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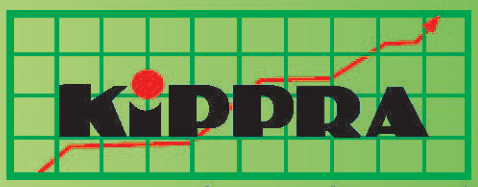

The KENYA INSTITUTE for PUBLIC POLICY RESEARCH and ANALYSIS

Effects of Foreign Direct Investment on Industrialization in Kenya

Lilian Kingori, Shadrack Mwatu and John Karanja

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Bishops Garden Towers, Bishops Road
PO Box 56445-00200 Nairobi, Kenya
tel: +254 20 2719933/4; fax: +254 20 2719951
email: admin@kippra.or.ke
website: http://www.kippra.org

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Abstract

Evidence shows that leveraging foreign direct investment (FDI) could lead to industrial growth by providing benefits such as technology spillovers, human capital development, improved international trade integration, and a more competitive business environment. These benefits collectively contribute to higher economic growth, which is crucial for reducing poverty in developing countries and promoting industrialization. This study evaluates the impact of FDI on industrialization in four key sectors in Kenya: mining, manufacturing, electricity, oil and gas, and construction, covering the period from 2007 to 2022. The study used three models using a one-step Generalized Method of Moments (GMM) to analyze the effects of FDI on sector-specific industrial value added relative to their contribution in Gross Domestic Product (GDP). Further, the study estimated a seemingly unrelated regression (SUR) to analyze the sector specific analysis effect of FDI and Domestic Direct Investments (DDI) on the sector's value added contribution to GDP for the four industrial sectors. The study found that FDI inflows have a minimal impact on overall industrialization. The sector-specific analysis shows that mining and quarrying benefit from both FDI and DDI, with foreign investments being crucial due to the capital-intensive nature of the sector. In manufacturing, FDI, especially greenfield investments, significantly enhances production capabilities through new technologies, while brownfield investments need regulatory reforms to improve their long-term benefits. The electricity, oil and gas sectors benefit from greenfield FDI and domestic investments, with greenfield projects boosting productivity and local investments. Brownfield FDI currently has a negative effect, but holds the potential for long-term benefits. The construction sector benefits from both FDI and DDI, but the domestic investment is more pronounced due to its capital-intensive nature. The sector also significantly benefits from both brownfield and greenfield FDI. To attract FDI in the mining and quarrying sector, it is important to focus on encouraging brownfield investments. This can be achieved through promotion of joint ventures between foreign and local firms. Such partnerships would facilitate technology transfer and help build local expertise. Similarly, in the manufacturing sector, creating an enabling policy and legal environment is crucial to attract and retain foreign investors. Reviewing the National Industrial Policy and emphasizing the foreign investment focus would play a key role in attracting more foreign investment and monitoring its impact on different industrial sectors in the country. Furthermore, there is a need to encourage greenfield FDI in the electricity, oil and gas sectors. To encourage such investments, incentives geared towards tax holidays and reducing duties on imports of machinery and infrastructure, which are key in the sector, would encourage greenfield projects. Lastly, it is essential to ensure that FDI in the construction sector aligns with local needs and meets local infrastructure requirements. Leveraging on public-private partnerships could facilitate attracting FDI in the sector.

Abbreviations and Acronyms

BETA	Bottom-up Economic Transformation Agenda
CFDI	Chinese FDI
EAC	East African Community
FDIB	FDI Brownfields
FDIG	FDI Greenfields
FDI	Foreign Direct Investment
GMM	Generalized Method of Moments
GDP	Gross Domestic Product
GIFTP	Growth Industrial Foreign Investment and Trade Programme
KeSIC	Kenya Standard Industrial Classification
MTP	Medium-Term Plan
M&A	Mergers and Acquisitions
MNCs	Multinational Corporations
HO	Null Hypothesis
OECD	Organization for Economic Co-operation and Development
PCSE	Panel-Corrected Standard Error
SVA	Sectoral Value Added
SUR	Seemingly Unrelated Regression
SEZ	Special Economic Zones
UNIDO	United Nations Industrial Development Organization
VIF	Variance of Inflation Factors

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1. Introduction

Industrialization has progressed rapidly on a global scale due to the attraction of foreign direct investment (FDI). Consequently, FDI has emerged as crucial for economies to become industrialized (Nyeadi, 2023). In recent years, African countries have been working to attract more FDI to promote their economic growth. Thus, developing countries are increasingly targeting FDI as a means of achieving industrialization, economic sustainability and capital formation. Evidence shows that FDI impacts economic growth in the host country, leading to industrialization (Ostic *et al.*, 2022). To attract foreign investors, countries have relaxed their FDI laws and implemented various investment policies (Organization for Economic Co-operation and Development - OECD, 2002).

The ability to attract FDI in Kenya's industrial sectors such as mining, manufacturing, electricity, oil and gas, and construction is critical to spur industrialization. These sectors form the backbone of Kenya's industrialization and primary beneficiaries of FDI. Attracting greenfield projects often introduces new technology and enhances local capacities in industrial sectors; brownfield investments can rapidly leverage on the existing infrastructure to scale up production, therefore increasing value addition in industrial sectors. FDI inflows to these sectors are expected to enhance industrial output contribution to GDP (Onyango, 2017).

The Kenya Vision 2030 projects that an increase in foreign investment will lead to industrialization, which will drive the growth of the economy by the year 2030. In implementing the Kenya Vision 2030, the Medium-Term Plan III 2018-2022 (MTP III) emphasized the need for accelerating industrialization through FDI by ensuring there is macroeconomic stability in the country through low inflation, stable foreign exchange rate, affordable interest rates, and low cost of energy, which has been identified as a challenge to industrialization in the country. The Kenya Vision 2030 expects FDI to support industrial activities and manufacturing, which has been singled out as a key driver of economic growth in Kenya. As a result, MTP IV (2023-2027) targets the share of manufacturing contribution to GDP to rise from 7.8 per cent in 2022 to 15.0 per cent in 2027. Attaining the MTP IV targets will require the country to attract and retain foreign investments in the manufacturing, agriculture and service sectors of the economy.

However, despite Kenya's strategic efforts and economic reforms and incentives through EPZs and SEZs to attract and retain FDI, there has been a notable decline in FDI's GDP contribution. Statistics show that the percentage of FDI inflows to GDP has dropped from 4.77 per cent in 2011 to 0.65 per cent in 2022, making it a policy concern for the country. Further, the decline of FDI inflows contribution to GDP poses a policy question on how the declining contribution of FDI to GDP impacts industrialization in the country.

The Bottom-up Economic Transformation Agenda (BETA) is committed to spurring industrialization and resolving obstacles that hinder attraction of FDI into the country. Consequently, the objective of the study is to evaluate the effect of FDI on the four main industrial sectors: mining and quarrying; manufacturing;

electricity, oil and gas and the construction sectors in the country, and provide policy recommendations and options that will attract more FDI and retain investors in the country, thus accelerating industrialization.

2. Overview of FDI in Kenya

The contribution share of FDI to GDP has been below 5 per cent for over a decade. Kenya has relied on FDI as a channel for investment in manufacturing, agriculture and service sectors, and to support their GDP contribution. To make the country attractive for FDI, the country embraced trade liberalization and the establishment of Export Processing Zones (EPZs) in the 1990s. Further, the introduction of EPZs in 1990 resulted in a sharp rise in the percentage of FDI to GDP due to incentives provided by the government. To further boost the attraction of FDI in the country, Kenya has adopted the Special Economic Zones (SEZs) as a model for attracting FDI in the country to boost industrialization. Consequently, the SEZ models have provided various incentives, including corporate tax holidays, waivers for import tariffs and exemption from numerous business regulations to attract new firms for investment and boost manufacturing for export (Were *et al.*, 2005).

In the East African Community (EAC), Kenya's FDI contribution to GDP has been declining since 2011 as illustrated in Table 2.1. While statistics show that Kenya was leading in FDI contribution to GDP in EAC in the year 2011, the trend has reversed and other EAC members have overtaken Kenya. Consequently, the current trend indicates that there is need for Kenya to re-evaluate its strategies for attracting and retaining FDI in the country to support industrialization as envisioned in the Kenya Vision 2030 and BETA.

Table 2.1 : Percentage of FDI inflows to GDP (%) East African countries

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Uganda	3.15	3.91	4.67	2.72	2.52	2.05	2.54	3.10	3.37	2.30	2.58	3.27
Rwanda	1.73	3.33	3.30	5.57	4.45	3.94	3.85	3.96	3.42	2.69	3.61	3.16
Congo D. Rep.	6.53	11.30	6.42	5.13	4.41	2.99	3.56	3.43	3.14	3.63	3.54	3.14
South Sudan	_	1.81	-6.23	0.29	0.00	-0.24	0.04	1.58	-5.38	0.42	1.57	2.22
Tanzania	3.52	4.46	4.46	2.76	3.21	1.69	1.71	1.66	1.94	1.39	1.43	1.43
Kenya	4.77	3.83	3.21	2.22	2.09	1.52	1.71	1.24	1.09	0.71	0.42	0.65
Burundi	0.15	0.03	0.30	1.74	0.26	0.00	0.01	..	0.03	0.24	0.25	0.28

Source: World Bank (2023), World Development Indicators

Regionally, statistics show that in 2011, Kenya dropped from being the FDI leading destination in the region to second last in 2023. This raises concern about the current state of the ability of the country to attract foreign investors. The BETA has committed to reverse this trend by opening Kenya for investments through various government policies to attract foreign investments.

2.1 FDI Shares Various Economic Activities

Statistics from several foreign investment surveys conducted between 2012 and 2019 reveal that Kenya's economic sectors have continued to attract FDI over time. Manufacturing, finance and insurance, wholesale and retail trade, repair of motor vehicles and motor cycles service, and information and communication continue to receive the largest percentage of FDI in the country, while it appears to be unevenly spread across other economic activities. Significantly, the share of FDI in manufacturing economic activities has been continuously declining, generating policy concerns, especially given that manufacturing has been identified by the Kenya Vision 2030 as a crucial driver of industrialization in the country.

Table 2.2: The share of FDI (%) contributions to various economic activities

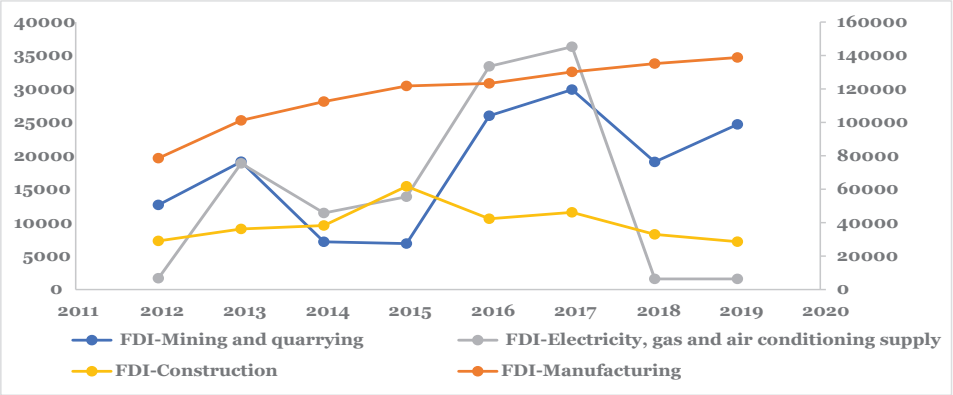
Economic Activity	2012	2013	2014	2015	2016	2017	2018	2019
Agriculture, forestry and fishing	5.3	4.6	0.5	0.4	4.2	1.6	7.5	7.8
Mining and quarrying	3.4	4.2	1.3	1.2	4.1	4.4	2.2	2.6
Manufacturing	20.9	22.3	21	20.7	19.6	19	15.5	14.8
Electricity, gas and air conditioning supply	0.4	4.2	2.1	2.4	5.3	5.3	0.2	0.2
Water supply, sewerage, waste management and remediation	-	0	0	0	0	0	0	0
Construction	1.9	2	1.8	2.6	1.7	1.7	0.9	0.8
Wholesale & retail trade, repair of motor vehicles and motor cycles service	16.1	15.8	12.1	12.2	17.7	15.5	12.7	15.4
Transportation and storage	7.6	6.6	2.2	-0.1	-0.2	-0.1	2.5	2.2
Accommodation and food service activities	3.6	3.1	2.7	2.5	2.4	2.2	2.3	2.1
Information and communication	7	6	18.2	20	8.5	7.4	17.1	16.1
Finance and insurance activities	30.6	28.4	34.4	34.5	33.9	40	33.8	33.2
Real estate activities	0	0	0	0	0	0	3.4	3.2
Professional, scientific and technical activities	0.2	0.1	1.4	1.2	1.4	1.4	0.9	0.8
Administrative and support service activities	1.1	0.9	1.3	1.2	0.2	0.2	0.8	0.8
Human health and social work activities	0	0	-		0.1	0.1	0.1	0.1
Arts, entertainment and recreation	0	0	-	-	0	0	0	0
Other service activities	0.7	0.5	0.1	0.2	0.1	0.1	0.1	0.1

Source: KNBS (2010-2020), Foreign Investment Surveys

2.2 Contribution of Domestic and FDI Investments into Industrial Sectors

The mining and quarrying sector shows a steady rise in FDI from 2011 to 2019, with a slight decrease in 2015, indicating growing foreign interest possibly due to new resource discoveries or improved mining policies. The manufacturing sector also sees a significant increase in investment highlighting its potential as a regional manufacturing hub. The electricity, gas and air conditioning supply sector experiences relatively linear FDI levels, hovering around Ksh 40,000, suggesting a mature market with stable policy conditions that do not attract substantial new investments. The construction sector demonstrates variability, peaking in 2015 before stabilizing from 2016 onwards, reflecting initial investment enthusiasm followed by potential market saturation or economic challenges (Figure 2.1).

Figure 2.1: FDI in industrial sectors (Ksh million)

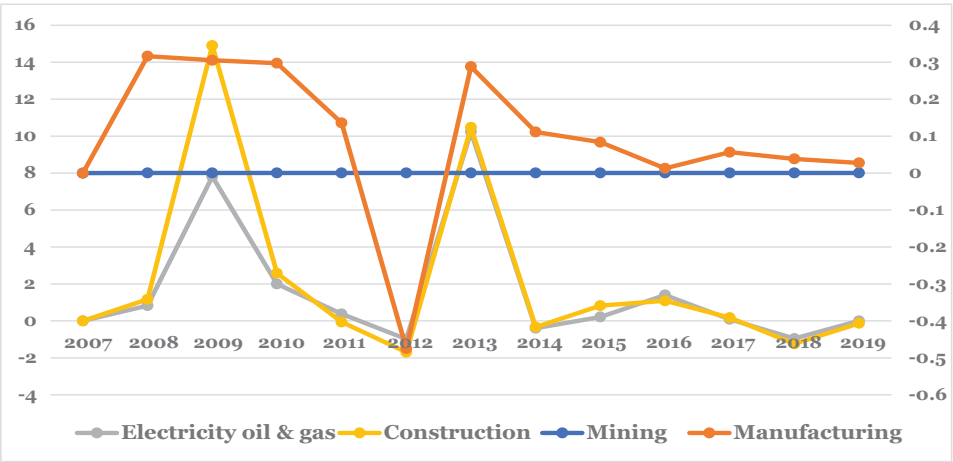


Source: KNBS (2010-2020), Foreign Investment Surveys

2.3 FDI Inflows into Industrial Sectors Growth Rates

Figure 2.2 shows the growth rate of FDI inflows into the industrial sector. Construction, electricity, oil and gas have erratic growth rates, with 2009 having the highest and 2012 the lowest. The sector has also been having a very low growth rate for the past years, because the sector has been receiving very few greenfield projects (Figure 2.3). Further, FDI growth rates in the mining and manufacturing sectors show a linear trend. This suggests a relatively stable pattern of FDI inflows into both the mining and manufacturing sectors, making it less pronounced than the other two sectors. This may be driven by factors such as technological advancements, market demand, government incentives and policies across these sectors.

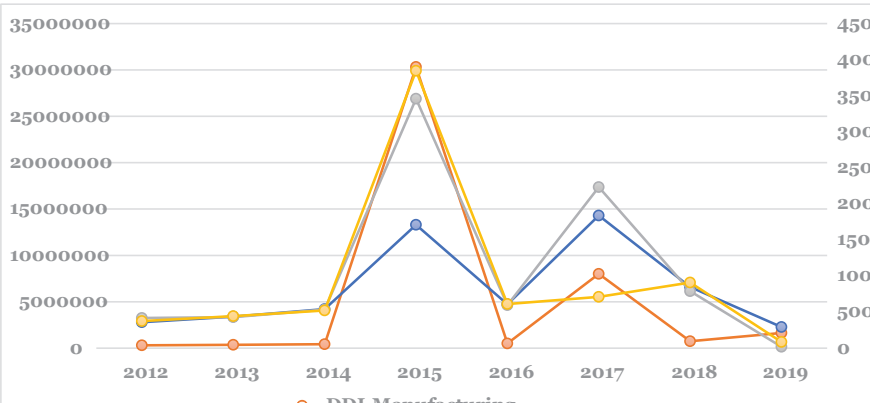
Figure 2.2: Growth in FDI inflows into industrial sectors (%)



Source: KNBS (2010-2020), Foreign Investment Surveys

Kenya's DDI has seen steady growth in recent decades, particularly since the early 2000s. The World Bank reports that Kenya achieved an average growth rate of 4.8 per year between 2015 and 2019. This is comparable to the average for lower-middle-income countries and above the Sub-Saharan Africa average. In 2023, Kenya's domestic investment expanded by 5 per cent, following a slight contraction in 2020 due to the COVID-19 pandemic. The growth is attributed to a broad-based expansion across various sectors such as agriculture, which has seen improvements in productivity and diversification. The service sector, including tourism, telecommunications and financial services, has grown significantly. The manufacturing sector is showing signs of expansion, particularly in areas such as light manufacturing and agribusiness.

Figure 2.3: Domestic direct investment in industrial sectors (Ksh Million)



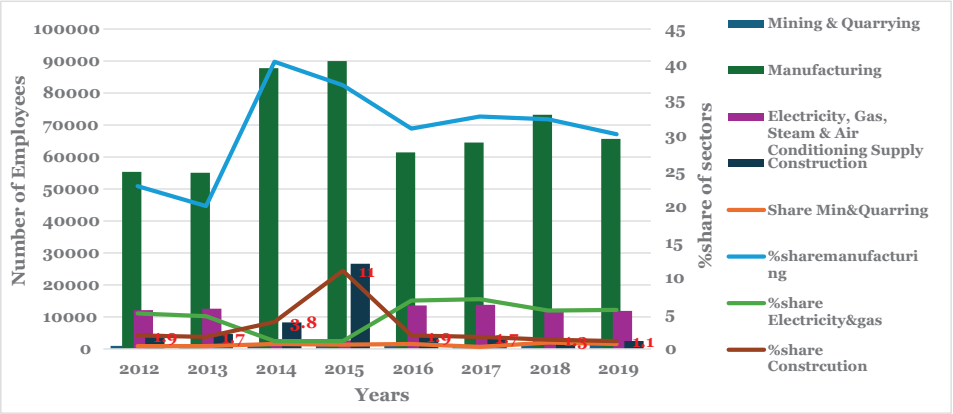
Source: KNBS (2010-2020), Foreign Investment Surveys

Figure 2.3 indicates DDI across four industrial sectors: mining and quarrying, manufacturing, electricity, gas and air conditioning supply, and construction. The DDI consistently exceeds FDI in each sector, with visible fluctuations. While FDI in these sectors shows a general decline over the period, DDI demonstrates varying trends, with some sectors such as mining and quarrying showing significant increases by 2019. The figure indicates a significant peak in DDI in 2015 for mining and quarrying, with moderate peaks for manufacturing and construction. The electricity, gas and air conditioning supply sectors show stable, but low investment levels throughout the years.

2.4 FDI Contribution to Employment in Industrial Sectors

The manufacturing sector contributes the highest number of employees across the industrial sectors; between 20.1 per cent to 40.4 per cent in the economy. The construction sector is second highest, contributing 1.1 per cent to 11 per cent of employees in the economy over the years (Figure 2.4).

Figure 2.4: Number of FDI employees across industrial sectors



Source: KNBS (2010-2020), Foreign Investment Surveys

The foreign investment survey (2020) indicates a decrease in workforce in foreign firms, with the total employment figures dropping from 226,4 to ??. FDI can serve as a source of economic growth, a tool for employment creation in developing countries and an accelerator in the industrial development of host economies (Soreide, 2001). Statistics from 2010 to 2019 show that more than 90 per cent of the jobs created by foreign investments were filled by locals, with fewer than 2 per cent filled by foreigners. Furthermore, statistics from EPZ, which are designated to attract export-oriented investments, show a consistent increase in employment creation for Kenyans. For example, data available shows that from 2015 to 2019, employment of locals grew from 50,302 to 60,390, equivalent to 20 per cent growth. Notably, investment in garments and textiles in EPZ produces an average

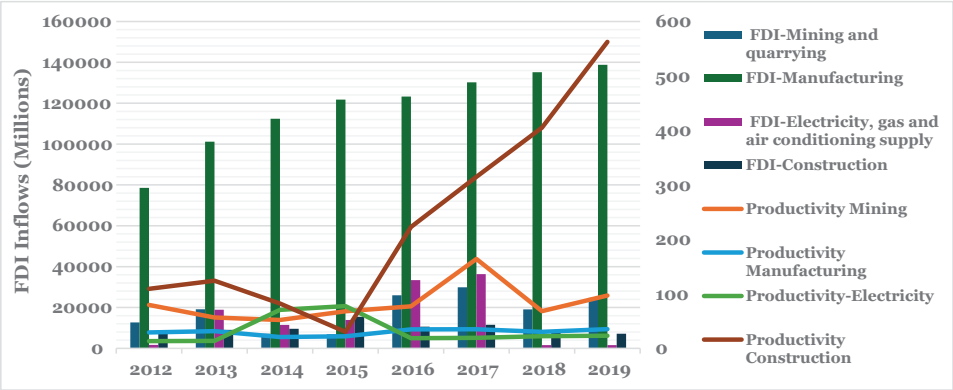
of 81 per cent of jobs, followed by agro-processing, which produces an average of 11 per cent of jobs for locals.

2.5 FDI Inflows and Productivity per Sector

Investment growth leads to improvements in industries' productivity, enabling firms to acquire new technology and upgrade machinery and equipment to expand their production capacities. Advancement in innovation and technology is critical for firms to remain competitive in rapidly evolving industries.

Figure 2.5 shows FDI inflows and productivity within four key sectors of Kenya's economy. The graph suggests a complex relationship between FDI inflows and productivity. The manufacturing sector stands out as a clear beneficiary of FDI to linear productivity. The construction sector has the highest growth rate in the level of productivity. The other sectors, however, show no strong or direct correlation between FDI inflows and productivity, pointing towards a more nuanced impact of FDI that could be influenced by sector-specific factors or the effectiveness of how FDI is managed and used in these industries.

Figure 2.5: FDI inflows and productivity per sector



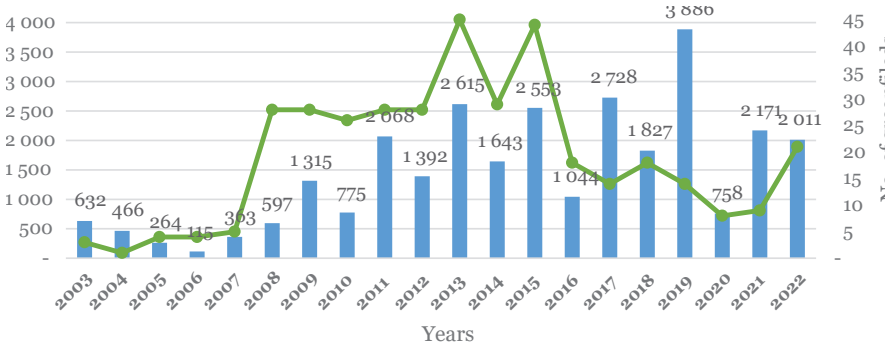
Source: KNBS (2010-2020), Foreign Investment Surveys

2.6 Greenfield Investments in Kenya

Kenya has continued to receive a significant amount of greenfield investments over the years. Available data from UNCTAD shows that Kenya has staggered greenfield investments from 2003 to 2022. For instance, in 2019, Kenya received greenfield investments worth US$3,886 million. The investment policy and regulatory framework in the country is keen to support FDI. In 2015, Kenya enacted the Special Economic Zones Act of 2015 and Regulations in 2017. The implementation of the regulatory mechanisms was to attract investments in

the country by offering incentives. As a result, Kenya's greenfield investments announced in 2019 amounted to US$ 2,728 million, up from US$ 1,044 million in 2018. Furthermore, with the development of the Kenya Investment Policy 2019, the country's greenfield investments increased from US$ 1,827 million in 2018 to US$ 3,886 million in 2019. Although the volume of greenfield investments fell in 2020 because of the COVID-19 pandemic, it began to rebound in 2021, as seen in Figure 2.6.

Figure 2.6: Value of greenfield investments in US$ millions

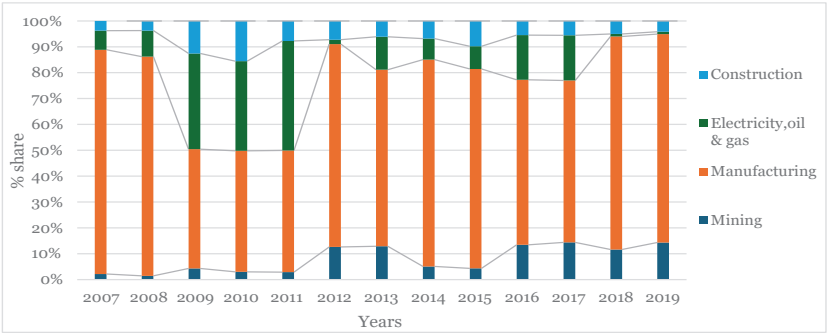


Source; UNCTAD (2003-2022)

2.7 Flow of FDI Greenfield into Industrial Sectors

The manufacturing sector seems to be attracting the highest share of greenfield investments compared to the other industrial sectors. Electricity, oil and gas have been receiving significant value of new projects, but have seen a huge drop over the past years, while that of the mining sector has been increasing. The construction sector seems to be attracting very few new projects.

Figure 2.7: Flow of FDI greenfield into industrial sectors

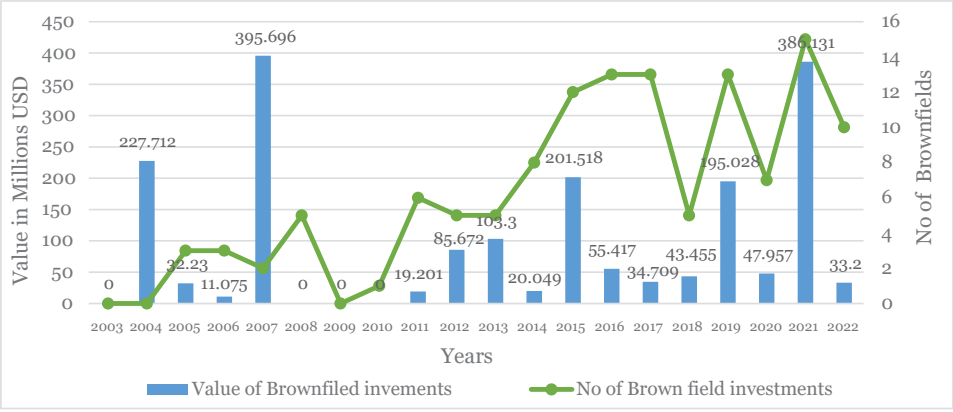


Source UNCTAD (2023)

2.8 Brownfield Investment (Mergers and Acquisitions) in Kenya

In recent years, Kenya has seen a significant rise in Mergers and Acquisitions (M&A), becoming one of the most attractive destinations for such transactions. Figure 2.8 shows that the number and value of mergers in Kenya seem to have an increasing trajectory. In 2019, there was an increase of brownfield investments in the banking sector due to an occurrence of deals in capital markets, contributing to a significant amount of US$ 195 million value of mergers. In 2021, Kenya received US$ 386 million value of mergers due to post-pandemic recovery and increasing interest from private equity and venture capital firms looking to invest in banking and financial services, energy, fast-moving consumer goods and the real estate sectors. Kenya reviewed and enhanced its regulations and criteria related to M&A. The Competition Authority of Kenya (CAK) implemented the modifications through the Competition (General) Rules 2019, which exempt transactions involving small businesses from the need for merger notification. The rules provide more explicit guidelines for regional notification, particularly in COMESA.

Figure 2.8: Value of brownfield investments in US$ millions

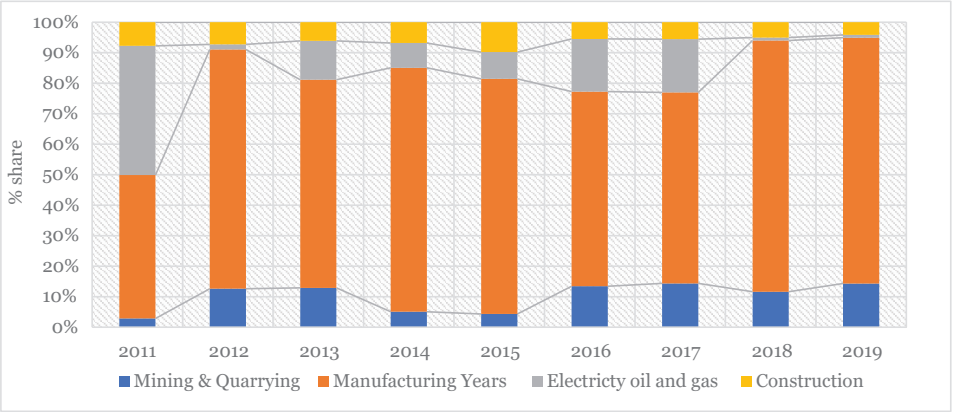


Source: UNCTAD (2023)

2.9 Flow of FDI Brownfields into Industrial Sectors

Kenya's industrial sectors attract a significant amount of brownfield FDI. The trend is particularly noticeable in sectors such as manufacturing. Electricity, oil and gas have been attracting significant brownfield investments since 2011, but data shows that, consequently, the sector has seen a drop in the value of brownfield investments.

Figure 2.9: Flow of FDI brownfields into industrial sectors



Source: UNCTAD (2023)

3. Literature Review

3.1 Theoretical Review

3.1.1 Theory of Heterogeneous Firms

The theory of firm heterogeneity investigates the mechanism driving industry dynamics and growth, by exploring how the processes are influenced by the presence of industries that have varying levels of productivity. Empirical observations foundation within this framework are disparities in productivity among firms and plants, which play crucial roles in determining the overall growth of an industry. These empirical patterns suggest that firm heterogeneity stands as a lasting aspect of the industrial sector and serves as a fundamental factor driving their dynamics (Castellacci, 2011).

Firms can invest in research and development through innovation and technology to enhance their productivity and remain competitive in the market. The level of research and development varies between the leading and following industries. These levels of innovation and intensity are influenced by the level of competition in the product market (Aghion *et al.*, 2005). The framework of this model further suggests that the profit and value addition of firms are influenced by the size of the market as it determines the level of competition within the industries. Productivity, inherently tied to the market size and the dynamics of firm-level is influenced by the broader context of the industries, allowing the need to explore a wider range of sector-specific conditions for future research (Melitz and Ottaviano, 2008).

Within each industry, only a small proportion of firms engage in exporting, while the rest focus on the domestic market. Exporting firms differ from non-exporting firms in that they tend to be larger, require more capital and skilled labour and have very high levels of productivity. The theory assumes they have uniformity in technology and firm productivity. This assumption implies that all firms within a given industry should have the capacity to export to any country (Helpman, 2006) and the reorganization of production across national borders. Although traditional trade theory has much to offer in explaining parts of this puzzle, other parts required new approaches. Particularly acute has been the need to model alternative forms of involvement of business firms in foreign activities because organizational change has been central in the transformation of the world economy. This paper reviews the literature that has emerged from these efforts. The theoretical refinements have focused on the individual firm, studying its choices in response to its own characteristics, the nature of the industry in which it operates, and the opportunities afforded by foreign trade and investment. Important among these choices are organizational features, such as sourcing strategies. But the theory has gone beyond the individual firm, studying the implications of firm behaviour for the structure of industries. It provides new explanations for trade structure and patterns of foreign direct investment, both within and across industries, and has identified new sources of comparative advantage.

3.1.2 Dunning's Eclectic Theory

The Dunning eclectic paradigm is still one of the most detailed frameworks for analyzing factors that determine an FDI firm's response to configuration. This is contextual, reflecting the peculiarities of both the parent and host country, industry and the characteristics of the investing firm (Dunning, 2020). The theory analyses two categories of engagement in international relations to determine the nature of a country's involvement. The first participation involves the economic activities operating within the borders, thus leveraging on national resources, but with goods and services intended for the outside market. The second involvement is concerned with the activities of national economic agents, which use resources from multiple countries to manufacture goods and services for the international market (Mohammed and Mwenda, 2015). It implies that firms are unlikely to pursue FDI if they can obtain the service or product locally at a cheaper cost, and they can decide on the most effective strategy to enter a new foreign market based on ownership, location of the country under consideration, and the internalization advantages of a particular circumstance (Brouthers, Broutherst, and Werner, 1996).

3.1.3 Monopolistic Advantage Theory

Monopolistic Advantage Theory, initially postulated in S.H. Hymer's doctorate dissertation and later developed by C. P. Kindleberger, explains why Multinational Corporations (MNCs) can compete successfully against local firms. The theory elicits why firms choose to internationalize their operations. According to the theory, MNCs embrace FDI because it provides them with access to resources and capabilities in international markets, and a degree of monopolistic power relative to foreign competitors (Salimath, 2009). Having firm-specific 'ownership' or 'monopolistic' advantage is a requirement for a firm to manufacture in a foreign country. While several flaws and product markets might lead to monopolistic advantages, not all are necessarily favourable for overseas manufacturing. To give rise to multinational operations, the benefits must first provide a competitive advantage to the firm involved, not just over its domestic rivals, but also over possible investors in the host country (both domestic and foreign). Second, they must be exportable and economically exploitable in a foreign location; and third, profitability must be exploited by the firm itself rather than licensing them to other parties (Lall and Siddharthan, 1982).

3.2 Empirical Review

3.2.1 FDI and industrialization

According to Zhang (2014), Industrial Competitiveness (IC) is a country's capacity to competitively produce and export manufactured goods. The study focuses on assessing the effects of FDI on IC in China, given the significant success of the

Chinese industry and the substantial growth in FDI flows over the last decade. The study analyzes the role of FDI in 21 manufacturing sectors across 31 regions during a 6-year period (2005-2010). Using United Nations Industrial Development Organization - UNIDO (2002) technique, IC index measures multidimensional industrial performance. The findings reveal that FDI has a considerable positive impact on China's industrial performance, particularly in low-tech manufacturing compared to medium and high-tech sectors. The contribution is enhanced by FDI interaction with local human capital. The study also notes that the role of FDI strengthens over time, and changes in FDI have corresponding effects on changes in industrial performance.

In a study by Ngouhouo and Ivo Ewane (2020), the effects of FDI on industrialization are empirically explored by comparing the franc and non-franc zones across 25 African countries from 1990-2017 using panel data. The findings indicate a positive and substantial influence of FDI on industrialization in franc zone countries, while a negative but significant effect is observed in non-franc zone countries. The study emphasizes the importance of policy variables, particularly governance, in modulating the impact of FDI on African industrialization. Policy implications suggest that policy makers should prioritize measures such as good governance, effective and non-corrupt public institutions, and policies supporting open markets. The study indicates that countries enhancing governance in these areas are likely to attract not only more FDI inflows, but also larger absolute sums. It recommends a re-evaluation of national policies aimed at attracting FDI, emphasizing the need for sound monetary and industrial policies, while streamlining policies within the same framework.

Ben Mim *et al*. (2022) examined the impact of FDI on African economies, focused on nonlinearity and the role of receipt countries' absorptive capacity as a catalyst for the spillover effects of foreign investments. The empirical approach analyses a threshold connection between FDI and industrial production. To have a good impact on indigenous industries, FDI should fall between an upper and lower bound. The data also implies that poorly industrialized countries and those with high absorptive capacity benefit from FDI spillover effects. They also estimate that financial development, human development, infrastructure, and the legal framework are all important for FDI to contribute to promoting industrialization process in Africa.

Gui-Diby and Renard (2015) examined the relationship between inward FDI and the industrialization process in Africa using panel data from 46 countries spanning from 1980 to 2009. The findings suggest that FDI inflows have no substantial impact on countries' industrialization. This conclusion remains consistent even with the inclusion and modification of various factors such as the size of the banking sector, trade balance, government interventions and sub-period analysis. The study implies that governments' failure to create an enabling environment for FDI to catalyze industrialization might explain FDI's limited contribution in this context. This situation often leads to the hosting of resource-seeking FDI inflows and the establishment of weak or non-existent ties between multinational corporations and local firms.

Newman *et al.* (2016) focused on understanding the limited industrial development in Africa compared to emerging Asia. The research compiles detailed analyses of industrial strategies and outcomes in 11 countries. The study provides a comprehensive analysis of the current industrialization landscape in low-income Africa. Comparative findings suggest that policy decisions, infrastructure, human capital and institutions influence disparities in industrialization outcomes. Notably, differences in exports, agglomerations and FDI distinguish SSA from Cambodia, Tunisia and Vietnam. These factors significantly impact firm-level productivity and are crucial for industrial growth. The study attributes infrastructural, skill and institutional deficiencies in SSA to the poor growth during the structural adjustment period and fiscal austerity, suggesting a larger role of bad luck rather than bad policy.

Megbowon *et al.* (2019) conducted a study to determine whether "China's FDI in SSA stimulates the sub-region's industrialization." The research covers 26 economies in SSA from 2003 to 2016, using the Panel-Corrected Standard Error (PCSE). The results indicate that China's FDI in SSA has a limited but favourable impact on industrialization. Additionally, the findings highlight the considerable and positive influence of power provision in SSA's industrialization. To maximize benefits from China, SSA governments should prioritize and, if necessary, modify future agreements to promote Chinese investment in sectors with positive links to manufacturing. Therefore, local outsourcing of inputs and intermediate production activities should be increased.

Darko and Xu (2022) conducted an empirical study investigating the long-run and interactive effects of Chinese FDI (CFDI) on Africa's industrialization. They used two-step GMM and PCSE techniques with a panel of 49 African countries from 2003 to 2020 in both the short- and long-run. The study found that CFDI positively influences industrial productivity by adding value to the association of CFDI, with labour and natural resources significantly impacting industrialization in the short-run. This emphasizes the importance of efficiency-seeking CFDI and the role of human capital, electricity and political stability in enhancing its influence on industrialization in both the short- and long-run.

Adom and Amuakwa-Mensah (2016) studied the conditional effects of FDIs and industrialization on energy production in 13 EAC from 1980 to 2011. Baseline findings show that energy productivity is supported by higher income and a well-integrated economy, while FDIs and strong industrialization hinder it in the sub-region. This conclusion remains robust even after excluding the high-income group. The study indicates that income significantly boosts energy productivity more in the low than medium-income group. Intense industrialization and FDI reduce energy productivity considerably only in low-income countries, while trade openness benefits the middle-income group. The study recommends a "Growth Industrial Foreign Investment and Trade Programme" (GIFTP), emphasizing the complementary role of FDIs, income, intensive industrialization and globalization in enhancing energy productivity in East Africa, particularly for the middle-income group. The findings suggest an unconditional study of energy production to serve as a starting point for future investigations.

Zhang (2021) explores the differing perceptions and impacts of CFDI and North-South investments in African economies. The positive sentiment toward CFDI within Africa suggests its potential as a catalyst for sustainable economic growth, while skepticism in Western countries indicates the need for careful consideration. Using cross-country panel data analysis, the study quantitatively emphasizes the importance of infrastructure, exports and industrialization in CFDI's contribution to Africa's development. As Africa attracts investment from emerging markets, understanding these nuances becomes crucial for informed policy decisions and sustainable development.

3.2.2 Institutional Factors

Ouyang and Fu (2012) suggest that analyzing FDI inter-regional spillovers enhances our understanding of how it influences growth. Emerging countries aiming for political stability amidst rapid development and increasing inequality must balance concentrated FDI's growth effects on regions where it is scarce. The study, using data from 277 Chinese cities (1996-2004) and a two-stage least square fixed effect estimation approach, examines how coastal FDI impacts economic growth in inland regions. Results indicate that a standard deviation increase in effective coastal FDI boosts the growth rate of the average inland city by 33 per cent. Particularly, East China's FDI, concentrated in ordinary trade industries, has the most significant impact on inland economic growth.

Sabir and Khan (2018) analyzed the effects of political stability and human capital on FDI in Asian countries. The study applies panel data fixed effect and generalized method of moment approaches on a sample of 18 South Asian and Pacific countries from 1981 to 2015. The findings show that political stability and human capital have a considerable impact on FDI. It was found that inflation, GDP per capita and political stability have significantly greater effects on FDI in the East Asia and Pacific region, while trade openness had lesser effects.

In a study by Groznykh *et al.* (2020), political stability was found to be directly proportional to FDI, with greater significance in developed countries, especially when they are investors. Improved corruption control, higher inclusion standards, favourable investment profiles, and efficient external policies make developed countries more attractive to investments from developing nations. The study suggests that developing countries should enhance their political environment to create favourable conditions for investor countries. Additionally, the findings indicate that, unlike in developed countries, political institutions are less influential in FDI inflows between developing countries, suggesting that other variables play a more crucial role in attracting investments in these contexts.

Thede and Karpaty (2023) present new data on multinational businesses (MNEs) adaptation to corrupt environments. Using a comprehensive business data set on Swedish manufacturers' operation from 1997 to 2015, the study investigates whether the corruption system lowers the corruption barrier to entry. The study estimates a mixed logit model and finds out that the substantial deterrent effect

of corruption is mitigated by corruption experience. This implies that MNEs learn to reduce the entry costs of corruption. Multinational corporations that obtain corruption experience get a competitive advantage over other businesses.

4. Methodology

4.1 Theoretical Framework

This study borrows heavily from the theory of industrial organization and technological spillovers by Tirole (1990). It examines how a country's structure attractiveness can boost industrialization. The study explores the dynamics of FDI on industrial growth, focusing on how inflows of FDI and the accompanying technology transfer influences the vibrancy of the domestic industrial sectors.

FDI facilitates new investments in a country's economy and supports technology transfer. The outcome is improved industrial activity that enhances industrial output, diversification and sophistication, and improved consumer demand by changing the attractiveness and competitiveness of locally produced industrial goods. FDI also influences industrial activity by exposing domestic firms to a certain level of competition, which is vital for continued diversification, sophistication and resilience of a country's industrial sector.

As local firms enhance productivity and quality to compete with FDI firms, they achieve higher efficiency and reduced production cost allowing them to offer competitively priced products in international markets. These products can meet and stimulate foreign demand, therefore driving export growth in the industrial sectors. The study considers the dynamics of DDI (local firms) and FDI (foreign firms) showing the differential game where each firm's strategy affects the others outcome in terms of investments, technology acquisition, industrial output and overall competitiveness.

In addition to focusing on the effect of FDI on industrialization, the study considers the effect of DDI on industrialization measured by the share of value added in GDP in Kenya. It hypothesizes industrialization as a function of investments - both foreign and domestic as shown in equations (4.1):

$$\textit{Industrialization} = f(\textit{foreign direct investments, domestic direct investments, controls}) \quad (4.1)$$

4.2 Empirical Model Equation

To facilitate estimations on the effect of investments on industrialization, investments are broken down into FDI and DDI. The FDI are further broken down into total *f* flows, and greenfield and brownfield investments. These are treated as key independent variables, while the dependent variable— industrialization, is measured as the share of value added in GDP. This implies that equation (4.1) is broken down into three (3) equations as in (4.2), (4.3) and (4.4), respectively:

$$\textit{Industrialization} = f(\textit{FDI flows, controls}) \quad (4.2)$$

Industrialization= f (FDI greenfield, FDI brownfield, controls) (4.3)

Industrialization= f (DDI flows, controls) (4.4)

Equation 4.2 estimates the overall effect of FDI on industrialization, equation 4.3 estimates the effects of various FDI components (greenfield and brownfield) on industrialization, and equation (4.4) estimates the effect of DDI on industrialization. The analysis focuses on four key industrial sectors: manufacturing; mining and quarrying; electricity, oil and gas; and construction.

The functional forms of equations (4.2), (4.3) and (4.4) are converted into econometric forms (4.5), (4.6) and (4.7), which are applied to panel data and estimation carried out using the Generalized Method of Moments (GMM). Darko and Xu (2022) used two-step GMM to conduct an empirical study investigating the long-run and interactive effects of CFDI on Africa's industrialization. The study applies panel data fixed effect and generalized method of moment approaches on a sample of 18 South Asian and Pacific countries from 1981 to 2015. The controls considered include: per capital GDP, technology and innovation, productivity and exports.

Industrialization=*f (FDI inflows, GDP per capita, innovation & technology, productivity, credit and exports)*

$$SVA/GDP_{it} = SVA/GDP_{it-1} + \beta_1 FDI/GDP_{it-1} + \beta_4 IT_{it-1} + \beta_5 GDPPC_{it-1} + \beta_6 Credit_{it-1} + \beta_7 Productivity_{it-1} + \beta_8 Export_{it-1} + \mu_t + \epsilon_{it} \quad \text{.....(i)}$$

$$SVA/GDP_{it} = SVA/GDP_{it-1} + \beta_1 FDIG/gdp_{it-1} + \beta_2 FDIB/gdp_{it-1} + \beta_3 IT_{it-1} + \beta_4 GDPPC_{it-1} + \beta_5 Credit_{it-1} + \beta_6 Productivity_{it-1} + \beta_7 Export_{it-1} + \mu_t + \epsilon_{it} \quad \text{.....(ii)}$$

$$SVA/GDP_{it} = SVA/GDP_{it-1} + \beta_1 DDI/GDP_{it-1} + \beta_2 IT_{it-1} + \beta_3 GDPPC_{it-1} + \beta_4 Credit_{it-1} + \beta_5 Productivity_{it-1} + \beta_6 Export_{it-1} + \mu_t + \epsilon_{it} \quad \text{.....(iii)}$$

From each of the three models, the study further estimates a Seemingly Unrelated Regression (SUR) for sector specific effect of FDI inflows/GDP to each of the sectors in model 1, effects of FDI components on each sector under model 2, and effects of DDI on each of the 4 industrial sectors under model 3.

4.2.1 Data and data sources

The data used in the analysis includes various variables extracted from the Economic Survey (2010-2023) and Foreign Investment Survey (2010-2019) conducted by KNBS and UNCTAD. The data is for four industrial sectors: mining and quarrying; manufacturing; electricity, oil and gas; and construction as categorized in the Kenya Standard Industrial Classification (KeSIC)[1]. The study covered 15 years spanning from 2007 to 2022, and 64 observations for each of the 4 sectors totalling 256 observations.

1. https://www.labour.go.ke/sites/default/files/2022-10/PRINT-COPY-OF-KESIC-STANDARD.pdf

4.3 Measurement and Definition of Variables

4.3.1 Dependent variable

The objective of this study is to assess the effects of FDI on industrialization in Kenya. According to UNDP (2015) and Chandra (2003), two metrics may be used to measure industrialization, which include indicators such as industrial output growth, sectoral value addition and employment. This study used sectoral value added (SVA) for four industrial sector's contribution to total GDP as measure of the dependent variable (industrialization) - SVA/GDP.

Table 4.1: Definition of variables

Variable	Signs	Measure	Description	Data source
Dependent variable				
Industrialization (Sector-Value Added /GDP)	SVA/GDP	Industrialization	Sector value-added for each sector contribution to total GDP at time (t)	KNBS
Independent variables				
FDI inflows /GDP	FDI/GDP	FDI flows	FDI inflows for each sector (i) contribution to total GDP at time t	KNBS
	DDI/GDP	Domestic investment		KNBS
DDI	DDI/GDP	Domestic investment	DDI_{sector}=Total sector investment–FDI $inflows_{sector}$	KNBS
FDI Brownfields	FDIB/GDP	Brownfield investment in Ksh millions/total GDP	(Total brownfield investment/Total FDI inflows) *FDI inflow per sectors	UNCTAD/KNBS
FDI Greenfields	FDIG/GDP	Greenfield investment in Ksh Million/total GDP	(Total Greenfield investment/Total FDI inflows) *FDI inflows per sectors	UNCTAD/KNBS
Control variables				
Innovation & technology	IT	Technological intensity	Ratio of intermediate consumption to output at basic prices	KNBS
Credit _sector	Credit	Credit for financing	Ratio of loans borrowed from financial institutions across the four sector/total bank credit	
Productivity	Productivity	Labour productivity	Ratio of output/ number of employees per sector	KNBS

Exports	Exports	Exports/sector output	Ratio of exports to output	KNBS
GDP per capita	GDPPC	Household income level and purchasing power	Ratio of sector GDP divided by the total population in a year	KNBS

4.3.2 Explanatory variables

In this study, the FDI variable is constructed in various forms: contribution of FDI inflows to each sector's contribution to the total GDP, contribution of FDI brownfields (FDIB) and greenfields (FDIG) in the four sectors.

Market size and household income (GDP per capita) are critical components of the big push industrialization paradigm, to reflect the potential real buying power of households and reduce the issue of heteroskedasticity. Adom and Amuakwa-Mensah (2016), Kang and Lee (2011) also find that FDI affects industrialization through market and technology transfer. These variables have a beneficial influence on industrialization. These studies mostly use GDP per capita as a proxy for household income.

4.4 Summary Statistics

In these analyses, the four sectors' value-added contribution to GDP -SVA/GDP were used as a proxy for the level of industrialization—the dependent variable.

Table 4.2: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Mining and quarrying					
Sector value added/GDP	16	0.008	0.001	0.005	0.011
FDI inflows/GDP	16	0.002	0.0015	0.00012	0.004
FDI brown/GDP	16	0.00005	0.00004	0.000004	0.000135
FDI green/GDP	16	0.001	0.001	0.0000867	0.002
Credit	16	0.0119	0.0064	0.00348	0.2234
GDP per Capita	16	1,151.461	560.6906	320.504	2,377.47
Innovation &Technology	16	0.4	0.088	0.25	0.517
DDI/GDP	16	0.099	0.067	0.029	0.272
Productivity	16	116.848	47.939	52.113	194.626
Exports	16	0.288	0.343	0.0063	1.105
Manufacturing					

Sector value added/GDP	16	0.093	0.014	0.074	0.118
FDI inflows/GDP	16	0.013	0.006	0.004	0.021
FDI brown/GDP	16	0.001	0.001	0.00007	0.004
FDI green/GDP	16	0.007	0.003	0.003	0.011
Credit	16	0.1881	0.1124	0.0706	0.4213
Innovation & technology	16	0.688	0.022	0.646	0.712
DDI	16	0.474	1.184	0.047	4.825
GDP per capita	16	12,838.566	4,481.91	5,321.145	20,677.65
Productivity	16	30.341	9.309	17.725	49.973
Export	16	0.066	0.045	0.022	0.171
Electricity oil and gas					
Sector value added/GDP	16	0.02	0.003	0.015	0.026
FDI inflows/GDP	16	0.002	0.002	0.0001	0.007
FDI brown/GDP	16	0.00008	0.00001	0.0000008	0.00033
FDI green/GDP	16	0.002	0.003	0.00004	0.009
Credit	16	0.00931	0.0040	0.0047	0.0220
Innovation & technology	16	0.371	0.147	0.198	0.653
DDI/GDP	16	0.149	0.125	0.002	0.55
GDP per capita	16	2,037.366	1,194.419	411.397	3,473.642
Productivity	16	24.66	20.021	11.481	77.621
Exports	16	0.019	0.03	0.00006	0.09
Construction					
Sector value added /GDP	16	0.051	0.013	0.033	0.071
FDI inflows/GDP	16	0.003	0.004	0.00014	0.013
FDI brown/GDP	16	0.00005	0.00006	0.000005	0.0002
FDI green/GDP	16	0.001	0.001	0.00002	0.002
Credit	16	0.0834	0.4787	0.4018	0.1670
Innovation & technology	16	0.59	0.041	0.533	0.64
DDI /GDP	16	0.127	0.14	0.008	0.612
GDP per capita_ sector	16	8,218.315	5,508.218	1,942.905	18,849.27
Productivity	16	300.584	326.973	30.194	1035.521
Export	16	0.0003	0.0004	0.000005	0.001

Note: Descriptive statistics before transforming to log

Table 4.4 shows summary statistics covering various indicators across the four industrial sectors. Sector value added/GDP is the contribution of each industrial sector to GDP, measuring the level of industrialization. The manufacturing sector

has the highest mean value of (0.093), indicating it is the most significant to GDP among the 4 industrial sectors, followed by construction (0.051); electricity, oil and gas (0.02); and mining and quarrying (0.008).

Measures of FDI inflow contribution to GDP show that the manufacturing sector has the most significant proportion of FDI relative to the total GDP, from the highest mean of 0.013. This shows that the sector has the highest FDI inflows, followed by construction (0.003); electricity, oil and gas (0.002); and mining and quarrying (0.002). In other FDI components, the manufacturing sector has the highest mean in both greenfield and brownfield investments at 0.007 and 0.001, respectively. The electricity, oil and gas sector comes second with a mean of 0.002 in greenfield investments and 0.00008 in brownfield investments. The mining and construction sectors have the lowest levels of greenfield investment, with a mean of 0.001 and an equal mean of 0.00005 in the brownfield investments.

Domestic Direct Investment contribution to GDP is high in the manufacturing sector with a mean of 0.474 and has a high variability (std. dev. 1.184), showing there have been significant fluctuations in the sector. Electricity, oil and gas are second, with a mean of 0.149; followed by the construction sector (0.127), and mining and quarrying sector with a mean of (0.099). Credit growth representing access to finance is more pronounced in the manufacturing sector, followed by the mining; construction; and electricity, oil and gas.

In the level of innovation and technology, the manufacturing sector is leading among the industrial sectors with a mean of 0.688, indicating a robust technological base. The construction sector ranks second with a mean of 0.59, followed by the mining sector (0.4); and electricity, oil and gas sector with a mean of 0.371.

The construction sector has the highest labour productivity with a mean of 300.584, reflecting the efficiency and effective use of resources and labour. Mining and quarrying are second with a mean of 116.848, followed by manufacturing (30.341); and electricity, oil and gas with a mean of (24.66).

Mining and quarrying has the highest mean (0.288) of exports proportion to the sector output, showing most of the output is exported. The manufacturing sector is expected to have a higher ratio of exports to its output, but with a mean of 0.066, showing that the sector has a strong domestic market. This is followed by electricity, oil and gas sectors (0.019); and the construction sector with the least mean (0.0003).

The manufacturing sector has the highest GDP per capita among the industrial sectors, with a mean of 12,838.566. The construction sector comes second with a mean of 8,218.315; followed by electricity, oil, and gas (2,037.366); and mining sector (1,151.461).

4.4.1 Pre-estimation and diagnostic tests

(a) Test for multi-collinearity.

In this work, the variance of inflation factors (VIF) was used to assess multicollinearity.

Table 4.3: Variance Inflation Factor (VIF) for multi-collinearity testing

Model 1: FDI inflows/GDP		
Variance inflation factor	VIF	1/VIF
FDI inflows/GDP	2.51	0.3990
GDP per capita_ sector	4.27	0.135
Innovation & technology	2.274	0.44
Credit	2.47	0.4043
Exports	2.09	0.4785
Productivity	1.69	0.592
Mean VIF	2.56	.
Model 2: FDI components /GDP		
Variance inflation factor	VIF	1/VIF
FDI green	2.593	0.386
FDI brown	1.41	0.395
Exports	2.05	0.38
Credit	2.52	0.26
Innovation & technology	2.31	0.433
GDP per capita	3.49	0.288
Productivity	1.86	0.538
Mean VIF	2.29	.
Model 3: DDI/GDP		
Variance inflation factor	VIF	1/VIF
GDP per capita	3.47	0.288
Exports	1.85	0.537
Credit	2.55	0.3923
Innovation & technology	1.86	0.537
Productivity	1.27	0.563
DDI	1.17	0.855
Mean VIF	2.03	.

According to Alin (2010), a VIF of more than 10 suggests presence of multicollinearity. Table 4.5 shows a VIF of less than 10 for all the variables, meaning those used in the study are not statistically related and there is no presence of multicollinearity. Therefore, the variables appropriate for further modelling and panel regression modelling can be used to evaluate the effects of FDI inflows per sector share to total GDP, FDI inflows per sector growth rate, FDI greenfield, FDI brownfields, FDI wages growth rate, GDP per capita, sector exports growth rate, productivity growth rate, investment growth rate, and innovation and technology on industrialization.

(b) Test for heteroskedasticity

The Breusch-Test was used to assess the heteroskedasticity. The null hypothesis states that the variance of error terms is constant and homoscedastic, since the p-value of SVA/GDP is less than 0.05. As a result, we do not accept the null hypothesis constant variance, concluding the presence of heteroskedasticity in the data.

Table 4.4: Test for heteroskedasticity

Model 1-FDI inflows/GDP	Model 2-FDI components /GDP	Model 3-DDIA/GDP
Breusch-Pagan/Cook-Weisberg test for heteroskedasticity	Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
Ho: Constant variance	Ho: Constant variance	Ho: Constant variance
Variables: fitted values of SVA/GDP	Variables: fitted values of SVA/GDP	Variables: fitted values of SVA/GDP
$chi^2(1)$ = 11.10	$chi^2(1)$ = 20.46	$chi^2(1)$ = 20.84
Prob > chi^2 = 0.0009	Prob > chi^2 = 0.0000	Prob > chi^2 = 0.0000

The presence of heteroskedasticity can result in wrong estimates for standard errors for coefficients, hence t-values. The null hypothesis is rejected (p-value= (0.0009<0.05), (0.000<0.05), (0.000<0.05) for models 1, 2 and 3, respectively, hence the estimates of standard errors for co-efficient. To correct for heteroskedastic, the study uses robust standard error.

(c) Test for normality

The Shapiro-Wilk test was used to test whether the data follows a normal distribution applied in residuals of the regression model.

Table 4.5: Normality test

Shapiro-Wilk W test for normal data					
Model 1: FDI inflows/GDP					
Variable	Obs	W	V	Z	Prob>z
Sector value added/GDP	64	0.87918	4.417	3.214	0.001
FDI inflows GDP	64	0.7786	3.462	2.687	0.004
GDP per capita	64	0.9488	2.93	2.326	0.01
Credit	64	0.73244	2.601	2.068	0.01
Productivity	64	0.946	3.097	2.446	0.007
Innovation & technology	64	0.9193	7.549	4.373	0.0004
Exports	64	0.4970	3.892	2.94	0.002
Model 2: FDI components/GDP					
Variable	Obs	W	V	Z	Prob>z
Sector value added/GDP	64	0.923	4.417	3.214	0.001
FDI brown	64	0.99	0.591	-1.139	0.0000
FDI green	64	0.969	1.769	1.234	0.000
Credit	64	0.7324	15.318	5.904	0.000
GDP per capita	64	0.949	2.93	2.326	0.01
Productivity	64	0.946	3.097	2.446	0.007
Exports	64	0.932	3.892	2.94	0.002
Innovation & technology	64	0.9193	4.621	3.312	0.0004
Model 3: DDI/GDP					
Variable	Obs	W	V	Z	Prob>z
SVA/GDP	64	0.8792	6.417	3.214	0.001
DDI	64	0.2395	43.537	8.164	0.000
GDP per capita	64	0.949	2.93	2.326	0.01
Credit	64	0.7324	15.311	2.068	0.019
Productivity	64	0.946	3.097	2.446	0.007
Innovation & technology	64	0.868	4.549	3.373	0.0005
Exports	64	0.932	3.892	2.94	0.002

Table 4.7 shows that the majority of variables across all models significantly deviate from a normal distribution (p-values less than 0.05), suggesting that the data for these indicators are non-normally distributed. This is important for any subsequent statistical analysis because many parametric tests assume the normality of the data.

(d) Hausman test

The Hausman test is used to determine the appropriateness of using a fixed effect model or random effect model. The null hypothesis (HO) is that the preferred

model random effect model, meaning that unique errors (individual-specific effects) are uncorrelated with regressors. The alternative hypothesis (H1) is that the fixed effect is appropriate indicating that these errors are correlated with regressors (Hausman, 1978).

Table 4.8 shows the results of the Hausman test. Typically, chi-squares should be non-negative, implying that there is a fundamental issue in using the random or fixed model and the study should consider other dynamic models of panel data analysis. The study's model specification includes: a lagged dependent variable, and the test shows the presence of heterogeneity and suspected issue of endogeneity. Therefore, the study considers using the GMM estimator to account for these issues.

Table 4.6: Hausman test

Hausman (1978) specification test					
Model 1-FDI inflows/GDP		**Model 2-FDI components/GDP**		**Model 3-Domestic Direct Investment/GDP**	
	Coef.		Coef.		Coef.
Chi-square test value	-622.42	Chi-square test value	-25.31	Chi-square test value	-5551.623
P-value	1	P-value	1	P-value	1

(e) Sargan test for over-identification of instruments

The Sargan test assesses the validity of instrumental variables and GMM estimation. It evaluates whether the instrument is uncorrelated with the error term Sargan (1988). In this case, productivity, innovation and technology are used as instrumental variables.

Model	P-Value	Conclusion
Model 1: FDI inflows/GDP	0.706	null hypothesis (instruments are valid): do not reject
Model 2: FDI components/ GDP	0.779	null hypothesis (instruments are valid): do not reject
Model 3: Direct Domestic Investment/GDP	0.746	null hypothesis (instruments are valid): do not reject

The Sargan test results for the three models indicate that we do not reject the null hypothesis that the instruments are valid, implying they (productivity and IT) are uncorrelated with the error term.

5. Results and Estimations

5.1 General Effects of FDI on Industrialization

This study estimated three models to examine the relationship between FDI on industrialization. The study used dynamic panel-data estimation with a Generalized Method of Moments (GMM) to estimate the general effects of FDI inflows, FDI components, and DDI on industrialization. This model choice was motivated by the need to account for potential endogeneity issues, commonly present in panel datasets.

5.1.1 Sector-specific effects of FDI on value-added contribution to GDP

The sector-specific effect of the three models were estimated using Seemingly Unrelated Regression (SUR). This method allows for simultaneous estimation of multiple equations that are potentially correlated, providing more efficient estimates than separate OLS regressions. In the study, equations for the four sectors have different numbers of explanatory variables, and the sectors are interrelated. Therefore, the study uses seemingly unrelated regression. SUR consists of a system of regression equations and adheres to the classical assumptions of standard regression models. According to Zellener (1962), the SUR estimator is designed for models with multiple dependent variables, allowing for different regressor matrices in each equation.

5.1.2 Effects of FDI on industrialization

To establish the effect of FDI on industrialization, the study did a panel data analysis for four industrial sectors for the period of (2007-2022).

Table 5.1: GMM regression analysis-Model one, two and three

Variables	Model 1: FDI inflows/GDP	Model 2: FDI components/GDP	Model 3: DDI/GDP
SVA/GDP	**Coef.**	**Coef.**	**Coef.**
l. log SVA/GDP	0.225 (0.037) **	0.0215 (0.038) ***	0.216 (0.029) **
Log FDI inflows/GDP	0.009 (0.353)		
Log FDI brown/GDP		-0.0002 (0.848)	
Log FDI green/GDP		0.009 (0.697)	
Log DDI/GDP			-0.008 (0.418)
Log GDP per capita_ sector	0.696 (0.001) ***	0.705 (0.001) ***	0.703 (0.001) ***
Log credit-sector	0.044 (0.057) *	0.04 (0.111)	0.04 (0.117)

log productivity	0.024 (0.298)	0.021 (0.276)	0.024 (0.118)
Log exports	0.0002 (0.73)	0.0001 (0.612)	0.002 (0.762)
Log innovation & technology	0.158 (0.017) **	0.168 (0.002) ***	0.184 0.003***
Year-2008	0.701 (0.02) **	0.186 (0.202)	0.159 (0.261)
Year-2009	0.803 (0.000) ***	0.284 (0.014) **	0.27 (0.006) ***
Year-2010	0.306 (0.009) ***	-0.22 (0.003) ***	-0.235 (0.003) ***
Year-2011	0.536 (0.002) ***	-0.11 (0.011) **	-0.114 (0.008) ***
Year-2012	0.417 (0.006) ***	-0.2 (0.041) **	-0.197 0.017**
Year-2013	0.327 (0.001) ***	-0.28 (0.000) ***	-0.278 (0.001) ***
Year-2014	0.251 (0.007) ***	-0.34 (0.003) ***	-0.318 (0.012) **
Year-2015	0.189 (0.01) ***	-0.4 (0.007) ***	-0.402 (0.003) ***
Year-2016	0.122 (0.002) ***	-0.53 (0.001) ***	-0.514 (0.004) ***
Year-2017	-0.06 0.288	-0.59 (0.003) ***	-0.589 (0.004) ***
Year-2018	-0.13 0.01**	-0.67 (0.001) ***	-0.676 (0.001) ***
Year-2019	-0.14 (0.014) **	-0.67 (0.003) ***	-0.67 (0.002) ***
Year-2021	-0.21 (0.005) ***	-0.75 (0.003) ***	-0.743 (0.002) ***
Year-2022	-0.27 (0.002) ***	-0.81 (0.002) ***	-0.802 (0.001) ***

In model one, the elasticity of the previous year's SVA/GDP is 0.225, indicating that a 1 per cent increase in the previous year's SVA/GDP results in a 0.225 per cent increase in the current year's value. FDI inflows have a coefficient of 0.009, suggesting a small and statistically insignificant effect. GDP per capita shows a strong positive effect, where a 1 per cent increase in GDP per capita results in a 0.696 per cent increase in industrialization. Innovation and technology have a positive effect, where a 1 per cent increase in the level of innovation and technology results in a 0.158 per cent increase in industrialization.

In model 2, the elasticity of the previous year's level of industrialization is 0.071 per cent, which is lower than in model 1, indicating a reduced influence on industrialization from FDI components. FDI brownfields show a negative statistically insignificant effect, and greenfield investments show a positive

statistically insignificant effect on industrialization. GDP per capita has an elasticity of 0.705, reflecting a strong positive effect on industrialization, where a 1 per cent increase in household income results to a 0.705 per cent increase in the level of industrialization. Innovation and technology are associated with a 0.168 per cent increase in the level of industrialization, indicating a stronger positive impact than model 1.

In model 3, the elasticity is 0.216 per cent, similar to model 1 indicating a significant positive effect of past industrial performance. A 1 per cent increase in DDI results in a 0.008 per cent decrease in industrialization, the effect is small and statistically insignificant. GDP per capita, measuring the level of household income consistently shows a strong positive effect associated with 0.703 per cent increase in the level of industrialization, when considering DDI. Innovation and technology have the highest positive effect on industrialization among the three models associated with a 0.184 per cent increase in the level of industrialization. This suggests that domestic investors are in a strong position to compete favourably with foreign investors on technological advancements.

The year 2009 shows a positive significant shock across all the models, indicating recovery or positive development post-2007 election crisis. In the year 2015, all three models show a significant negative shock as well from 2017 to 2022. This continued negative shock shows the possibility of other economic disturbances affecting the country's industrialization. The regression automatically omits the year with major shocks such as 2007 when Kenya experienced post-election violence, following the presidential election results. The year 2020 is also omitted as it was marked by the global COVID-19 pandemic.

5.2 Analysis of Sector Specific Effect of FDI Inflows/GDP: Model 1

Table 5.2: Seemingly unrelated regression of FDI inflows/GDP and specific industrial sector

Industrial Sectors				
Variables	**Mining and quarrying sector**	**Manufacturing sector**	**Electricity oil and gas**	**Construction sector**
Sector alued added/GDP	Coef	**Coef**	**Coef**	**Coef**
FDI inflows /GDP	0.157 (0.000) ***	0.152 (0.000) ***	0.101 (0.000) ***	0.058 (0.033) ***
Log GDP per Capita	-0.237 (0.000) ***	0.002 (0.959)	-0.299 (0.000) ***	0.082 (0.000) ***
Log credit	0.315 (0.000) ***	0.027 (0.206)	0.356 (0.000) ***	-0.091 (0.193)
Log productivity	-0.01 (0.000) ***	-0.193 (0.001) ***	-0.108 (0.027) ***	0.514 (0.000) ***

Log exports	-0.001 (0.949)	0.091 (0.02) ***	-0.026 (0.134)	0.002 (0.966)
Log innovation & technology	0.72 (0.000) ***	2.059 (0.000) ***	-0.841 (0.000) ***	-0.041 (0.056) *

Table 5.2 shows an analysis of variables across the four industrial sectors, while considering FDI inflows for each sector's contribution to GDP. The effects of sectors FDI inflows in the mining sector is associated with 0.157 per cent increase in this sector and value added to GDP. Credit (access to finance) significantly boosts growth in the sector, with a 0.315 per cent increase in the valued added to GDP. The manufacturing sector's FDI inflows and exports show a positive effect, where a 1 per cent increase in these variables results to an increase in the value added to GDP by 0.152 per cent and 0.091 per cent, respectively, within the sector. Innovation and technology show a high positive elasticity of 0.72 per cent increase in the value added to GDP in the sector.

In the electricity, oil and gas sector, FDI inflows and credit (access to finance) are positive drivers, while household income and productivity have a negative effect on the value added/GDP that results to a decrease of 0.299 per cent and 0.108 per cent, respectively. Innovation and technology have a negative effect, where a 1 per cent increase in innovation and technology results to a notable decrease of 0.841 per cent of the sector's value added share to GDP. The construction sector benefits from increase in the FDI inflows, household income and productivity, where a 1 per cent increase in these factors significantly results to an increase in the value added to GDP in the sector by 0.058 per cent, 0.082 per cent, and a 0.514 per cent, respectively.

5.3 Analysis of Sector-Specific Effect of FDI Components: Model 2

Table 5.3 shows analysis of the four industrial sectors, while considering components of FDI brownfields and greenfields. In the mining sector, brownfield FDI and access to finance significantly boost this sector's growth, where a 1 per cent increase in brownfield investment results to a 0.127 per cent increase, and 1 per cent increase in access to finance results to 0.31 per cent increase in value added to GDP in the sector. The level of innovation and technology has a more pronounced effect, where a 1 per cent increase results to 0.718 per cent increase in value added to GDP.

Table 5.3: Seemingly unrelated regression of FDI components/GDP and specific industrial sectors (Model two)

Industrial Sectors				
Variables	**Mining & quarrying sector**	**Manufacturing sector**	**Electricity oil and gas**	**Construction sector**
Sector value added/GDP	Coef	Coef	Coef	Coef
FDI brownfield/GDP	0.127 (0.000) ***	-0.034 (0.041) ***	-0.103 (0.000) ***	0.058 (0.000) ***
FDI greenfield/GDP	0.038 (0.165)	0.064 (0.022) ***	0.13 (0.000) ***	0.082 (0.000) ***
log GDP per capita	-0.047 (0.288)	-0.143 (0.000) ***	-0.49 (0.000) ***	-0.091 (0.193)
Log credit	0.31 (0.000) ***	0.009 (0.735)	0.272 (0.000) ***	0.514 (0.000) ***
log productivity	-0.187 (0.003) ***	-0.164 (0.031) ***	-0.122 (0.024) ***	0.002 (0.966)
Log exports	0.0001 (0.96)	-0.01 (0.787)	-0.052 (0.007) ***	-0.041 (0.056) *
Log innovation and technology	0.718 (0.000) ***	1.205 (0.017) ***	-0.927 (0.000) ***	-0.036 (0.969)

The manufacturing sector benefits positively from greenfield FDI, innovation and technology, where a 1 per cent increase in these factors results to 0.064 per cent and 1.205 per cent increase in value added to GDP. Brownfield investment has a negative effect on this sector, where a 1 per cent increase in brownfield FDI results to a 0.034 per cent decrease in value added to GDP. Productivity and household income affect this sector negatively, with a 0.164 per cent and 0.143 per cent decrease in sector value added to GDP, respectively.

In the electricity oil and gas sector, greenfield FDI and access to finance positively influence the growth of this sector, where a 1 per cent increase in these factors results to an increase in value added to GDP by 0.130 per cent and 0.272 per cent, respectively. Brownfield FDI, household income (GDPPC), productivity, exports, innovation and technology show negative effects associated with 0.103 per cent, 0.490 per cent, 0.122 per cent, 0.052 per cent and 0.927 per cent decrease in sector value added to GDP, respectively.

The construction benefits both brownfield and greenfield FDI, as well as access to finance. A 1 per cent increase in both brown and greenfield FDI results to an increase in value-added/GDP by 0.058 per cent and 0.082 per cent, respectively. A unit increase in access to finance results to an increase in value added to GDP by 0.514 per cent in the sector.

5.4 Analysis of Sector-Specific Effect of DDI/GDP: Model 3

Table 5.4 shows the effects of DDI on the sector's value added to GDP across the four industrial sectors. In the mining sector, a 1 per cent increase in DDI results in 0.114 per cent in value added to GDP in the sector. An increase in access to finance (credit) results to an increase of 0.29 per cent of the value added to GDP. Innovation and technology have the most pronounced effects where a 1 per cent increase in innovation and technology results in a 0.519 per cent increase in value-added to GDP. GDP per capita and exports have a negative effect associated with 0.341 per cent and 0.165 per cent decrease in value-added to GDP in the sector, respectively.

Table 5.4: Seemingly unrelated regression of DDI/GDP and specific industrial sectors (Model 3)

Industrial Sectors				
Variables	**Mining & quarrying sector**	**Manufacturing sector**	**Electricity oil and gas sector**	**Construction sector**
Sector value added/GDP	Coef	Coef	Coef	Coef
Log DDI/GDP	0.114 (0.012) ***	-0.035 (0.001) ***	0.137 (0.000) ***	0.13 (0.000) ***
log GDP per sector	-0.341 (0.000) ***	-0.201 (0.000) ***	-0.339 (0.000) ***	-0.304 (0.000) ***
Log credit-sector	0.29 (0.000) ***	0.015 (0.518)	0.292 (0.000) ***	0.419 (0.000) ***
Log productivity	-0.162 (0.019) ***	-0.052 (0.401)	-0.361 (0.000) ***	0.169 (0.000) ***
Log exports	-0.165 (0.000) ***	-0.102 (0.000) ***	-0.139 (0.000) ***	-0.046 (0.015) ***
Log innovation & technology	0.519 (0.005) ***	1.776 (0.000) ***	-0.607 (0.000) ***	0.367 (0.665)

The manufacturing sector seems not to benefit from DDI, where a 1 per cent increase in DDI to GDP results to a 0.25 per cent decrease in SVA to GDP. An increase in GDPPC results in a 0.201 per cent decrease in this sector's value added to GDP. Innovation and technology have a profound effect, where a 1 per cent increase leads to a 1.776 per cent increase in value added to GDP in the sector.

For electricity, oil and gas, a 1 per cent increase in DDI to GDP results to a 0.137 per cent increase in value-added to GDP. Access to finance (credit) significantly gave a positive effect associated with a 0.292 per cent increase in value-added to GDP. However, households' income.

5.5 General Insights from the Analysis

5.5.1 Effects of FDI on industrialization

The findings reveal that FDI inflows have not had a substantial impact on industrialization. This agrees with Gui-Diby and Renard (2015), who suggest the importance of an enabling business environment to attract more FDI. This indicates that while FDI brings in capital, it does not effectively translate into enhanced industrial output for the four industrial sectors. Further, it appears that FDI inflows are channeled into non-industrial sectors such as wholesale and retail, finance and insurance activities, information, and communication and accommodation and food service activities.

The findings show that household income measured by GDP per capita has a strong positive effect on industrialization. This is observed across the three models where a 1 per cent increase leads to a 0.696 per cent, 0.705 per cent, and 0.703 per cent rise in industrialization in models 1, 2 and 3, respectively. These findings align with the studies of Zhang (2014) and Ben Mim *et al.* (2022), who emphasized economic growth's role in industrial performance and GDP per capita being a critical factor for the positive spillover effect of FDI on industrial production. Higher GDP per capita indicates better financial development and infrastructure, which enhances the ability of a country to use FDI effectively for industrial growth.

Innovation and technology show a significant positive effect across all the models, where a 1 per cent increase leads to an increase in industrialization by 0.158 per cent, 0.168 per cent and 0.184 percent respectively, across the models. This is aligned with Ben *et al.* (2022) who emphasize the role of absorptive capacity, which includes technological advancement and innovation in enhancing the effectiveness of FDI in promoting industrial growth. Similarly, the study of Darko and Xu (2022) highlights the importance of efficiency-seeking FDI and the role of innovation in improving industrial productivity by integrating advanced technologies and innovative practices that are important to industrial growth. Both studies reinforce the idea that continuous innovation and technological advancements are important in maintaining competitiveness and driving industrial growth.

The positive effect of credit (access to finance), where a 1 per cent increase results to a 0.044 per cent increase in industrialization, supports the findings of Ben Mim *et al.* (2022), and Ngouhouo and Ewane (2020). They emphasize the role of financial development and governance in maximizing the benefits of investments for industrial growth and the need for strong financial systems to support industrialization efforts.

5.5.2 Effects of FDI on the mining and quarrying sector

The findings of the mining and quarrying sector show that this sector benefits from both FDI and DDI, where a 1 per cent increase in FDI inflows results in a 0.157 per cent increase in SVA to GDP. This suggests that foreign investments

are crucial for the development of this sector due to the capital-intensive nature of mining and quarrying, which benefits from the infusion of foreign capital and technology. Brownfield FDI has a positive effect associated with a 0.127 per cent increase in this value added to GDP. This shows that brownfield investment boosts the sector through cost-effective upgrades and the modernization of existing facilities. However, the sector must prioritize further advancements in innovation to sustain long-term growth and competitiveness.

DDI in this sector also shows a positive effect associated with a 0.114 per cent increase in value added/GDP. This sector benefits more from FDI, hence has less effect, indicating that while local investments are beneficial, the sector might depend more significantly on foreign technology and capital to drive growth.

5.5.3 Effects of FDI on manufacturing sector

The manufacturing sector experiences pronounced effect of FDI than any other sector. Analysis shows that a 1 per cent increase in FDI inflows results in a 0.152 per cent increase in SVA to GDP. This can be attributed to the pronounced effect of innovation and technology in value added to GDP, associated with a 2.059 per cent increase. Greenfield FDI shows a positive effect associated with a 0.064 per cent rise in the value-added to GDP. This reflects the transformative potential of establishing new production facilities with modern technologies and processes that may lead to an increase in production capabilities that are likely to foster a competitive local industry—this is reflected by the spillover effect of innovation and technology in this sector. Brownfield investment shows a negative effect, with a 0.034 per cent decrease in sector value added to GDP. However, this sector could also benefit from these mergers and acquisitions in the long-run.

Domestic Direct Investment shows a negative significant effect associated with 0.0035 per cent in SVA to GDP. This suggests several challenges. First, domestic investments lack the scale and technological capability needed to significantly boost productivity and competitiveness in the manufacturing sector. Second, there may be inefficiencies in the resources allocated, or domestic firms are focusing on less productive aspects of manufacturing. Lastly, the regulatory policies across this sector do not favour domestic firms leading to their closure and exit from the market.

5.5.4 Effects of FDI on the electricity oil and gas sector

The analysis of the electricity, oil, and gas sectors shows that the sector benefits from both FDI and DDI. The results show that a 1 per cent increase in FDI results in a 0.101 per cent increase in SVA to GDP. In the context of FDI components, greenfield FDI has a positive effect where a 1 per cent increase results to 0.13 per cent increase in value added to GDP. New FDI projects come in with upgraded technologies that are even more compliant with environmental standards. Since this sector requires a significant boost in technological upgrades, facilitating new

projects in the sector may bring improvements in operational efficiencies, while FDI brownfields have a negative effect associated with a 0.103 per cent decrease in SVA to GDP.

However, brownfield FDI has the potential to improve this sector's performance in the long run because the initial period post-investment is often characterized by substantial costs related to integration, modernization, regulatory compliance, and overcoming organizational challenges. These factors may lead to temporary reduction in the sector's value added.

In model 3, a 1 per cent increase in DDI leads to a 0.137 per cent increase in this SVA to GDP, which is more pronounced than FDI. This suggests that local investments have been effective in contributing to these sectors' value added compared to FDI. This is attributed to regulations in the sector that favour domestic firms to invest long term unlike foreigners, also by investing domestically in this sector there is an inherent enhancement of national energy security.

5.5.5 Effects of FDI on the construction sector

The findings from the analysis show that the construction sector benefits significantly from FDI and DDI. In model 1, a 1 per cent increase in FDI inflows results in a 0.058 per cent increase in SVA to GDP. Brownfield and greenfeld FDI positively impact the sector, with greenfield FDI leading to a 0.082 per cent increase and brownfield FDI a 0.058 per cent increase in SVA to GDP. In model 3, a 1 per cent increase in DDI results in a 0.13 per cent increase in sector value added to GDP, which is more pronounced than FDI. This means that local investment is crucial in driving the growth of this sector. It also indicates that there is a stronger alignment of domestic investments with local needs and economic conditions and the possibility of quicker turnaround and implementation of projects compared to FDI.

6. Conclusion and Recommendations

6.1 Conclusion

The study concludes that FDI inflows have an insignificant effect on the country's industrialization. This means that Kenya is not performing well in terms of attracting both FDI and DDI into industrial sectors, given that domestic investment also has an insignificant effect. While FDI brings in capital, it does not effectively translate into enhanced industrial output for the four industrial sectors. Further, it appears that FDI inflows are preferentially channeled into other sectors other than industrial. These other sectors are mainly services sectors such as wholesale and retail, finance and insurance, information, communication and accommodation and food service. Further, greenfield investments have positive insignificant effects on industrialization. This could be associated with the fact that greenfield projects often require significant capital investment and time to be productive, which may delay their impact. This finding points to the fact that greenfields are more pronounced in other sectors such as services that are not capital intensive, rather than industrial sectors. FDI in the mining and quarrying sector is driven by brownfield upgrades, unlike in manufacturing where FDI is largely greenfields and innovation. The electricity, oil, and gas sectors benefit from both FDI and DDI, with DDI having a more pronounced effect. In construction, both FDI and DDI significantly boost the sectors' value added contribution to GDP, with DDI aligning well with local needs.

6.2 Policy Recommendations

Industrialization continues to play a significant role in Kenya's economic growth, hence the need to attract FDI in the key industrial sectors. Consequently, the following recommendations are made:

(1) To attract FDI in the mining and quarrying sector, it is important to focus policy interventions on encouraging brownfield investments in the sector. This can be achieved through promoting joint ventures between foreign and local firms. Such partnerships would facilitate technology transfer and help build local expertise, ultimately boosting the sector's growth and sustainability.

(2) In the manufacturing sector, creating an enabling policy and legal environment is crucial to attract and retain foreign investors. Reviewing the National Industrial Policy and enhancing the focus on foreign investment would play a key role in attracting more foreign investment and monitoring its impact on different industrial sectors in the country. This will encourage greenfield investments in the sector and strengthen local capabilities by encouraging the adoption of 4^{th} industrial revolution technologies to enhance productivity and competitiveness.

(3) Further, there is a need to encourage greenfield FDI in the electricity, oil and gas sectors. To encourage such investments, incentives geared towards tax

holidays, and reducing duties on imports of machinery and infrastructure, which are key in the sector, would encourage greenfield projects.

(4) Lastly, leveraging on public-private partnerships could facilitate attracting FDI in the construction sector. It is essential to ensure that FDI in the construction sector aligns with local needs and meets local infrastructure requirements.

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Kenya Institute for Public Policy Research and Analysis
Bishops Garden Towers, Bishops Road
PO Box 56445, Nairobi, Kenya
tel: +254 20 2719933/4, 2714714/5, 2721654, 2721110
fax: +254 20 2719951
email: admin@kippra.or.ke
website: http://www.kippra.org