether the countries with a strong institutional setup and business-friendly policies genuinely attract more FDI compared to the countries with a weaker institutional set-up and less favourable policy mix. Wernick *et. al.* (2009) in a study seek to answer this question by taking data for FDI flows for a sample of 64 emerging economies over time. In another study, Tun *et. al.* (2012) investigate whether domestic institutional quality has any important role in attracting FDI. The relationship between FDI and economic growth for 16 Arab countries over the time period 1970-2008 is investigated by El-Wassal (2012). The role of economic, institutional and political factors in attracting FDI for BRICS (Brazil, Russia, India, China & South Africa) countries was taken up by Jadhav (2012). In a recent paper, Bokpin (2017) investigated the impact of FDI inflows across Africa with a 24-year panel data (see Ibrahim *et. al.*, 2019; Warsame, 2021). Ibrahim used panel data for 46 sub-Saharan countries over the period 1980-2016 to show the effect of ICT infrastructure on FDI inflows. Using the GMM method, the study showed that well well-developed ICT infrastructure can stimulate the growth of FDI inflows regardless of the measure of ICT. In a similar paper, Kurul *et. al.* (2017) revisited the relationship between inflow of FDI and institutional factors for developing countries by employing dynamic panel data methodology and addressed the endogeneity issues. System GMM method was used by Sabir *et.*

al. (2019) to investigate the impact of institutional quality on FDI flows using a panel data model for low, lower-middle, upper-middle and high-income countries for a period of 1996-2016. In a recent study, Chunyang *et al.* (2021) argue that the presence of “effective government” in the host country sends a positive indication to the foreign investors to invest. Accordingly, strong management capabilities of the host country act as an environment conducive to foreign investment. This study is done in a theoretical framework and is based on “government competition theory” and the “signalling theory”, and analyses how FDI inflows are affected due to the internal mechanisms of city marathons.

Some studies have explored the interconnectedness between institutions, ICT expenditure, and FDI. These studies analyse how institutional quality and ICT investments jointly influence FDI inflows and their impact on economic development. The findings suggest that a combination of strong institutions and significant ICT expenditure can create a virtuous cycle for attracting FDI. Countries with good governance and supportive institutions tend to allocate resources more efficiently, including ICT investments, leading to increased FDI inflows. Moreover, it is argued that ICT expenditure in countries with robust institutions can facilitate knowledge transfer and technology spillovers from foreign investors to the local economy, resulting in more sustainable and long-term developmental impacts. According to Nair and Shariffadeen (2009) application of digital platforms by economic agents can gain access to resources and world markets. Digital platforms can be used to bridge the information and knowledge gap. According to the literature, substantial investment in ICT in the past three decades has increased the usage of cloud computing, big data handling and other digital platforms. In another study, Soomro *et al.* (2022) showed that ICT can alone improve the economic growth as GDP increases by .75 per cent when the increase in ICT is 10 per cent. Accordingly, Chen *et al.* (2018), ICT led to a decline in industrial expenditures and increased the productivity of the corporate sector. In another paper, Mehmood *et al.* (2021) investigate the relationship between infrastructure and sectoral distribution of FDI inflow in China. The effect of ICT infrastructure, educational attainment and institutional quality on intra-African trade was analysed by Bankole *et al.* (2015). In

another recent paper, Wang *et al.* (2021) analysed the availability of ICT infrastructure on FDI inflows for eight developing countries (Bangladesh, Indonesia, Iran, Egypt, Nigeria, Malaysia, Pakistan and Turkey). Similarly, Bayo-Moriones *et al.* (2007) analysed the role of factors like ICT adoption, environment, and human capital in attracting FDI. Intensity of the use of ICT and socio-economic factors has been analysed by Mocnik *et al.* (2010). Similarly, Mushtaq *et al.* (2019) try to evaluate the role of ICT in the reduction of poverty and Inequality in a panel data model of 62 countries for the period 2001-2012. Leng *et al.* (2020) studied the role of ICT on income distribution among rural households in China. In a recent study, Bello *et al.* (2023) examined the effect of FDI and ICT on inclusive growth for Sub-Saharan countries over the period 2005-2020. The empirical results of the model show that the positive effect of FDI on inclusive growth would intensify if ICT diffusion reaches beyond the given threshold level.

Soumaré *et al.* (2016) made a comparative study of the characteristics of FDI inflows from China to Africa compared to developed countries. They studied the legal and institutional criteria, market size of the supporting industries, infrastructure facilities, development of technology, international cooperation, etc. in attracting FDI inflow. The factors affecting FDI inflows were again studied by Wang *et al.* (2016) using fuzzy preference relations (FPR) for developing countries. Bittencourt *et al.* (2021) analysed the FDI absorption capacity of the Brazilian economy and its impact on economic growth for the period 1996-2014. In a very recent study, the quality of institutions and financial development was analysed by Cherni *et al.* (2021) using panel data for 93 countries over the period 2002-2017, where a special focus was given to the MENA region. Role of governance infrastructure in attracting US FDI was taken up by Gliberman *et al.* (2003).

This study provides an indication of the moderating effects of institutional quality on the marginal effects of ICT infrastructure on FDI inflows, grounded on a panel data analysis of 20 African countries over the period 2001 to 2019, according to the availability of secondary data. The findings suggest that ICT infrastructure positively and significantly affects FDI inflows to the countries. Importantly, improving institutional quality moderates the ICT infrastructure's marginal effect on FDI inflows. This

means that an increase in the level of ICT infrastructure in a country with a better investment profile positively impacts FDI inflows. In all the cases, we have found statistically significant positive results. Depending on the results, policymakers are recommended to commence a set of modifications to improve the quality of institutions and markets and ramp up investments in ICT infrastructure.

5. RESEARCH GAP, OBJECTIVE OF THE STUDY AND HYPOTHESIS BUILDING

Through our preliminary research, we have noted a significant emphasis placed by foreign direct investors on the institutional quality of host countries. Previous studies have primarily concentrated on investigating the correlation between Foreign Direct Investment (FDI) and institutional factors. In parallel, numerous studies have explored the connection between FDI and a critical determinant—ICT (Information and Communication Technology) infrastructures. However, there lies a gap in the existing research landscape. Despite the wealth of studies, none have investigated the conditional role of ICT infrastructures, FDI, and institutional quality. This research gap highlights an important feature: the lack of attention on the potential combined impact of ICT infrastructures and institutional quality on the influx of FDI. This insight prompts a need to explore the conditional relationship between these two factors and their effect on FDI inflows.

This study deals with the conditional relationship between ICT infrastructure, country-specific Institutional quality and FDI inflows. Countries with improved ICT infrastructure will invite more FDI if they have a good quality of institutions. On the other hand, countries with a good quality of institutions will obtain more FDI inflows, provided the degree of ICT infrastructure is high for the country.

6. EMPIRICAL MODEL, DATA AND METHODOLOGY

The model, data, and methodology to explore the relationship between FDI, institutional quality and ICT infrastructure are discussed in the following section. According to the hypothesis of this study, the conditional effect of institutional quality, measured in terms of property rights protection, has a significantly positive significant effect in attracting FDI with increasing quality

of ICT infrastructure. We have taken 20 African countries for the period 2001 to 2019 for the analysis.

The Model

Our focus of this study centres on the joint/conditional effect between property rights protection and the level of ICT infrastructure in attracting FDI is structured (see equation 1). Following Baltagi (2008), Sen and Sinha (2017), Sinha and Saha (2022), Sinha *et al* (2024), Sinha and Das (2015), etc., the interaction effect is modelled for a panel data over the period 2001-2019 for 20 African countries.

$$FDI_{it} = \alpha_0 + \alpha_1 INVPRO_{c,t} + \alpha_2 ICT_{c,t} + \alpha_3 INVPRO_{c,t} * ICT_{c,t} + \alpha_4 X_{c,t} + \eta_c + \phi_t + u_{c,t} \quad (1)$$

Where *FDI* is the FDI as a percentage of GDP, and is our dependent variable. The focus variables are *INVPRO* (measure of property rights), *ICT* (measure of Information and Communication Technology Infrastructure of a country) and the interaction term *INVPRO * ICT* (which captures how *ICT* infrastructure of a country, in conjunct with strong property rights, can attract *FDI* in countries). *X* is a vector of control variables, η captures country fixed effects, ϕ Captures time fixed effects and *u* is a stochastic error term. Subscripts *c* stands for country and *t* stands for time. OLS and Two-Way Fixed Effects (Country-Year Fixed Effects) are done. Fixed Effects are calculated to capture any unobserved effect specific to individual cross-sectional units or time. The individual effects of property rights and *ICT* infrastructure are expected to influence *FDI* flows positively.

Our variable of interest is the interaction term *INVPRO*ICT*. A positive coefficient α_3 Indicates that the joint effect of property rights and *ICT* increases the level of *FDI* flows in a country. In other words, the quality of property rights and the level of *ICT* might not work effectively at the individual level, but they are effective in attracting FDI when they work together. The expected sign of the α_3 the coefficient is positive. A positive α_3 the coefficient indicates that countries with higher levels of property rights protection, measured in terms of *INVPRO*, receive relatively more *FDI* as their level of *ICT* rises.

Choice of Control Variables

The selection of control variables is according to the related literature. The variables are merchandise trade as percentage of GDP (OPEN), life expectancy at birth (LEB), percentage of urban population to total population (URBAN), inflation consumer prices (INFCP), general government final consumption expenditure as a percentage of GDP (GGFCEP) and per capita electric power consumption (EPC), natural resource rent as a percentage of GDP (NATURALRPGDP). The hypothesis is that higher life expectancy (as a proxy for human capital), a lower inflation rate (as a measure of macroeconomic stability), better electricity provision, a smaller size of the government and greater urbanization (as another proxy for market size) would foster FDI inflows (see Al-Sadig 2008, Noorbakhsh *et al.* 2001, Schmitz and Bieri 1972 and Schneider and Frey 1985, etc.).

Data Sources

Data about *INVPRO* was taken from the Political Risk Services (PRS) database of the ICRG (<https://www.prsgroup.com/>). We cannot use institutional variable data from PRS before 1984 because this is only accessible since 1984. The repudiation of contracts and expropriation risk data, which are utilised to build *CONTVIAB*, are also collected from PRS. The World Development Indicators (WDI) database of the World Bank contains the data for all the control variables. The data for FDI as a percentage of GDP is taken from the World Bank. We have used data on internal conflict, which is also an institutional variable, for a robustness check from the ICRG data set. We have constructed four composite indices of *ICT*, which we use for a robustness check.

Methodology

Equation (1) has been estimated by a panel of the least squares method for 20 African countries over the period 2001–2019¹. Two-way fixed effects (Country and Year Fixed effects) are used in this study to capture any overlooked effects specific to individual cross-sectional units or time.

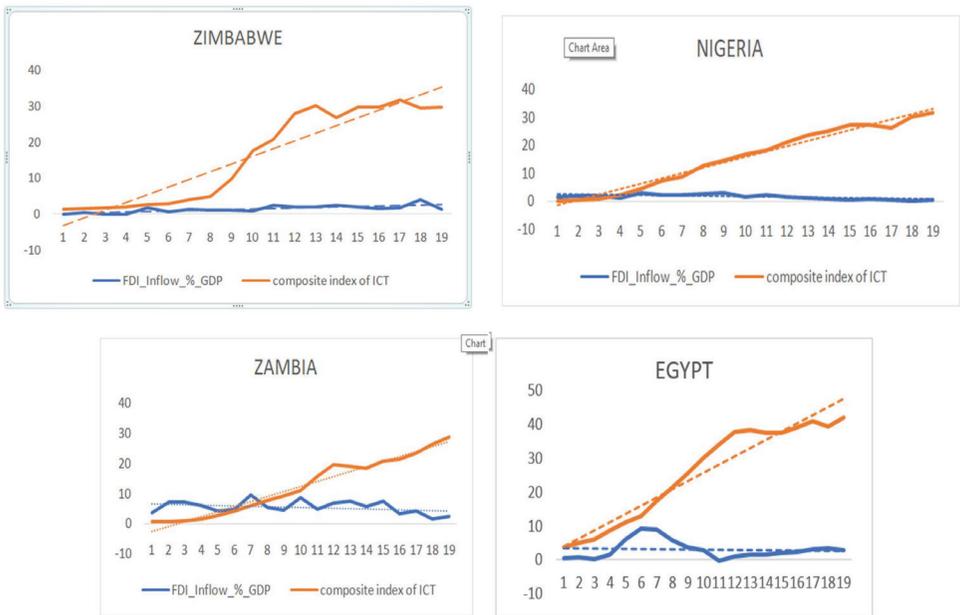
7. RESULTS

We begin our empirical analysis by looking graphically at the bivariate relationship between *ICT* infrastructure and *FDI* for the countries over the

period 2001–2019. We see wide variations in this bivariate relationship. To check this bivariate relationship, we first divide the countries into three groups (low institutional quality countries, middle institutional quality countries and high institutional quality countries) according to their *INVPRO* rank (see Figure 3). Most of the countries show a positive relationship between *ICT* infrastructure and inflow of *FDI* (Zimbabwe, Nigeria, Egypt, Ethiopia, Zambia). However, countries like Angola and Togo (that have a moderate level of institutional quality) show a negative trend between *FDI* and *ICT*.

Similarly, we have grouped the countries according to their composite *ICT* index and have derived the relationship between *FDI* inflow and *INVPRO* for different average values of the composite index of the *ICT* variable. We have divided the countries with different values of the *ICT* index into three groups: countries with a low level of *ICT*, moderate *ICT* countries and high *ICT* countries.

This analysis helps us to check the marginal effect of *ICT* on *FDI* for different levels of Institutional quality (see Figures 5) and again the marginal effect of institutional quality on *FDI* for different levels of *ICT* infrastructure (see Figures 6 to 8).



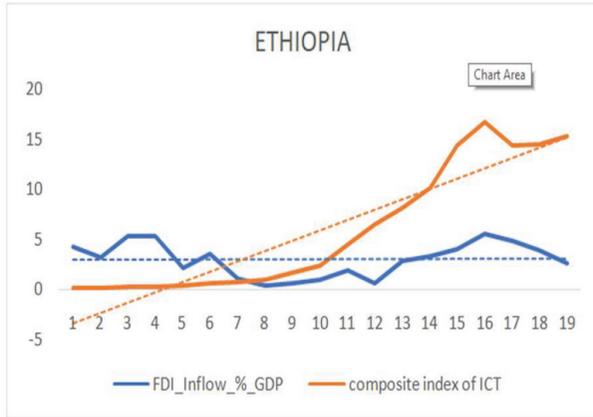
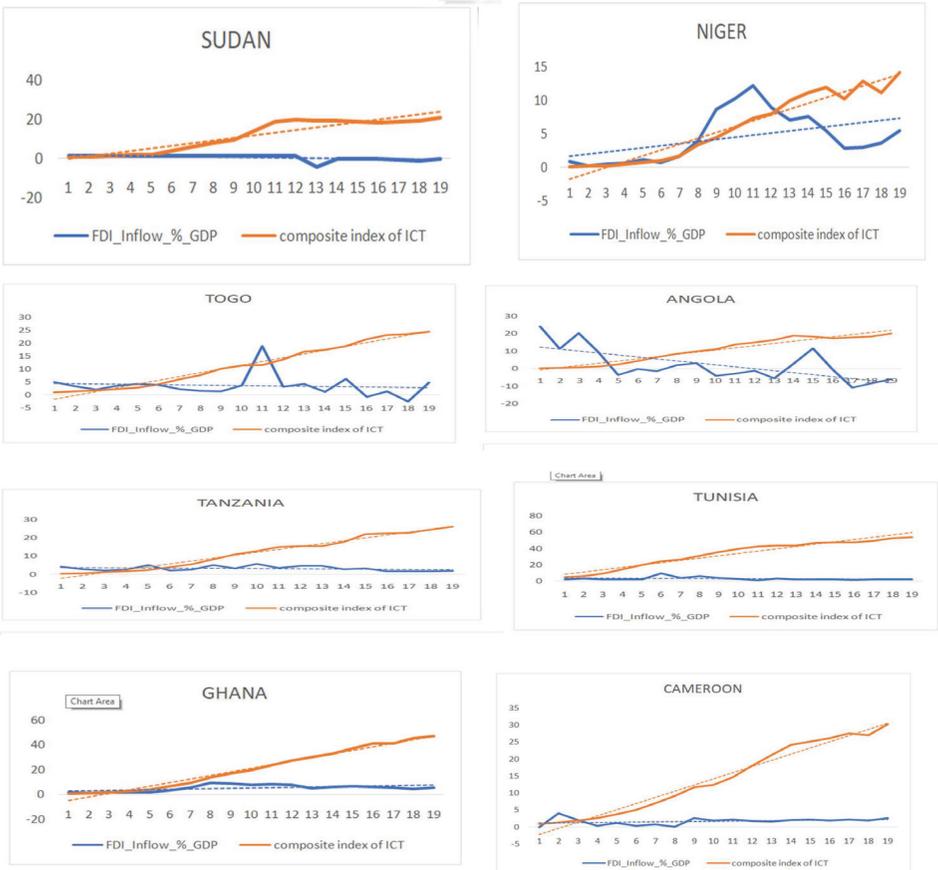


Figure 3: Graphical Relationship between ICT Infrastructure and FDI for Countries with Low Quality of Institutions



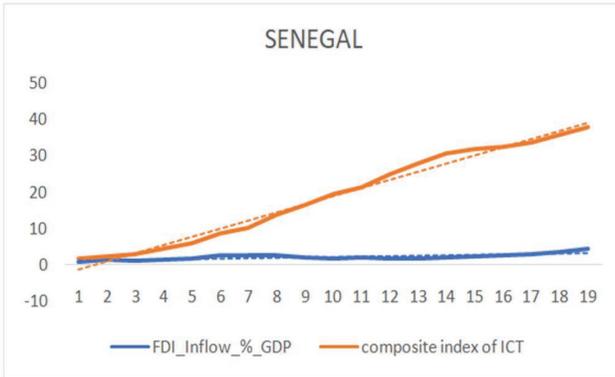


Figure 4: Graphical Relationship between ICT Infrastructure and FDI for Countries with Moderate Quality of Institutions:



Figure 5: Graphical Relationship between ICT Infrastructure and FDI for Countries with Comparatively High Quality of Institutions:

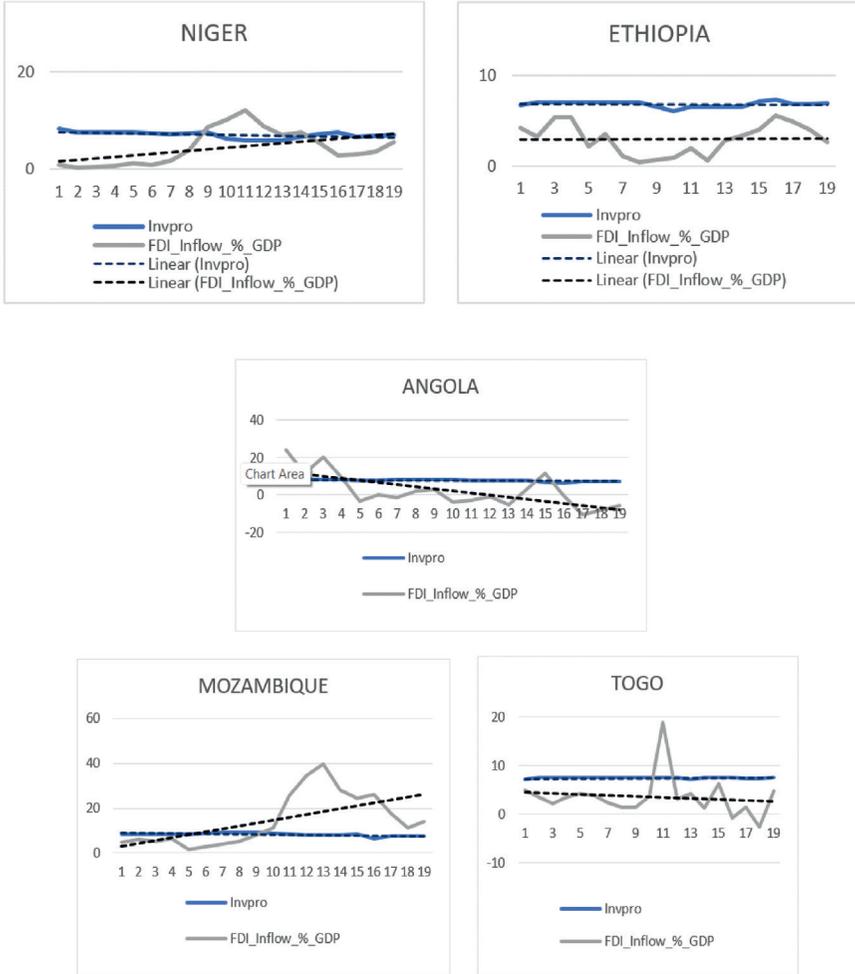
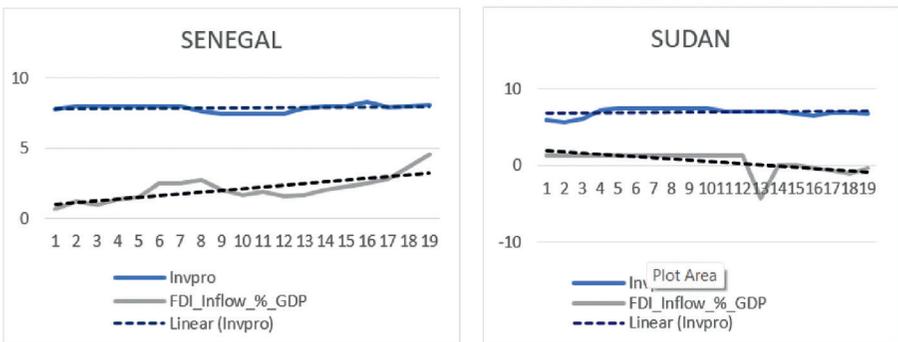


Figure 6: Graphical Relationship between Quality of Institutions (INVPRO) and FDI for Countries with Comparatively Low ICT infrastructure



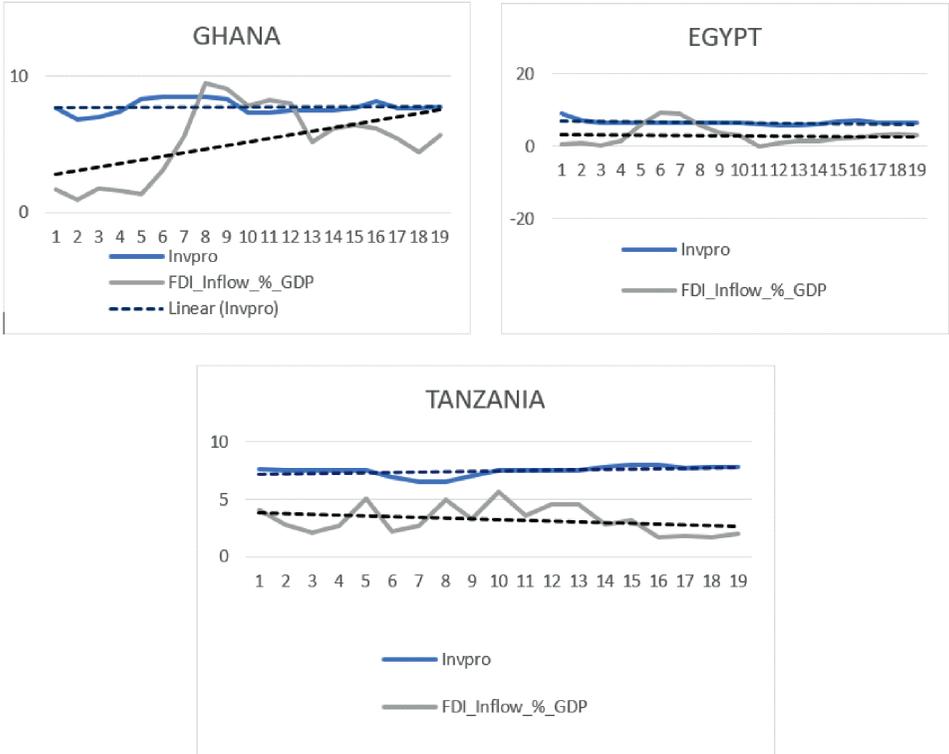
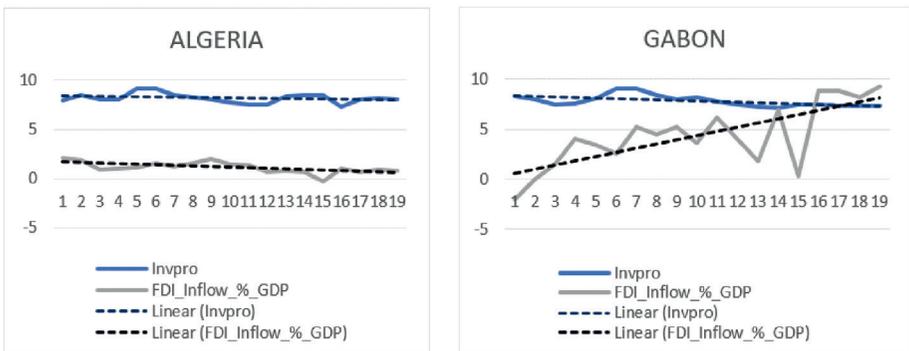


Figure 7: Graphical Relationship between Quality of Institutions (INVPRO) and FDI for Countries with Comparatively moderate ICT infrastructure:



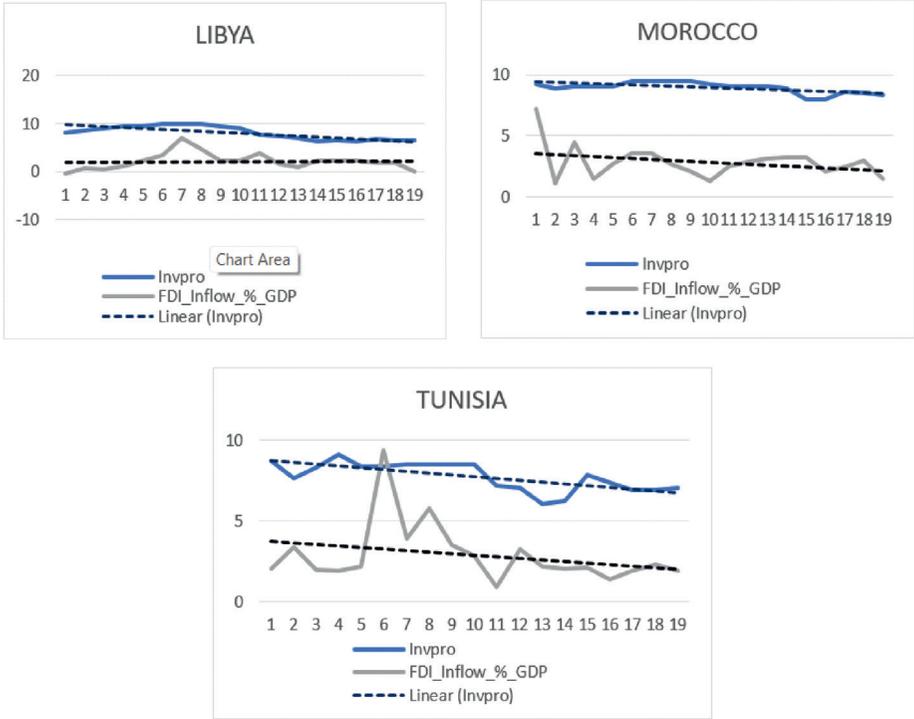


Figure 8: Graphical Relationship between Quality of Institutions (INVPRO) and FDI for Countries with Comparatively high ICT infrastructure:

8. REGRESSION RESULTS

Table 1: Relationship between FDI_PERCENTAGE_GDP and four ICT Infrastructure Index with institutional variables INVPRO and INTERNAL Conflict

FDI_INFLOW_% OF GDP COLUMN (1)	FDI_INFLOW_% OF GDP COLUMN (2)	FDI_INFLOW_% OF GDP COLUMN (3)	FDI_INFLOW_% OF GDP COLUMN (4)	FDI_INFLOW_% OF GDP COLUMN (5)	FDI_INFLOW_% OF GDP COLUMN (6)	FDI_INFLOW_% OF GDP COLUMN (7)	FDI_INFLOW_% OF GDP COLUMN (8)	FDI_INFLOW_% OF GDP COLUMN (9)
INVPRO	-0.567* (0.070)	-0.464 (0.133)						
INTERNAL_CONFLICT					-0.400* (0.093)	-0.371* (0.098)	-0.371 (0.119)	-0.335 (0.153)
COMPIC1	-0.310*** (0.000)				-0.515*** (0.000)			
COMPIC2		-0.230*** (0.001)				-0.401*** (0.000)		
COMPIC3							-0.595*** (0.000)	
COMPIC4								-0.593*** (0.000)
INVPROCOMP ICT1	0.031*** (0.001)							

FDI_INFLOW_% OF GDP COLUMN (1)	FDI_ INFLOW_% OF GDP COLUMN COLUMN (2)	FDI_ INFLOW_% OF GDP COLUMN (3)	FDI_ INFLOW_% OF GDP COLUMN COLUMN (4)	FDI_ INFLOW_% OF GDP COLUMN COLUMN (5)	FDI_ INFLOW_% OF GDP COLUMN COLUMN (6)	FDI_ INFLOW_% OF GDP COLUMN COLUMN (7)	FDI_ INFLOW_% OF GDP COLUMN COLUMN (8)	FDI_ INFLOW_% OF GDP COLUMN COLUMN (9)
INVPROCOMP ICT2		0.023*** (0.002)						
INVPROCOMP ICT3			0.041*** (0.001)					
INVPROCOMP ICT4				0.040*** (0.002)				
INTERNAL CONFLICTCOMP1					0.049*** (0.002)			
INTERNAL CONFLICTCOMP2						0.038*** (0.000)		
INTERNAL CONFLICTCOMP3							0.059*** (0.000)	
INTERNAL CONFLICTCOMP4								0.058*** (0.000)
EPC	-0.001 (0.455)	-0.001 (0.419)	-0.001 (0.578)	-0.001 (0.653)	-0.001 (0.316)	-0.001 (0.251)	-0.001 (0.551)	-0.001 (0.643)
LEB	-24.69** (0.028)	-23.74** (0.035)	-26.499** (0.019)	-26.715** (0.019)	-65.873*** (0.000)	-64.972*** (0.000)	-64.471*** (0.000)	-64.258*** (0.000)
URBAN	-0.508*** (0.000)	-0.509*** (0.000)	-0.501*** (0.000)	-0.499*** (0.000)	-0.483*** (0.000)	-0.477*** (0.000)	-0.496*** (0.000)	-0.496*** (0.000)
OPEN	0.054** (0.015)	0.054** (0.016)	0.056** (0.012)	0.056** (0.012)	0.056*** (0.006)	0.054*** (0.007)	0.061*** (0.003)	0.061*** (0.003)
INFCP	0.029** (0.012)	0.029** (0.012)	0.029** (0.011)	0.029** (0.011)	0.0281** (0.016)	0.0289** (0.013)	0.0261** (0.025)	0.026** (0.024)
NATURALRPGDP	0.009 (0.833)	0.011 (0.808)	0.004 (0.927)	0.005 (0.912)	-0.010 (0.811)	-0.005 (0.901)	-0.019 (0.643)	-0.018 (0.672)
GGFCEP	0.039*** (0.000)	0.388*** (0.000)	0.391*** (0.000)	0.390*** (0.000)	0.333*** (0.000)	0.329*** (0.000)	0.338*** (0.000)	0.338*** (0.000)
CONSTANT	74.421*** (0.000)	72.596*** (0.000)	77.170*** (0.000)	77.119*** (0.000)	149.62*** (0.000)	147.705*** (0.000)	146.974*** (0.000)	146.049*** (0.000)
COUNTRY FIXED EFFECT	yes	yes	yes	yes	yes	yes	yes	yes

P-value in parentheses. *** significant at 1% level of significance; ** significant at 5% level of significance; * significant at 10% level of significance.

The relationships between property rights institutions (*INVPRO*) with *FDI* are explored using two-way panel fixed effects,² and the results are reported in Table 1. The coefficients of *INVPRO* and *ICT* are negative at the individual level and significant, suggesting that property rights and *ICT* are not able to bring *FDI* inflows at the individual level rather behave oppositely. Interestingly, the findings reflect that the interaction term between *INVPRO* and *COMPACT1*, *COMPACT2*, *COMPACT3* and *COMPACT4*³ is positive and significant (see TABLE-1). The findings reveal that property rights and *ICT* infrastructure are complementary to each other after incorporating two-way fixed effects. This supports our core hypothesis that countries with strong property rights are

more likely to attract *FDI* if they have a good quality of *ICT* infrastructure. Our hypothesis passes the robustness check (for the robustness check, we have used four different composite indices of *ICT* and Internal Conflict as alternative variables). Countries with strong institutions complemented by a good quality of *ICT* will not be devoid of foreign investments. With respect to our control variables, the coefficients of *OPEN*, *INFCP*, and *GGFCEP* are positive and significant, and the results are consistent across the models⁴. On the other hand, coefficients of *EPC*, *LEB* and *URBAN* are negative and significant and consistent across the model. We have also conducted tests for multicollinearity⁵.

9. CONCLUDING REMARKS AND POLICY PRESCRIPTIONS

In conclusion, excellent institutions help to foster *FDI* inflow with the help of an improved *ICT* sector. A country needs a stable investment climate, favourable legislation, a sound infrastructure, and a trained labour force to draw in international investors. These nations are in a good position to take advantage of the opportunities the *ICT* sector provides and promote its expansion through increased *FDI* inflow. According to this study, for different levels of institutional quality measured in terms of *INVPRO*, *ICT* infrastructure, and *FDI* is positively related. In other words, with an increase in the level of *ICT* infrastructure, a country can have a positive result to attract *FDI* inflows if the country is institutionally strong. Hence, from the perspective of policy prescription, we can say that an increasing *ICT* infrastructure expenditure can accelerate the absorption capacity of a country to attract more *FDI* inflows, provided the country has a strong quality of institutions. Therefore, the countries should invest more in *ICT* infrastructure and try to improve their institutional quality to attract foreign funds.

ANNEXURE

A1: List of Countries used in this study:

COUNTRY
Sudan
Nigeria
Ethiopia
Algeria
Egypt
Zimbabwe
Morocco
Senegal
Angola
Tanzania
Niger
Cameroon
Gabon
Togo
Libya
Ghana
Tunisia
Mozambique
Zambia
Namibia

A2. Summary Statistics:

Variables	Observations	Mean	Std. Dev.	Min	Max
CONTVIAB	304	6.341	1.642	1.25	8.75
INVPRO	304	7.078	1.633	1	10
Internal_Conflict	304	8.591	1.416	2.958	11
External_Conflict	304	10.006	1.238	5.375	12
Composite_Index	304	7.485	1.085	4.158	9.8
FDI inflow	304	3.984	5.22	-10.725	39.456
EPC	304	527.406	516.245	26.232	1692.406
LEB	304	1.766	0.054	1.634	1.884
URBAN	304	43.139	17.223	14.927	89.741
OPEN	304	54.313	22.468	17.011	115.312
INFCP	304	9.203	19.55	-8.237	255.305
GDPPC	304	2342.906	2333.052	194.873	10142.65
NATURALRPGDP	304	11.66	9.622	0.598	55.874
GGFCEP	304	14.077	5.113	0.951	28.014
COMPICT1	304	16.67	13.958	0.077	53.905
COMPICT2	304	21.732	17.953	0.078	65.518
COMPICT3	304	12.756	11.273	0.085	47.945
COMPICT4	304	12.546	11.546	0.067	47.72

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Notes

1. The number of countries selected in this study based on the data availability and to avoid missing data for some variables.
2. We conducted the Hausman test and subsequently opted for a fixed effect regression analysis.
3. COMPICT1, COMPICT2, COMPICT3 and COMPICT4 are the four composite ICT index developed by us. We have used different weights to build these indices. These indices also serve the purpose of robustness check.
4. A one percent rise in the openness of the host country increases the FDI inflow by 5.4 percent (see Chakraborty, 2001 for related literature).
5. The Mean VIF is 1.98 which is below 5. So, there is no problem of multicollinearity.

References

- Bankole, F. O., Osei-Bryson, K. M., & Brown, I. (2015a). The impact of ICT infrastructure and complementary factors on intra-African trade. *Information Technology for Development, 21*(1), 12–28.
- Bankole, F. O., Osei-Bryson, K. M., & Brown, I. (2015b). The impact of telecommunication infrastructure and institutional quality on intra-Africa trade. *Information Technology for Development, 21*(1), 29–43.
- Bello, A. A., Renai, J., & Hassan, A. (2023). Synergy effects of ICT diffusion and foreign direct investment on inclusive growth in Sub-Saharan Africa. *Environmental Science and Pollution Research, 30*, 9428–9444. <https://doi.org/10.1007/s11356-022-22689-3>
- Bopkin, G. A. (2017). Foreign direct investment and environmental sustainability in Africa: The role of institutions and governance. *Research in International Business and Finance, 39*(A), 239–247.
- Chakrabarti, A. (2001). The determinants of foreign direct investment: Sensitivity analysis of cross-country regressions. *Kyklos, 54*(1), 89–113.
- Cherni, F., Goaid, M., & Sarea, A. (2021). Quality of institutions, ICT diffusion and financial development: An empirical evidence from developing countries. In A. Hamdan, A. E. Hassanien, R. Khamis, B. Alareeni, A. Razzaque, & B. Awwad (Eds.), *Applications of artificial intelligence in business, education and healthcare* (Studies in Computational Intelligence, Vol. 954). Springer. https://doi.org/10.1007/978-3-030-72080-3_25

- El-Wassal, K. A. (2012). Foreign direct investment and economic growth in Arab countries (1970–2008): An inquiry into determinants of growth benefits. *Journal of Economic Development*, 37, 79–100.
- Gamage, T. (2019). Determinants of cloud computing adoption among SMEs in Sri Lanka: A meta theoretical framework. *Asian Economic and Financial Review*, 9(2), 189–203. <https://doi.org/10.18488/journal.1.2019.92.189.203>
- Globerman, S., & Shapiro, D. (2003). Governance infrastructure and US foreign direct investment. *Journal of International Business Studies*, 34, 19–39.
- Görg, H. (2000). Multinational companies and indirect employment: Measurement and evidence. *Applied Economics*, 32, 1809–1818.
- Ibrahim, M., Adam, I. O., & Sare, Y. A. (2019). Networking for foreign direct investment in Africa. *Journal of Economic Integration*, 34(2), 346–369.
- Jadhav, P., & Katti, P. (2012). Institutional and political determinants of foreign direct investment: Evidence from BRICS economies. *Poverty & Public Policy*, 4(3), 49–57.
- Kar, S., & Sinha, S. (2014). Sectoral technical progress and aggregate skill formation. *Journal of Industry, Competition and Trade*, 14(2), 159–172.
- Kurul, Z., & Yalta, A. Y. (2017). Relationship between institutional factors and FDI flows in developing countries: New evidence from dynamic panel estimation. *Economies*, 5(2), 17. <https://doi.org/10.3390/economies5020017>
- Lee, I. H. I., Hong, E., & Makino, S. (2020). The effect of non-conventional outbound foreign direct investment (FDI) on the domestic employment of multinational enterprises (MNEs). *International Business Review*, 29(3), 101671.
- Leng, C., Ma, W., Tang, J., & Zhu, Z. (2020). ICT adoption and income diversification among rural households in China. *Applied Economics*, 52(33), 3614–3628. <https://doi.org/10.1080/00036846.2020.1715338>
- Linh, M. M. A., Ha, D. H., & Sen, M. D. T. (2019). The effect of FDI on economic growth in Vietnam. *Socio-Economic and Environmental Issues in Development*, 57.
- Mahmood, T., Shireen, S., & Mumtaz, M. (2021b). Testing the role of financial development and urbanisation in the conventional EKC: Evidence from China and India. *International Journal of Sustainable Development and Planning*, 16(3), 445–455.
- Mahmood, T., Ullah, S., & Mumtaz, M. (2021a). Dependence of energy intensity on economic growth: Panel data analysis of South Asian economies. *International Journal of Energy Economics and Policy*, 11(2), 234–239.

- Mocnik, D., & Sirec, K. (2010). The determinants of Internet use controlling for income level: Cross-country empirical evidence. *Information Economics and Policy*, 22(3), 243–256. <https://doi.org/10.1016/j.infoecopol.2010.01.002>
- Moriones, A., & López, F. (2007). A firm-level analysis of determinants of ICT adoption in Spain. *Information Economics and Policy*, 27(6–7), 352–366.
- Mushtaq, R., & Bruneau, C. (2019). Microfinance, financial inclusion and ICT: Implications for poverty and inequality. *Technology in Society*, 59, 101154. <https://doi.org/10.1016/j.techsoc.2019.101154>
- Orbes, I., Dang, H. M., & Eapen, A. (2019). Direct investment and human development. *Academy of Management Proceedings*, 10732.
- Ritchie, B. K. (2002). Foreign direct investment and intellectual capital formation in Southeast Asia. *OECD Development Centre Working Papers*, 194.
- Sabir, S., Rafique, A., & Abbas, K. (2019). Institutions and FDI: Evidence from developed and developing countries. *Financial Innovation*, 5(1), 1–20. <https://doi.org/10.1186/s40854-019-0123-7>
- Sen, K., & Sinha, C. (2017). The location choice of US foreign direct investment: How do institutions matter? *Journal of Institutional Economics*, 401–420. <https://doi.org/10.1017/S1744137416000333>
- Sinha, C., & Das, S. (2025). Cross-country variations in infrastructure development, inflow of FDI and quality of institutions. *Journal of Infrastructure Development*. <https://doi.org/10.1177/09749306241292886>
- Sinha, C., & Saha, S. (2022). Foreign direct investment and its location choice to developing nations: The role of ICT infrastructure and corruption. In *Digitalisation and Economic Development* (pp. 74–98). https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=1xH-0_YAAAAJ&citation_for_view=1xH-0_YAAAAJ:UeHWp8X0CEIC
- Sinha, C., Saha, S., & Vasilev, A. (2024). Institutional quality and US FDI outflows: Do political regimes matter? *Economic Systems*, 48(3), 101241. <https://doi.org/10.1016/j.ecosys.2024.101241>
- Soumaré, I., Gohou, G., & Kouadio, H. (2016). Comparative study of the characteristics of FDI from China to Africa versus developed countries. *Transnational Corporations Review*, 8(3), 165–177. <https://doi.org/10.1080/19186444.2016.1233715>
- Tun, Y.-L., Azman-Saini, W. N. W., & Law, S.-H. (2012). International evidence on the link between foreign direct investment and institutional quality. *Inzinerine*

- Ekonomika – Engineering Economics*, 23(4), 379–386. <https://doi.org/10.5755/j01.ee.23.4.2569>
- UNCTAD. (2023). *Economic development in Africa report 2023*. <https://unctad.org/publication/economic-development-africa-report-2023>
- Wang, P., & Rukh, B. (2021). The effect of information communication technology (ICT) infrastructure availability on FDI inflow in D8 countries. *E3S Web of Conferences*, 235, 02052. <https://doi.org/10.1051/e3sconf/202123502052>
- Wang, T.-C., Wang, C.-N., & Nguyen, X. H. (2016). Evaluating the influence of criteria to attract foreign direct investment to develop supporting industries in Vietnam by utilising fuzzy preference relations. *Sustainability*, 8(5), 447.
- Warsame, A. S. (2021). The relationship between information & communication technology and foreign direct investment inflow to Africa. *International Journal of Economics and Finance*, 13(5), 22–35. <https://doi.org/10.5539/ijef.v13n5p22>
- Wernick, D. A., Haar, J., & Singh, S. (2009). Do governing institutions affect foreign direct investment inflows? New evidence from emerging economies. *International Journal of Economics and Business Research*, 3(1), 1–17.
- Zhao, J., & Wang, K. (2009). Analysis of the technology spillovers of multinational corporations. *Transnational Corporations Review*, 1(2), 28–37.