Strathmore UNIVERSITY

The Effect of Foreign Direct Investment on the Level of Carbon Emissions in Kenya

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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12/02/2021 ..... [Date]

This Research Project has been submitted for examination with my approval as the Supervisor.

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Table of Contents

Abstract

Foreign direct investment (FDI) can be thought of as either a blessing or a curse to the economies of countries. The study was investigating the impact FDI has on the level of carbon emissions Through FDI, growth of the economy is witnessed. However, it also serves as an avenue for dumping with hazardous effects to the environment. This study examines the effect that foreign direct investment has on the level of carbon emissions in Kenya. The period of study is from 1960-2016. A long run relationship was realized between the explanatory variables and carbon emissions. Owing to this fact a Vector error correction model was most relevant for the study especially in estimating the short run effect. From the results obtained, it is evident that foreign direct investment has a decreasing effect on the level of carbon emissions in both the short and long run. Meaning that with an increase in FDI, a significant reduction in carbon emissions is noted in Kenya. A recommendation made is that the government and policy makers actively and effectively monitor and evaluate adherence to the laid-out policies by both foreign investors and foreign related investments. One constraint while carrying out the project was the lack of an abundant dataset. For further research, being able to obtain the sectoral breakdown of how FDI is distributed and carrying out a research based on a sectoral view will be able to give more insight into the topic.

List of Tables:

List of Figures:

List of abbreviations and acronyms

ADF - Augmented Dickey-Fuller

CEIC - CEIC Data

CO2 - Carbon dioxide

DF - Dickey-Fuller

FDI - Foreign direct investment

GDP - Gross Domestic Product

MTAR - Mitigation Technical Analysis Report

NCCAP - National Climate Change Action Plan

NDC - National Determined Contribution

OECD - Organization for Economic Co-operation and Development

POPG - Population Growth

TOP - Trade Openness

UNCTAD - United Nations Conference on Trade and Development

VECM - Vector error correction model

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

1.1.1 Foreign Direct Investment

According to the Organisation for Economic Co-operation and Development (OECD, 2018) Foreign Direct Investment (FDI) refers to an investment across borders. This investment occurs when an interested foreign individual or organization establishes a lasting interest of significant degree on the economy of another country. Ownership of 10 percent or more of the voting power in an enterprise in one economy by an investor in another economy is evidence of such a relationship. FDI is an important factor towards economic integration, in that it promotes international trade between countries and enables easier access to their markets. Through FDI, the promotion of transfer of technologies is enabled and highly accelerated. FDI can also be thought of as a crucial vehicle that seeks to drive economic development of all countries involved. The indicators covered in this group are inward and outward values for stocks, flows and income, by partner country and by industry and FDI restrictiveness.

The (OECD, 2018) come to depict the flows as follows: Outward flows speak to exchanges that lead to increments in investments that financial specialists in the reporting economy have in undertakings in an foreign economy, for example, through acquisition of value or reinvestment of earnings, less any exchanges that lead to a decline in investments that investors in the reporting economy have in endeavours in a foreign economy, for example, sales of equity or the case of borrowing by the local investor from the foreign organization. Inward flows speak to exchanges lead to increments in investments that foreign investors have in undertakings occupant in the occupant economy less exchanges that lead to a decline in investments of outside financial specialists in local enterprises. FDI streams are estimated in USD and as a portion of GDP for example. In Kenya, CEIC converts annual Foreign Direct Investment into USD. The Kenya National Bureau of Statistics provides Foreign Direct Investment in local currency based on BPM6. The Central Bank of Kenya average market exchange rate is used for currency conversions.

Considering Kenya's size and level of development, the foreign investments into the country are still relatively weak. That being the case however, it is still one of the largest recipients of FDI in Africa (Nordea, 2020). FDI inflows have been significantly

increasing since 2010 and according to UNCTAD (2019) it increased by 27% to a record high in the country of USD 1.6 billion December 2018. Investments from China, mainly in the mining and hydrocarbon sectors are greatly attributed to the all-time high of USD 1.6 billion in 2018 from USD 1.2 billion in 2017.

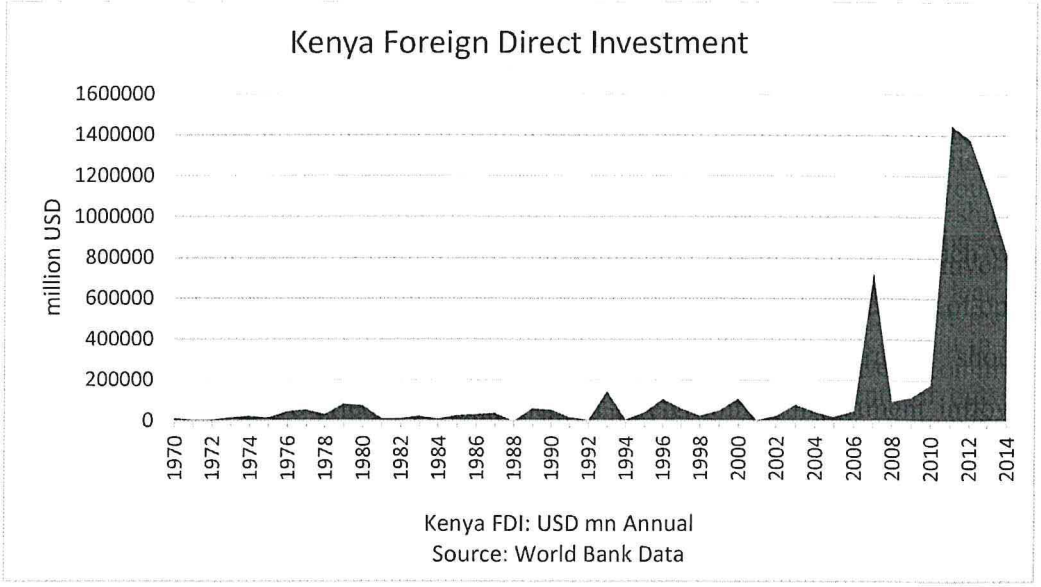

Figure 1: Kenya's net foreign direct investment inflows

Figure 1 above is the graphical representation of Kenya's annual Foreign Direct Investment inflows into the country between 1970 – 2014. In the earlier years just after independence, the flows were relatively low. However, as the country continued to develop, more interest was shown to Kenya and thus the gradual increase in flows in the later years.

As per the Nordea report, "Foreign direct investment (FDI) in Kenya," which was revolved around putting resources and investing into Kenya, the advancement of open public-private associations as a component of the 'Vision 2030' strategy should likewise have a positive effect and influence on foreign direct investment inflows. Kenya assumes a critical role in the East African Community, going about as a territorial monetary centre point and regional economic hub. It profits from a vital geographic area with ocean access, a developing innovative middle/white collar class, a differentiated agribusiness and expanding services sector, and as of late found hydrocarbons assets. In any case, various impediments to venture and invest in the country have continued to persist, such as the nation's less than adequate infrastructure,

aptitude and skills deficiencies, unsteadiness identified with fear monger chance and political, social and ethnic divisions, incapable guideline of law and corruption.

1.1.2 Carbon Emissions

A carbon footprint can be defined as the total greenhouse gas emissions caused by a single person or persons, event organization or product, expressed as a carbon dioxide equivalent (OECD, 2020). Depending on their level of development, different countries will have different sizes of carbon footprints they impose on the world. This is highly determinant on the activities carried out in the countries. A highly industrial country will have a bigger carbon footprint as compared to a country that mainly focuses on trade as its core for the economy.

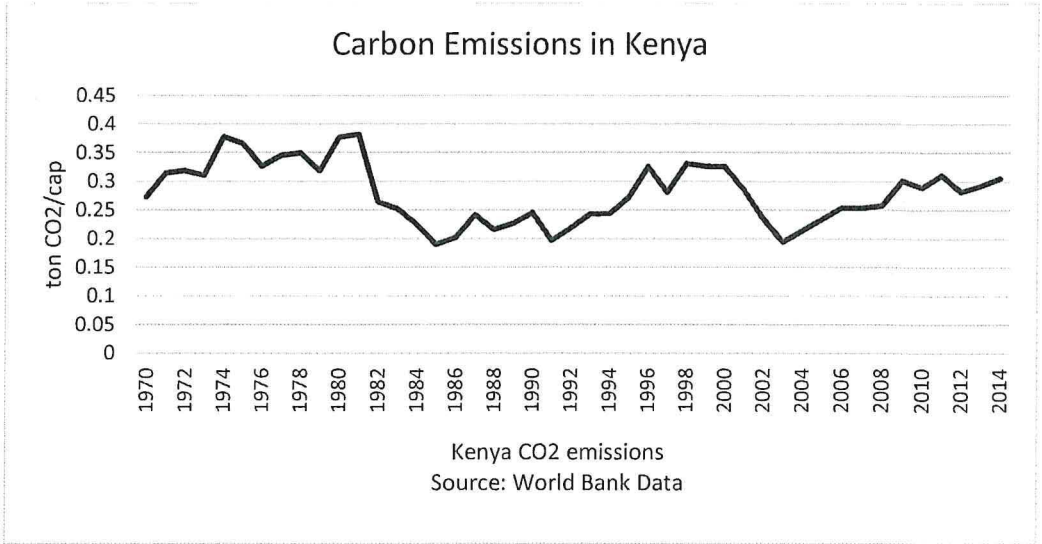

Figure 2: Amount of carbon emissions in Kenya

Figure 2 above is the graphical representation of Kenya's annual Carbon Emissions between 1970 – 2014. Carbon emissions have remained relatively stable over the years but began showing an upward trend from the year 2003 onwards. Some of the major economic activities carried out in Kenya include; Tourism, Agriculture, Manufacturing and Energy. As can be seen, most of these economic activities contribute proportionately to the carbon footprint the country has.

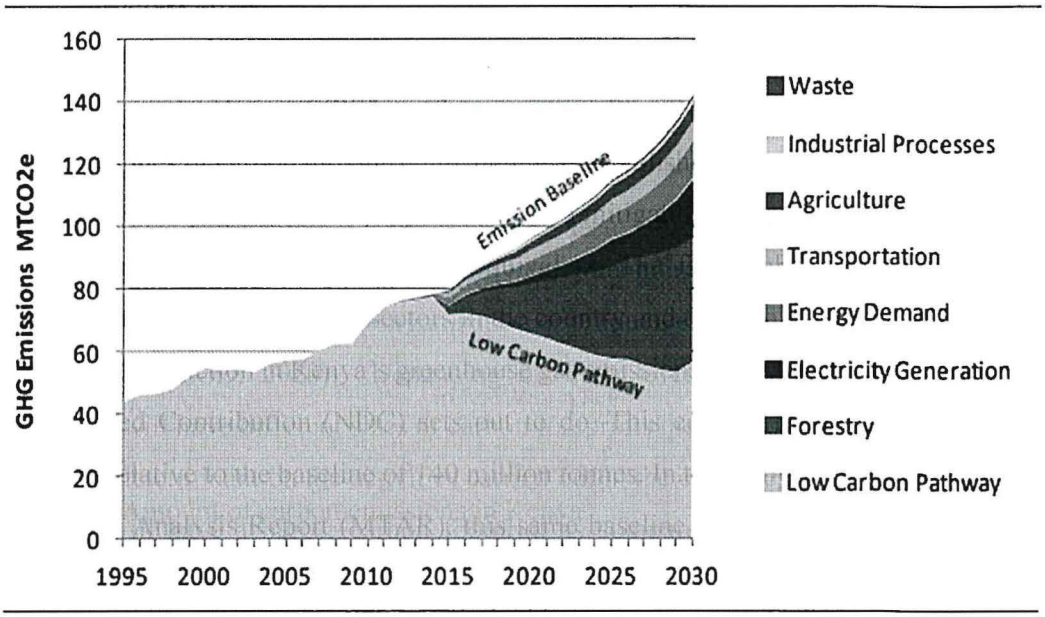

Figure 3: Kenya's Baseline Emissions and Mitigation Potential for the Sectors
Source: GOK; NCCAP 2013-2017

According to the National Climate Change Action Plan (NCCAP 2013-2018) over 140 million tonnes of carbon dioxide equivalent was established to be the 2030 projections for greenhouse gas emissions projections with a mitigation potential of 60% to around 85 million tonnes of carbon dioxide equivalent. The figure above gives graphical representation of the different sectors in the country and the level of carbon emissions for each. A reduction in Kenya's greenhouse gas emissions to 30% is what the National Determined Contribution (NDC) sets out to do. This equates to around 42 million tonnes. Relative to the baseline of 140 million tonnes. In the analysis of the Mitigation Technical Analysis Report (MTAR), this same baseline will also be used (NCCAP, 2018-2022).

Sector	GHG Emission Reduction Potential ($MtCO_2e$)				NDC Target ($MtCO_2e$)
	2015	2020	2025	2030	2030
Forestry	2.71	16.24	29.76	40.2	20.10
Electricity Generation	0.28	2.24	8.61	18.63	9.32
Energy Demand	2.74	5.16	7.92	12.17	6.09
Transportation	1.54	3.52	5.13	6.92	3.46
Agriculture	0.63	2.57	4.41	5.53	2.77
Industrial Processes	0.26	0.69	1.03	1.56	0.78
Waste	0.05	0.33	0.5	0.78	0.39
Total Emission Reduction Potential				85.79	42.90
Total Emissions in 2030	8.21	30.75	56.86	143.00	143.00
% of Total Emissions in 2030				60%	30%

Figure 4: Kenya's Emissions Reduction Potential and the NDC Targets by Sector
Source: derived from GOK (2015), Second National Communication, page 172

In spite of the fact that the NDC target assumes that all areas will progress and work together in achieving the mitigation goals, this doesn't really convert into a 30% decrease in the greenhouse gas emissions for every one of the 6 segments as shown in *Figure 4*. The genuine mitigation potential of every one of the six parts sectors depends upon various components running from resources, policies and prioritisation of the implementation practicality of the potential mitigation actions (NCCAP, 2018-2022).

1.2 Relationship between Foreign Direct Investment and Carbon emissions

Foreign Direct Investment can be looked at from two spectrums as both a blessing and a curse. Owing to growing evidence, it is believed that carbon emissions efficiency enhancing innovations from the foreign country, tend to spill over to the local countries eventually leading to the attainment of their goals of climate mitigations (Perkins & Neumayer, 2008). It is still however unclear the exact conditions necessary for these spill overs to occur Peterson, 2008). However, more is being done to investigate. According to Perkins and Neumayer (2008) from their study, found that countries with much lower domestic efficiency are able to improve their efficiency much faster owing to the international spill overs. Moreover, they found that countries with lower carbon emission efficiency and those with higher institutional quality all still experience

international spill overs from foreign carbon emission efficient countries. Their results further show that improving domestic carbon emission efficiency can be brought about by setting up various policies that create fertile and suitable domestic conditions that will facilitate a much easier spill over of carbon emission efficient technologies.

There are also schools of thoughts that believe that FDI leads to pollution havens in the domestic country. According to (Aminu, 2005), the author believes that among these large multinational corporations, there is relocation of heavy polluting industries from the developed countries to the less developed countries. Reasons being that in the developed countries there are stringent environmental policies that have to be adhered to and may in turn greatly increase their expenses. However, in less developed countries these policies tend to be lax or completely non-existent, making them perfect to relocate these industries. Owing to this, when companies relocate, this could lead to a competition to relax environmental policies so as to gain an advantage in the 'dirty' goods production. Having direct and strict environmental policies may lead to increased cost for the foreign company hence the local one would lax the laws so as to attract the potential foreign capital.

Assi (2018) out rightly believes that increases in the levels of FDI to a country will have a significant impact on carbon emissions and subsequently lead to its increase in the given country. A positive relationship between the two variables is clearly observed from the study. Other authors also notice this same relationship between the variables but that is only in the short term. They go ahead to notice a reversal of the effects as the time period extends into a longer term.

In a Kenyan context, the country has been realising a steady increase in foreign investments with China topping the list. As these foreign flows have been on the rise, the amount of carbon emissions in the country has also been rising. It is noted that the transport sector, mainly dominated by road transport, is a significant contributor to the growing carbon emissions in the country (Greenhouse Gas Emissions Factsheet: Kenya 2017). The aim of this study is to investigate the effect of foreign direct investment on the level of carbon emissions produced in Kenya.

1.3 Problem Statement

Research as to what the main most significant cause in increase of carbon emissions has mainly been geared towards investigating foreign direct investment. Even more

so, most of the studies attempting to investigate such a similar relationship is mainly carried out in developed countries, not giving much perspective of the developing countries like Kenya for example. Though there are preceding studies and literature on whether FDI does indeed impact the carbon emissions of a country, there lacks any studies and literature that have been carried out from a Kenyan perspective. There is yet to be a study that investigates the effects of FDI on carbon emissions in general. This gap is clear and hence the purpose of this research is to fill the gap.

FDI forms an important source of financing for most investment projects in developing countries such as Kenya for example. In developing economies, most foreign direct investment is channeled to the manufacturing sub-sectors or the mining sub-sector. By increasing the amount of FDI a country receives, this more often than not leads to increased employment opportunities, technological advancements and a boost in productivity in general, holding all other factors constant. However, with increase in production, the pressure on limited natural resources is heavier and the subsequent environmental implications that could be witnessed with the increase as well. Thus, this shows that although increase in the foreign direct investments Kenya receives as a country are growth enhancing, they are also accompanied by detrimental effects to the environment.

The main purpose of this research is to investigate the relationship between foreign direct investment and the level of carbon emissions produced from a Kenyan perspective. In addition, this study will seek to investigate the other relevant factors that may indeed also contribute to the level of carbon emissions and actually establish the significant ones that are present.

By carrying out this study, it will enable involved parties such as policy makers and environmentalists have greater understanding on the effects of foreign direct investment on the level of carbon emissions and create policies and other relevant activities to help reduce the detrimental effects it is having on the environment.

1.4 Research Objectives

1. To investigate the effect of foreign direct investment on the level of carbon emissions produced in the long run in Kenya.

2. To investigate the effect of foreign direct investment on the level of carbon emissions produced in the short run in Kenya.

1.5 Research Questions

1. What is the effect of foreign direct investment on the level of carbon emissions in the long run in Kenya?

2. What is the effect of foreign direct investment on the level of carbon emissions in the short run in Kenya?

1.6 Significance of the Study

By carrying out this research, an important information will be able to be brought to light. Depending on the results, whether positive or negative, the country will be able to act accordingly and establish whether more FDI is what is good for the country or much less is needed. By carrying out this research, it would be relevant to policy makers and environmentalists. CO2 emission poses great danger on human health, both in the short and long term. Majority of carbon emissions are mainly from industrial activities and consumption. The results from the study will be of significance to policy makers, and environmentalist gain a better and practical understanding of the environment response to the FDI related activities. Owing to nearly no other studies done that investigate the effect of FDI on carbon emissions, this investigation in this manner adds to a few related works and furthermore makes a stage which stirs some enthusiasm for additional examinations in such manner, filling in as a wellspring of reference for future studies in the area.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter will tackle the various past theoretical and empirical studies that have been done in relation to the impact foreign direct investment has on the amount of carbon emissions released in a country.

2.2 Theoretical Review

2.2.1 Pollution Haven Hypothesis:

Academics define the Pollution Haven Hypothesis as for certain given degrees of environmental policy, changing exchange or foreign venture rules causes contaminating and polluting industry (or firms/production facilities) to migrate to countries with more fragile ecological strategies and policies. As indicated by Aminu (2005), the Pollution Haven Hypothesis has three dimensions:

The first and foremost dimension is the migration and relocation of substantial polluting businesses from developed countries with tough and ecological approaches to less developed countries where comparative arrangements don't exist, are careless and laxer or not implemented at all. As needs be, worldwide organized commerce would energize enterprises in the developed countries to be more constrained to embrace production of dirty or contamination inclined exercises in a country where they discover it similarly more affordable to produce such products since the countries have generally feeble ecological strategy and environmental policy (Nubuor, 2017).

According to (Aminu, 2005), a portion of the unmistakable or conceivable explanations behind relocation choices are labour intensity towards work plentiful countries; natural resource endowment in certain ventures like oil and Petro-synthetic compounds, paper and mash, concrete, wood and lumber; natural and mechanical components, generally "dirty" enterprises are essential businesses related with beginning phase of industrialisation; exceptional yield to capital due to capital shortage. (Lucas, 1990), has dismissed this as a factor of capital versatility; and increment in the service industry in developed countries gross domestic product, or the knowledge society argument.

The subsequent dimension is the dumping of hazardous waste created from created developed countries (industrial and nuclear energy production), in less developed countries. This issue was the subject of the Basel Convention on hazardous waste. The Basel Convention is a global settlement treaty that was intended to diminish the development and movement of hazardous waste among countries and explicitly keep this loss from developed to less developed countries. Field and (Field, 2009) argue that with trade openness, developing countries tend to act as "pollution havens", for developed countries. They argue that stringent environmental factors in host countries are causing them to move to less developed countries. Also, that developing countries are also inviting these dirty multinational companies with promises of production incentives and the main aim of accelerating economic growth.

The last dimension is the over the top extraction of non-renewable natural resources in less developed countries by global enterprises occupied with delivering oil and oil-based commodities, wood and other backwoods resources, and so forth. All the dimensions identify with cognizant choices on ecological strategy and how they sway on the environment, future production and trade exchange.

The pollution haven hypothesis in this manner has two empirical results, to be specific: FDI outflow in developed nations is decidedly positively correlated with ecological arrangement toughness and contamination in less developed countries is emphatically connected to FDI inflow (Aminu, 2005). However, there are also some slight contradictions to general Pollution Haven Hypothesis. (Leonard & Duerksen, 1980) for example, through their research found that trade and investment data suggested that contrary to the belief that dirty industries relocate generally to less developed countries, they in fact instead move to more specifically, industrial countries. This being the case, it shows that relocation is simply not to less developed countries that they can take advantage of weaker economic policies. Instead however, there is certain criteria behind the relocation decision. They conclude that there are other factors like infrastructure, labour training, and political stability, as opposed to cost-savings from pollution regulations, that play critical roles in the relocation decisions of multinational firms.

2.3. Empirical Review

Foreign Direct Investment to most countries has been viewed as both a blessing and a curse. So, over the past recent years, more research efforts have been put into investigating this relationship between foreign direct investment and the effect it has on climate change more so the levels of CO2 emissions. However, different researchers have come up with varying conclusions to this study. On analysis of past studies done, a number of them have tended towards a more time series approach (Sha and Shi, 2006; Yanchun, 2010; Ahmad et al., 2016) with very few studies delving into a more cross-country or panel analysis on the subject (Grimes and Kentor, 2003; Liang, 2005; Wu, 2007).

2.3.1 Empirical Literature Based on Time Series Approach

Assi (2018) revealed that the effect FDI has is not consistent, it has different effects over different periods. This study was carried out in China with data that spans the course of 23 years (1990-2013). In the short run, it was found to have a positive relationship in that an increase in foreign direct investment would directly translate to an increase in CO2 emissions. However, this effect was minimal. The long run relationship however was found to be negative, in that an increase in foreign direct investment would actually lead to a decrease in the level of CO2 emissions. Various other variables were tested alongside Foreign Direct Investment to determine their significance to the study. The level of population was one of them. With this, a positive relationship was found between the size of a population and the level of CO2 emissions produced. A fractional increase in population would definitely lead to a positive, significantly different than zero value increase in CO2 emissions. Commercial openness was also tested and found to have a negative impact on the level of CO2 emissions produced.

Nubor (2017) examines the effect of manufacturing foreign direct investment on carbon emissions in Nigeria. According to the author's results, the second lag of manufacturing FDI was reported as to have a significant negative result, implying that an increase in manufacturing FDI is actually good for the environment, specifically climate change. The intuition behind the negative result that is most plausible is that most FDI into the manufacturing sector are driven into pollution reducing or environment-enhancing technologies that turn to enhance productivity whilst

promoting quality of the environment. Thus, inflows of FDI into the manufacturing sector does indeed reduce CO2 emissions in the short run. In the long run however, manufacturing FDI is found to have a positive impact on climate change. Various other factors such as Gross Domestic Product and population growth were also examined and found to increase emissions, thus having devastating effects on climate change. Manufacturing value added and trade openness though, were found to have a decreasing effect on CO2 emissions.

2.3.2 Empirical Literature Based on Panel Data Analysis Approach

Shao (2017) takes a more dynamic panel analysis of the subject in question. There are various sorts of perspectives on the impacts of FDI on the environment of the host country. Right off the bat, is that FDI moves low carbon innovation and technology, equipment and production procedures to the host country to enable the country to quicken the advancement of a low-carbon economy (Gray, 2002; Perkins and Neumayer, 2008; Talukdar and Meisner, 2001; Wheeler, 2001).

Both (Al-Mulali, 2012) and (Zhang, 2011) attempted to investigate the major factors of CO2 emissions in middle eastern countries such as Qatar, Egypt and Saudi Arabia for example. They used an extensive panel model whose time line was 1990-2009. Following the results from the study, foreign direct investment net inflows, energy consumption, GDP and total trade were factors that led to an increase in CO2 emissions in the countries under study. From a long-run perspective they found, Foreign Direct Investment does affect CO2 emissions but the impact is very low.

Numerous concerns have been raised about foreign direct investments social and environmental impacts (Gray, 2002). However, FDI appears to be increasingly unabated. Factors, for example, the advancement of the global economy, encouraged by lower tariffs on exchange goods and services and broad changes can be connected to this expansion in FDI. FDI has been viewed as a panacea for monetary turn of events thus leading to economic development, bringing important innovation and technology, skilled ability and monetary resources to developing economies. These developing nations regularly don't have the ability to exploit liberalized trade and open markets and can't deliver items for trade. FDI can offer chances to cultivate this capacity.

In their study, (Perkins and Neumayer, 2008) are of the conclusion that ongoing optimism about sustainability has fixated on the possibilities for enhancements in

environment-efficiency through the worldwide dissemination of ecologically advantageous developments. The paper examines two cases. Firstly, are that 'dirtier' economies ought to improve their environment-efficiency quicker, as they adopt naturally amicable sound innovation and sound strategies like those in 'cleaner' counties bringing about catch-up and convergence over time. Furthermore, is that transnational linkages quicken the global spread of environmentally advantageous advancements, and in this manner enhancements in environmental efficiency. For their investigation, they work with two pollutants, CO2 and SO2, utilizing a panel of 114 countries over the period, 1980-2000. Their exact discoveries extensively bolster both their cases. By applying tests of unconditional convergence, they find robust proof for convergence of CO2 and SO2 effectiveness, demonstrating catch-up by less contamination productive economies after some time. Similarly, affirming claims about transnational linkages, they find that imports from more contamination effective nations and telecommunications connectivity are related with quicker improvements in local CO2 and SO2 efficiency.

Secondly, is that FDI significantly increases the carbon emissions of the host country (Acharyya, 2009; Grimes and Kentor, 2003; Javorcik and Wei, 2001). According to (Acharyya, 2009), the inflows of FDI increased rapidly during the late 1980s and 1990s in almost every region in the world revitalizing the long and contentious debate about the costs and benefits of FDI inflows. This paper inspects two most significant advantages and costs of foreign direct investment in the Indian setting – Gross domestic product growth and environmental degradation. The author finds a measurably noteworthy long-run positive, however minimal, effect of FDI inflow on Gross domestic product development in India during 1980-2003. Then again, the long run growth effect of FDI inflow on CO2 outflows is very enormous. In the study they analysed and derived the following outcomes. Initially, a cointegration examination demonstrated that during 1980-2003, FDI inflow had some positive however minimal, long-run sway on growth total yield aggregate. Second, the declining portion of dirty enterprises altogether in relation to FDI doesn't give any direct proof on Pollution haven hypothesis in India after the mid-1990s. This doesn't preclude however the unfavourable ecological effect of FDI inflows since the portion of dirty enterprises in total yield may have expanded. Third, FDI appears to have a very huge long-run positive effect on the CO2 emission through Gross domestic product development. In

this manner their proof offers empirical support that FDI inflow has caused debasement of air quality as estimated by CO2 emission. This may, be that as it may, be an underestimation of the antagonistic effect of FDI inflow on the environment in light of the fact that the adjustments in water contamination and local air toxins are not evaluated.

During their research, (Grimes and Kentor, 2003) find that reliance on foreign capital quickens the pace of development of CO2 emissions in developing countries. This impact is driven by the global diffusion of production that has happened over the previous years in a few different ways. In the first place, foreign interest in developing countries is connected in energy consumptive industries. Second, the rationale of commodity chains, while cost efficient, expands the measure of transportation involved with the general assembling and manufacturing of goods. Third, countries to which production has been moved to have poor and lacking, local infrastructure, which brings about less energy efficient production. It is noticed that the contribution of local capital is unimportant, on the grounds that foreign capital can buy the equipment required for exceptionally computerized and automated (and energy-consumptive) production. Finally, transnational organizations might be less inclined to put resources into pollution controls for production in developing countries, which will in general have less stringent and fewer controls.

Javorcik and Wei (2001) test in the case of polluting exercises move from industrialized nations to developing economies, as alluded to by numerous anti-globalization activists. To enhance the capacity to recognize the conceivable "dirty secret" that global firms rush to countries with frail ecological security and this is especially the situation for more pollution-intensive industries, the authors look at the area choice decision relating to FDI streams from different source nations to 25 economies in Eastern Europe and the previous Soviet Union. First, they focus on investment flows from multiple countries to 25 economies in Eastern Europe and the former Soviet Union. Transition countries are a reasonable area for examining this question, as they offer an enormous variety as far as environmental norms. Second, they consider the impact of host nation debasement and. Third, they include data for both the polluting-intensity of the possible investor and the stringency to environmental factors in the potential host country, which permits them to test whether

dirty enterprises are moderately more pulled in to areas with feeble standards. What's more, fourth, they depended on firm-level instead of industry-level data.

Thirdly, is that FDI doesn't have any critical impact on the carbon emissions of the host country (Kentor and Grimes, 2006; Perkins and Neumayer, 2009). According to (Shao, 2017) in order to consider the endogeneity problem so that more accurate results can be obtained, the dynamic panel data model is used. Results showed that indeed there was a negative impact of FDI on carbon intensity and that the impact was significant in the host country. Variables such as; fossil fuels and industrial intensity are both positively correlated with carbon intensity. It was also established that FDI has a negative impact on carbon intensity of high-income countries.

2.4 Research Gap

From the above literature, various studies give various findings as to whether foreign direct investment does indeed affect climate change with respect to carbon emissions. From the study they carried out by (Perkins and Neumayer, 2009), the conclusion they had was that FDI has no significant effect of on the carbon emissions of a country.

Acharyya (2009) on the other hand tends to differ and instead concluded that FDI significantly increases the carbon emission of the host country. Some studies show a negative relationship between the CO2 emissions and FDI while others show a positive impact between the two. Assi (2018) has gone even as far as to show that the effects will instead take on two parts meaning if there is a positive relationship shown at the beginning, it eventually gets reversed in the long run.

Though there are preceding studies and literature on whether FDI does indeed impact the carbon emissions of a country, the studies and literature from a Kenyan perspective is almost non-existent. From a Kenyan perspective, FDI as a topic of research is mainly investigated with economic growth to see if there is any good that comes out of it. There is yet to be a study that investigates the effects of FDI on carbon emissions in general.

FDI makes up a significant part of investment into the economy. However, does it come at a detrimental price to us as a country? This study will however seek to investigate this and determine if there are any other potentially significant factors associated to change in climate in the country. Over and on top of that, whether an

increase in FDI would lead to environmental degradation of the country as a whole and generally whether there is any benefit or drawback of FDI on the country. It would not be a thorough study if FDI alone was investigated on testing its impact on climate change. Other potential factors such as: population size and trade openness for example will be isolated and highlighted on whether or not they have any significant impact on carbon emissions.

2.5 Conceptual Framework

The conceptual framework represented by *Figure 5* shows the various variables that affect the rate of release of carbon emissions in Kenya. The main focus of the study is to determine the effect FDI has on the level of carbon emissions. Additionally, other independent variables have been selected for study to investigate their effects as well on the rate of carbon emissions. They include; population growth, gross domestic product and trade openness.

Population growth is the increase or decrease in the number of people in a given country over a specified time. By increasing the population, in turn this would lead to more productivity in general. However, land and available resources are finite and limited. Thus, population growth was included as a control variable for the larger the population could actually be detrimental to the environment. Simply because they would put pressure on the environment (Danso-Mensah, 2015).

Trade openness simply describes how open an economy is to the international market. It is a good indicator of the trade policies of a country in terms of the removal of various trade barriers that may exist between countries to ensure exchange of goods happens. Trade openness is captured as a share of total gross domestic product (Sharma, 2011). Kenya's trade patterns involve a lot of importation of second-hand goods to the country. For example, the importation of second-hand vehicles into the country. This could result in an increase in rate of emissions owing to the age of these vehicles thus have a detrimental effect to the environment. Owing to this factor, this is the reason it was considered as a control variable for this study.

Gross domestic product can be defined as the monetary value of all finished goods and services made within a country. Increased per capita GDP would result in a higher level of production. By production increasing, there is increased pollution as a result

thus leading to environmental damage. Thus, GDP was considered as a control variable as well for this study.

Table 1: Expected Signs of variables

Variable	**Expected Sign**
Foreign Direct Investment	+/-
Population Growth	+
Gross Domestic Product	+
Trade Openness	+

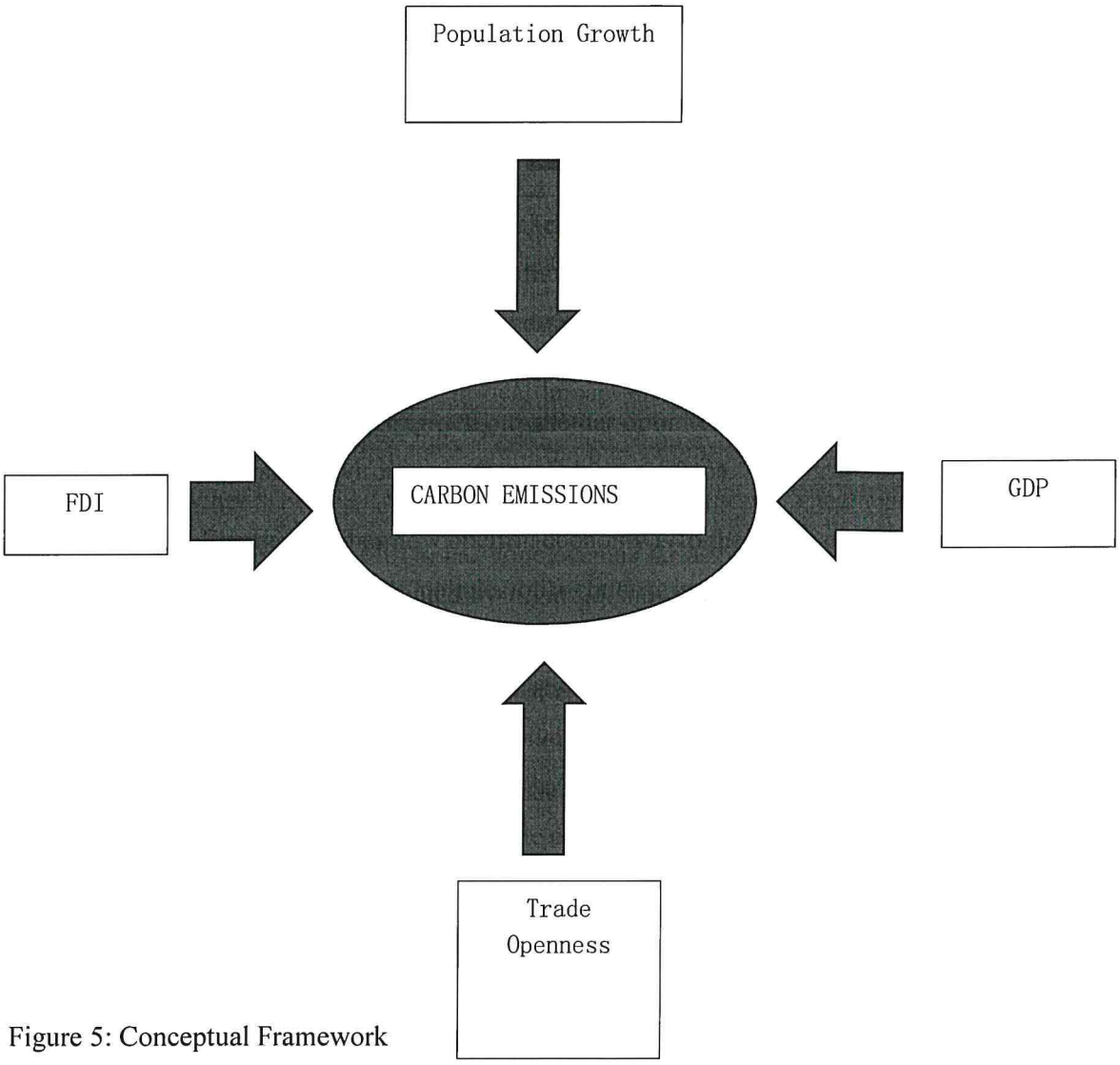

Figure 5: Conceptual Framework

CHAPTER THREE: METHODOLOGY

3.1 Introduction

In this chapter, the methodological assumptions and approaches to the study are presented here. The chapter includes the type of research design and methodology that was used. The population of the study, various types of variables used and where the data was collected from will also be made clear. The various data analysis steps are explained as well as the necessary tools that will be used to carry out the study, are mentioned.

3.2 Research Design

The study utilizes an exploratory research design. An exploratory research design is one that investigates not clearly defined problems with the purpose of having a better understanding of the problem. This research design explores the relationship between the various variables in question and allow for inferences to be made about the resulting associations and causality perceived. The relationship between foreign direct investment and carbon emissions is one that has not been investigated in the Kenyan context. This study gives a better understanding of this relationship from this research, conclusions will be made and weighed against the various hypothesis that have been put across from past studies in other developed and developing countries.

3.3 Population and Sampling

This study is a case study on the impact of Kenya's net foreign direct investment inflows on the level of carbon emissions. Only Kenyan related sample was considered for the various variables.

3.4 Data Collection

Owing to the nature of the study, secondary data would be the most appropriate to use to carry out the study. The study will use time series data for there is only one country being looked at namely Kenya. The secondary data that would be utilised is obtained from various sources. All the data on FDI, carbon emissions, population growth, trade openness and gross domestic product is obtained from the World Bank Open Data. The analysis period for this study is for the period between 1970 and 2016. Reason being because FDI data is only available up to 2016. Another reason for this time

period is owing to the fact that over this period, there has been a significant increase in foreign investments made with 2016 having the highest investment made. Also, in this period there has been major fluctuations in the level of carbon emissions in Kenya and thus whether there is a relationship between the is going to be discovered. The data was analysed on an annual basis. The reasons for using secondary data over primary data in this study is due to the fact that it was more easily accessible, reliable and more feasible to work with.

Table 2: Description of variables and unit of measurement

DEPENDANT VARIABLE	**Description**	**Unit**
Carbon Emissions	Carbon dioxide (CO2) is a colourless, odourless and non-poisonous gas formed by combustion of carbon and in the respiration of living organisms and is considered a greenhouse gas. Emissions means the release of greenhouse gases and/or their precursors into the atmosphere over a specified area and period of time	Kt (Kilotonnes)

INDEPENDENT VARIABLE	**Description**	**Unit**
Foreign Direct Investment (FDI)	Foreign direct investment (FDI) is a category of cross-border investment in which an investor resident in one economy establishes a lasting interest in and a significant degree of influence over an enterprise resident in another economy. (OECD definition)	million USD
INDEPENDENT VARIABLE	**Description**	**Unit**
Trade Openness	Trade openness refers to both export-led growth and openness to imports. This is measured by the ratio of the sum of exports and imports to real GDP. Liargovas and Skandalis (2012)	Ratio
Real Gross Domestic Product (GDP)	GDP measures the monetary value of final goods and services—that are bought by the final user—produced in a country in a given period of time adjusted for inflation. (IMF definition)	million USD
Population Growth	Population growth is the increase in the number of individuals in a population	million USD

3.5 Data Analysis

The control variables used in this study include: foreign direct investment, trade openness, gross domestic product and population growth. Once these variables are identified, the mode used is specified. The model will take the shape of investigating these control variables and the effects they have on the level of carbon emissions in Kenya. Afterwards, unit root tests are to be carried out on the variables to check for stationarity. If the variables are not stationary, this would be a problem for the issue of spurious regressions will arise and make the rest of the modelling difficult as the results will not be accurate and reliable if they are non-stationary. The Augmented Dickey-Fuller test would be most preferred here to be used. However, after differencing the data, long-run characteristics will be lost in the process. There would thus be need to run cointegration tests for there may be long-run relationships among the non-stationary variables in the system. That

3.5.1 Model Specification

In order to determine the impact Foreign direct investment has on Carbon Emissions, the following mathematical model is employed:

$$CO2_t = f\,(FDI_t, POPG_t, GDP_t, TOP_t) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where:

CO2 = Carbon Emissions at time t

FDI = Foreign Direct Investment at time t

POPG = Population Growth at time t

GDP = Gross Domestic Product at time t

TOP = Trade Openness at time t

Equation (1) can thus be written in its additive form as;

$$CO2_t = \beta_0 + \beta_1 FDI_t + \beta_2 POPG_t + \beta_3 GDP_t + \beta_4 TOP_t + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots \quad (2)$$

Some of the variables such as foreign direct investment and gross domestic product will be transformed into natural logarithms. This will allow coefficient estimates to be interpreted as elasticities.

As such the model is now specified as:

$$lnCO2_t = \beta_0 + \beta_1 lnFDI_t + \beta_2 POPG_t + \beta_3 lnGDP_t + \beta_4 TOP_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where:

ln = natural logarithm

t = time

ε_t = error term

β_0 = intercept coefficient

β_1, β_3 = elasticity coefficient

B_2, β_4 = parameter coefficient

3.5.2 Unit Root Tests

Standard classical methods of estimation are usually based on the assumption that all available variables are stationary. However, in reality, this is not the case for most macro-economic variables are not stationary (Baltagi, 2008) Owing to this fact, this leads to the issue of having spurious regressions. This could lead to a misleading conclusion of evidence of a linear relationship between non-stationary variables. Hence, stationarity tests on the variables before commencement of the study are essential to help us avoid the issue of spurious regressions. More often than not, it is common to see non-stationary variables become stationary after differencing them. However, due to this procedure, the short-run dynamics are favoured and we would lose a significant amount of long-run information as the study moves on.

The importance of carrying out stationarity tests is to attain accurate reliable results and this cannot be attained if the variables are not stationary. The assumption is that with an increase in the sample size, the covariances of the sample converge to the covariances of the actual population. However, with the presence of non-stationary variables, this would not occur for they do not fluctuate around a constant mean (Verbeek, 2004). A problem also arises when two completely unrelated non-stationary

variables are regressed together. The results from that would likely mislead anyone by the fact a high R^2 would be evident, unlike auto-correlated residuals and high regression coefficients in relation to their standard errors.

To be able to test for unit roots, there have been a number of approaches developed to help us do exactly this. Among the plethora of approaches available, the most common ones employed include; Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF) and Phillips-Perron test. For this study, the Augmented Dickey-Fuller test will be used. The ADF test is basically conducting a regular DF test but now in the presence of auto-correlated errors. Owing to this fact, the ADF test is preferred to the DF test simply because it takes into account error corrections and takes care of them by including lagged values, which does not apply in the DF test. After estimating the model using this test, if the p-value obtained is greater than 0.05, the null hypothesis will be rejected. Failing to reject the null hypothesis implies the presence of a unit root meaning the series is not stationary.

3.5.3 Cointegration Tests

As mentioned earlier, differencing would make the series stationary which is more preferred. However, in doing so, the long-run characteristics are lost to the estimation, which is not ideal. Though they are individually not stationary, a linear combination of two or more variables can be stationary, implying that there may exist cointegration and a long-run relationship among the non-stationary variables in the system. Thus, in order to be able to obtain both the short-run and long-run relationships, cointegration is crucial and mandatory.

The most common procedure to test for cointegration is the Johansen Maximum Likelihood procedure. Unlike the other possibility, which is the Engle Granger procedure, Johansen tests, allows for testing of more than one cointegrating vector. It allows for estimation of the model without having the restriction of classifying variables as either endogenous or exogenous. Thus, it is possible to test for multiple cointegrating relationships in a single step procedure.

Non-stationary time series are those whose means and variances fluctuate over time. With cointegration tests, these non-stationary variables will be able to be analysed and

enable the estimation of the long-run parameters in the system that we would want to observe and report on.

3.5.4 Vector Error Correction Model

Vector error correction modelling is one of the methods used to mode multivariate time series. For this study, the Vector Error Correction Model (VECM) would be the most appropriate. This is owing to the properties of the variables of the study and there being a cointegrating relationship among the variables in the model. When the variables are stationary and from the cointegration test, there exists a cointegration relationship, then the VECM would be most preferred. If that is not the case or there is absence of a cointegrating relationship, a Vector Autoregressive (VAR) model would have been more appropriate.

While carrying out the time series analysis, before the analysis can begin, the variables must be tested for their time series properties. In doing so, it will be easier to avoid any spurious regressions that may occur from non-stationary variables. If cointegrating relationships are found, that usually speak towards the long run relationship of the variables, the short run relationship between the variables should also be modelled. This is made possible by the use of a vector error correction model that can be thought of as a vector autoregressive model in first differences that also includes the cointegration vector.

By cointegrating, this would mean that the variables in question would be connected through an error correction model. With the error correction model, we would have a better understanding of the long run relationships. On estimating the cointegrating vector, standard OLS would enable us to get the error correction relationship. Vector error correction model would be a multivariate extension of the error correction model that can be estimated by the Johansen method. With the VECM parameters obtained, both the short run and long run relationships of the system would be able to be obtained and reported on.

CHAPTER FOUR: EMPIRICAL RESULTS AND ANALYSIS

4.1 Introduction

The main agenda of this chapter will be to go over the data analysis and present the findings that have originated from the study. An interpretation of both the short run and long run effects of FDI on carbon emissions will be given in this chapter. The analysis that was carried out entailed the descriptive statistics, test for stationarity, cointegration test, the execution of the error correction model and finally the residual diagnostics.

4.2 Descriptive Statistics

In this section, the descriptive statistics of the raw variables under study will be presented. The descriptive statistics shows the number of observations, mean, standard deviation, median, median absolute deviation, minimum, maximum, range, skewness, kurtosis and the standard error. As evident from the table below, the variables under study have a total of 47 observations. Implying that the period the data runs from was 47 years, (1970-2016). FDI has a mean of 184 million during the period 1970-2016. Just after Kenya gained independence in 1963, FDI inflows were very minimal. However, from 1970 there was increased interest in investing in the country and the flows greatly increased with 2016 being the year it hit an all-time high of 1.4 billion. The Vision 2030 plan by the government could be attributed to the continual growth of FDI in the country. Carbon emissions recorded a mean of 0.2837 Kilotonnes emitted over the 47-year period with 1981 being the year with the single highest emissions. Carbon emissions over the period of study have been fluctuating maintaining a generally upward trend. Trade openness showed an average of 57.48% and a high of 74.57%. This is an indication of how the country values international trade and its benefit to the economy. The population growth average of is in line with the government predictions showing the country grew by 3.19% over the study period for the country with a very low deviation from it of just about 0.48%. GDP recorded a mean of 17 billion with a maximum value of 69 billion, implying the economy of the country is not badly off.

Table 6: Selection-order criteria

Selection-order criteria								
Lag	**LL**	**LR**	**df**	**P**	**FPE**	**AIC**	**HQIC**	**SBIC**
0	-26.0184				2.90E-06	1.4427	1.5182	1.6475
1	191.8230	435.6800	25	0	3.70E-10	-7.5267	-7.0735	-6.2979
2	277.0390	170.4300	25	0	2.40E-11	-10.3274	-9.4967	-8.07471*
3	319.7970	85.5170	25	0	1.20E-11	-11.1534	-9.9450	-7.8767
4	366.2070	92.8190*	25	0	5.7E-12*	-12.1492*	-10.5632*	-7.8486

After selecting the optimal number of lags to be used in the model, the Johansen Cointegration test is run in order to be able to identify the cointegrating relationships among our variables. The hypothesis the Johansen Cointegration test are as follows

$$H_o = No\ cointegrating\ relationship$$

$$H_1 = Presense\ of\ cointegrating\ relationship$$

Table 7: Test for cointegration

Johansen test for cointegration					
Maximum Rank	**parms**	**LL**	**eigenvalue**	**trace statistic**	**5% critical value**
0	5	159.2642		89.7877	68.5200
1	14	182.0915	0.6293	44.1333*	47.2100
2	21	193.0414	0.3787	22.2335	29.6800
3	26	201.0661	0.2945	6.1841	15.4100
4	29	204.1496	0.4125	0.0171	3.7600
5	30	204.1581	0.0003		

In order to determine the number of cointegrating relationships, the trace statistic and eigen values are examined against the 5% critical values. With reference to Table 7 above, if the trace statistic is greater than the 5% critical value the null hypothesis of no cointegration is rejected. However, at 1 hypothesized relationship, it is necessary to fail to reject the null hypothesis implying there is at least one cointegrating relationship. By virtue of existence of a cointegrating relationship, this warrants for the construction of a vector error correction model.

4.4.2 Long-run Effect

The Johansen cointegration test made it apparent that there is presence of one cointegrating relationship in the model, implying the variables share some common

relationship in the long run. In order to obtain the long run relationship of the dependant and independent variables we use the normalized cointegrating equations to express this. The results of this equation are observed below in Table 8.

Table 8: Long run model results

NORMALIZED LONG RUN MODEL			
VARIABLES	**COEFFICIENTS**	**STANDARD ERROR**	**P-VALUE**
LNCARBON	1.0000	-	-
LNFDI	-0.2685**	0.0330	0.0000
TOP	-0.0746	0.3073	0.8080
POPG	0.4441	0.3066	0.1480
LNGDP	0.3728**	0.0725	0.0000
CONSTANT	-2.9188	-	-
***, ** & * denote 10%, 5% & 1% level of significance respectively			

Where LN- denotes logarithmic form of the variable

As per the results from the vector error correction model shown in Table 8, it is estimated that there is an approximate negative long-run effect of -0.2685% in Carbon emissions given a 1% increase in FDI holding all other factors constant. With regards to trade openness, there is a -0.0746% decrease in level of carbon emissions given a one percentage point change in trade openness. Given a one percentage point change in population growth, there is a 0.4441% positive increase in level of carbon emissions. GDP also has an increasing effect on level of carbon emissions in that a one percentage change in it leads to a 0.3728% change in level of carbon emissions. FDI and GDP however are the only two variables significant at 5% significance level in the long run model. The results of this model relate to the first research objective of this paper which is to examine the long run relationship of FDI on level of carbon emissions. FDI has a negative relationship with carbon emissions in that, an increase in FDI would be followed by a decrease in level of carbon emissions.

4.5 Short-run Effect

In order to examine the short run relationships between the variables, a Vector Error Correction Model is employed to help us obtain these results. On running the model, it is noted that for all the variables except GDP, the R-square is greater than 50%. This

implies that for most of the variables, more than 50% of the deviation in the dependant variable is explained by the model and thus these variables account for majority of the changes in rate of Carbon emissions in Kenya. The results from the short run model are as follows:

Table 9: Short run dynamic model

SHORT RUN DYNAMIC MODEL			
Dependant Variable: LD-LCARCON			
VARIABLES	**COEFFICIENTS**	**STANDARD ERROR**	**P-VALUE**
CONSTANT			
LD-LNCARBON	0.0586	0.1498	0.6950
L2D-LNCARBON	0.1969	0.1463	0.1780
LD-LNFDI	-0.0851***	0.0222	0.0000
L2D-LNFDI	-0.0643***	0.0152	0.0000
LD-TOP	0.1365	0.1645	0.4070
L2D-TOP	-0.5178***	0.1704	0.0020
L2D-POPG	3.1989	5.0137	0.5230
LD-POPG	-3.5466	4.7644	0.4570
LD-LNGDP	0.6138***	0.1609	0.0000
L2D-LNGDP	-0.2383	0.1858	0.2000
ECT-1	-0.4687***	0.1084	0.0000
***, ** & * denote 10%, 5% & 1% level of significance respectively			

Where LD - denotes the lagged difference of the variable.

L2D – denotes the second lagged difference of the variable.

According to the model as indicated in Table 8, FDI, the first lag of GDP, the second lag of TOP and both lags of FDI are the only significant variables to the model at 5% level of significance. The first and second lags of CO2 with the following coefficients, 0.0586 and 0.1969 show us that in the immediate previous years, the carbon emissions are increased by 0.0586% and 0.1969% respectively. This tells us that carbon emissions in the previous years have had an increasing effect on current levels of carbon emissions. The first and second lags of FDI are -0.0851 & -0.0643 respectively. This shows that given a 1% increase in FDI will lead to a -0.0851% decrease in level of carbon emissions and a -0.0643% decrease in carbon emissions as well. This makes it clear that in the short run, FDI also has a decreasing effect on level of carbon emissions. Thus, answering our second research objective of investigating the effect of FDI on level of carbon emissions in the short run. The first lag of GDP which is significant implies that holding all factors constant, a one percent increase in it will

lead to a 06138% increase in level of carbon emissions. The table above the error correction term has a p-value of 0.0000 which is an indication of significance at the 5% level. It has a negative sign (-0.4687) indicating convergence in the long run. Please interpret the other significant variables as well including the ECT.

4.6 Diagnostic Testing

Finally, it is necessary to undertake residual diagnostic tests to be able to get the efficiency of the model. These tests include tests for normality and heteroskedasticity. The Jarque-Bera (JB) p-value test was employed to test for normality. The p-value obtained was 0.85388. This is greater than the 5% level of significance implying insignificance hence it is concluded that the VEC residuals are normally distributed. The Breusch-Pagan-Godfrey test was employed to test for heteroskedasticity. The chi-squared p-value of 0.7552 shows insignificance when compared to the 5% level of significance and accordingly thus fail to reject the null hypothesis that there is no heteroskedasticity present and conclude the VEC residuals are homoscedastic.

CHAPTER FIVE: DISCUSSION, CONCLUSION & RECOMMENDATIONS

In this section of the study, a discussion on the estimated results will be made as well as concluding remarks based off of the results obtained. After that, recommendations to relevant stakeholders will be made. Finally, the limitations of the study will be stated and possible solutions to aid in further studies shall be made.

5.1 Discussion

5.1.1 Johansen Cointegration test results

In determining the number of cointegrating relationships, both the Maximum Eigen value and the trace test statistics are examined against the 5% critical values. The results are displayed in table 7. If the entire series is integrated of the same order, then it is necessary to carry out tests for cointegration namely the Johanses's test for cointegration among the variables. In doing so it enables the investigation of the long-term equilibrium relationships among the variables. From the results in table 7, it is necessary to reject our null hypothesis of no cointegrating relationship at the 5% level. From the test results it is observed there is indeed one cointegrating relationship. Presence of a cointegrating relationship implies that the series are related and can be combined in a linear fashion. Also, a shock in the short run that may affect movement of the individual series will converge in the long run. The presence of a cointegrating relationship is enough to warrant for a vector error correction model that would help in looking at the relationship between the dependant and independent variables of the model.

5.1.2 Long run model results

As per the results from the vector error correction model shown in Table 8, it is estimated that there is an approximate negative long-run effect of -0.2685% in Carbon emissions given a percentage increase in FDI. Trade openness with a coefficient of -0.0746 also has a decreasing effect on level of carbon emissions meaning that a one percentage point increase in trade openness would lead to a -0.0746% change in level of carbon emissions Population growth has a 0.4441% increase in carbon emissions given a percentage point increase in it. Real gross domestic product also has a positive 0.3728% increase in carbon emissions given a percentage change in itself. Implying a positive and increasing impact of the variables on level of carbon emissions.

According to Yao & Wei (2007), FDI has been found to contribute to growth of economies in developing countries. Their study notes that there is a technology spill over effect as the enhancement of productivity from foreign investments. By having a long run decreasing effect of FDI on carbon emissions, this is very much in line with the findings of Assi (2018). The decreasing effect of trade openness on level of carbon emissions is in line with Frankel & Rose (2002), who agree that it does indeed lead to improvement of environmental quality.

5.1.3 Short run model results

According to the model as indicated in the table 9 FDI, the first lag of real gross domestic product and the second lag of trade openness are the only significant variables to the model at 5% level of significance. The first and second lags of CO2 with the following coefficients, 0.0586 and 0.1969 show us that in the immediate previous years, the carbon emissions are increased by 0.0586% and 0.1969% respectively. This tells us that carbon emissions in the previous years have had an increasing effect on current levels of carbon emissions. This intuitively tells us that the relevant bodies in charge of maintaining environmental quality have not significantly improved in doing so. The past years carbon emissions have positively influenced current year carbon emissions hence a reduction in environmental quality.

The variable FDI fist lag reports a negative impact on carbon emissions that is significant. It has a p-value of 0.000 showing a significant negative effect on carbon emissions at 5% level of significance. Thus, in the short run, a percentage increase in FDI leads to a reduction of about -0.0851%. Intuitively we could deduce that the sector is into environment enhancing technologies that enhance productivity while promoting quality environment. This is in line with Yachum (2010) that FDI inflows have a reducing effect of carbon emissions in China owing to the spill over effects from technology.

From the results obtained, this comes into contradiction of various other authors findings such as Acharyya (2009) and Jalil (2014) among others who concluded that increase in FDI inflows increases carbon emissions in Northern Africa.

The second lag of trade openness with a coefficient of -0.5178 is also statistically significant in the short run. Implying that opening up the country to international trade is overall a benefit to Kenya for it comes with a decrease in the level of carbon

emissions. These new investors tend to have efficient equipment and processes compared to those of Kenya and thus are able to enhance environmental quality while in operation. These findings are also inline with those of Eskeland and Harrison (2002).

The error correction term is also taken note of. The error correction term indicates the speed of adjustment and defined the speed with which any disturbance or disequilibrium in the model reacts towards the long-run equilibrium. The significance of an error correction term with a negative coefficient implies long-run convergence, whilst a positive coefficient means divergence.

From table 9 above, the p-value of the error correction term is 0.0000. This is an indication of the error term being statistically significant. The coefficient is -0.4687 indicating convergence. Therefore, it is clear from the results that there is some long-run causality for the variables meaning they move together in the long-run, converging to the long-run equilibrium state. Approximately 46.87% of any disturbances is corrected in a year.

5.2 Conclusion

The effect foreign direct investment has on the environment is one that has been greatly debated as evidenced in literature. In this study, it is evident that the effect foreign direct investment has on carbon emissions is similar in both the short run and in the long run. The results indicate that FDI into the country helps reduce the level of carbon emissions. This could be due to the fact that numerous investments are made into technologies that are less polluting generally in their operation phase. The foreign investments made are more often than not concerned about the general well-being of the environment and necessary operational precautions to ensure the quality of the environment are taken.

5.3 Recommendations

From the analysis and findings from above, this study makes recommendations which include but not limited to the following:

Various relevant stakeholders such as the government and its various agencies and policy makers should be strict on the numerous environmental quality regulations and ensure they are adhered to the letter especially for all foreign related investments. One

way in which this could be achieved is through the effective implementation of protection regulations and policies that are environment building in nature. Foreign direct investment is a great way to boost growth in a country however, the environmental impact of such should not be overlooked.

There should also be active and effective monitoring and evaluation to ensure that foreign investors adhere to the stipulated policies and regulations in place with regards to emissions.

Another recommendation is that the country receiving the foreign investment should give emphasis on high-tech content while still preventing resource and pollution heavy investment through modifying the catalogue of attracting these foreign flows not only paying attention to the amount of the foreign investment but also on the quality of it.

Reduction of the amount of fossil fuels in use in the industries is imperative in order to be able to achieve a low carbon energy structure. Research and development into renewable sources of energy would be essential in order to make a shift from excessive coal usage in industries.

5.4 Limitations of the study

The availability of data for longer periods greatly constrained the scope of this study. FDI data only begins from 1970 and carbon emissions data is only available up to 2016. Another limitation is the lack of the detailed distribution of FDI flows to the various sectors.

5.5 Areas for Further Research

Having a more targeted and sectoral analysis will help critically assess the effect FDI has on carbon emissions from a sector-on-sector perspective. The more accurate and finely decomposed the FDI data is, the more a significantly relevant analysis can be caried out. It stops being a question of how much FDI the country receives and its effect on level of carbon emissions. Rather the quality of FDI will be looked at and thus each sector can be accessed and more concise decisions as to whether foreign investment to that sector is necessary or which particular sectors have the most detrimental effects to the environment and how they can be improved.

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