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(Master’s Degree in International Economics and Commerce)**

L’impatto degli investimenti in infrastrutture portuali sul commercio
marittimo internazionale - Evidenze empirica sul Kenya.

**THE IMPACT OF INVESTMENTS IN PORT INFRASTRUCTURE
ON INTERNATIONAL MARITIME TRADE – EMPIRICAL
EVIDENCE FROM KENYA.**

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DEDICATION

To my parents Mr. Francis Atieno and Mrs. Jecinter Atieno (**May your Souls Rest in Peace**) for the foundation you set and to the family for your prayers, support and encouragements. May this motivate you to keep working on your dreams.

ACKNOWLEDGMENT

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ABSTRACT

The quality of port infrastructure and the level of infrastructure connecting the port to the hinterland is turning out to be a major constraint affecting international maritime trade. The governments world over have continued to invest in the improvement of infrastructure at their respective ports to reduce the cost of trade. This thesis therefore applies the gravity model of international trade to determine the impact of infrastructure investments undertaken by Kenya at the port of Mombasa on the value of Kenyan maritime exports. The results show that the investments at the port of Mombasa from the year 2012 generated significant improvements in the value of Kenyan maritime exports.

Keywords: Gravity Model, Port Infrastructure, International trade cost, policy, maritime trade, fixed effect.

ASTRATTO

La qualità delle infrastrutture portuali e il livello delle infrastrutture che collegano il porto all'entroterra si stanno rivelando un grave ostacolo al commercio marittimo internazionale. I governi di tutto il mondo hanno continuato a investire nel miglioramento delle infrastrutture nei rispettivi porti per ridurre i costi commerciali. Questa tesi pertanto applica il modello di gravità del commercio internazionale per determinare l'impatto degli investimenti infrastrutturali intrapresi dal Kenya nel porto di Mombasa sul valore delle esportazioni marittime keniate. I risultati mostrano che gli investimenti nel porto di Mombasa a partire dall'anno 2012 hanno generato significativi miglioramenti nel valore delle esportazioni marittime keniate.

Parole chiave: modello a gravità, infrastruttura portuale, costo del commercio internazionale, politica, commercio marittimo, effetto fisso.

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LIST OF NOTATIONS.

MPD	–	Mombasa port development project
TEUs	–	Twenty Feet Equivalent Units
KPA	–	Kenya Ports Authority
KRA	–	Kenya Revenue Authority
GCI	–	Global Competitiveness Index
JICA	–	Japan International Cooperation Agency
COSCO	–	China Ocean Shipping Company
AFCTA	–	African Continental Free Trade Agreement
STEP	–	Special Terms for Economic Partnership
GRETL	–	GNU Regression, Econometric and Time-Series Library
ECTS	–	Regional Electronic Cargo Tracking System
EIB	–	European Investment Bank
IRR	–	Internal Rate of Return
H-O	–	Heckscher-Ohlin
ESA	–	East and Southern Africa
CEPII Internationales	–	Centre d'Etudes Prospectives et d'Informations
HSC	–	Harmonized Commodity Description and Coding System
KNBS	–	Kenya National Bureau of Statistics.
STS	–	Ship to Shore Gantry cranes
RTGs	–	Rubber Tyred Gantry Crane
KNSL	–	Kenya National Shipping Line
OEC	–	Observatory of Economic Complexity
MSC	–	Mediterranean Shipping Company.

CHAPTER ONE

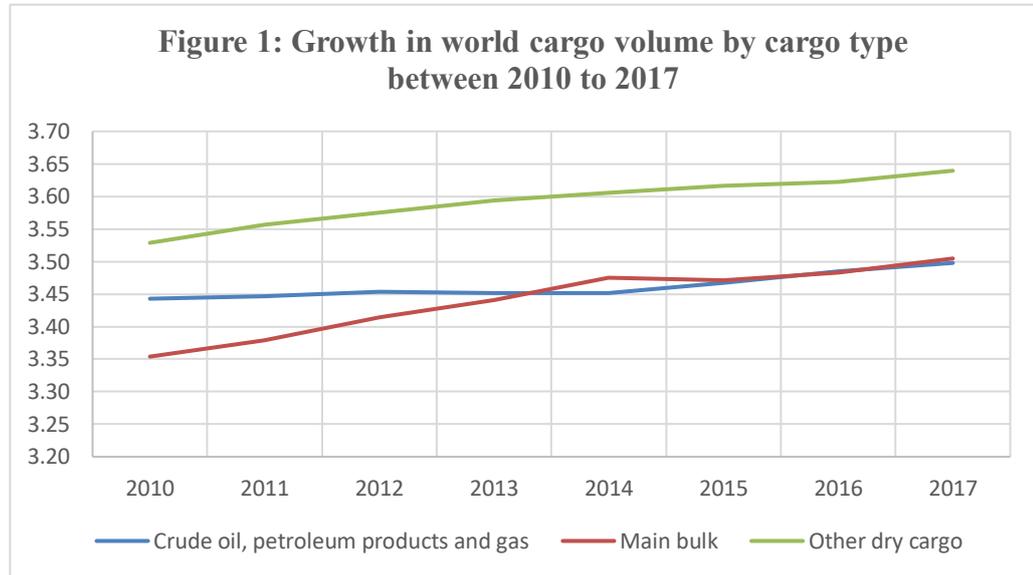
Introduction.

The world economy has been experiencing tremendous improvement having grown from 2.5 percent in 2016 to 3 percent in 2018 with the overall GDP projected to expand at a compound annual growth rate of 3.8 percent until 2023 (UNCTAD, 2018). The growth accounting theory helps explain these attributes and quality of an economy that allow for more efficient utilization of resources with the most important determinant of long-term economic growth being the productivity gains. Previous study showed that 70% of cross - country variations in long term growth is explained by the Global Competitiveness Index (GCI 4.0) organized into 12 main drivers of productivity: human capital, agility, resilience and innovation which are significant as the Forth Industrial (4IR) revolution gathers pace (Schwab, 2019).

The growth in world economy has resulted in the increase in the volume of international trade. International trade makes a country or region gain access to international markets and sources of supply which has been facilitated through trade liberalization. According to UNCTAD (2018) policy instruments such as the Comprehensive and Progressive Agreement for Trans-Pacific Partnership, the trade agreement between Europe and Singapore, the Regional Comprehensive Economic Partnership and Agreement establishing the African Continental Free Trade Area (AFCTA) which is expected to increase the value of intra-African trade by 33 per cent are projected to lead to increase in trade liberalization if successfully concluded and implemented. Moreover, the Agreement between European Union and Japan for the Economic Partnership is also in line with the projected rise in North-South trade.

A greater percentage of international trade is undertaken through the sea. The growth in international seaborne trade has been increasing steadily with a total of 10702 million tons of cargoes loaded in 2017 up from 8409 million tons in 2010 (UNCTAD, 2018). While other dry

bulk cargo continues to dominate cargo types in terms of volume, crude oil, petroleum products and main bulk have experienced uniform growth during the same period as shown in figure 1.

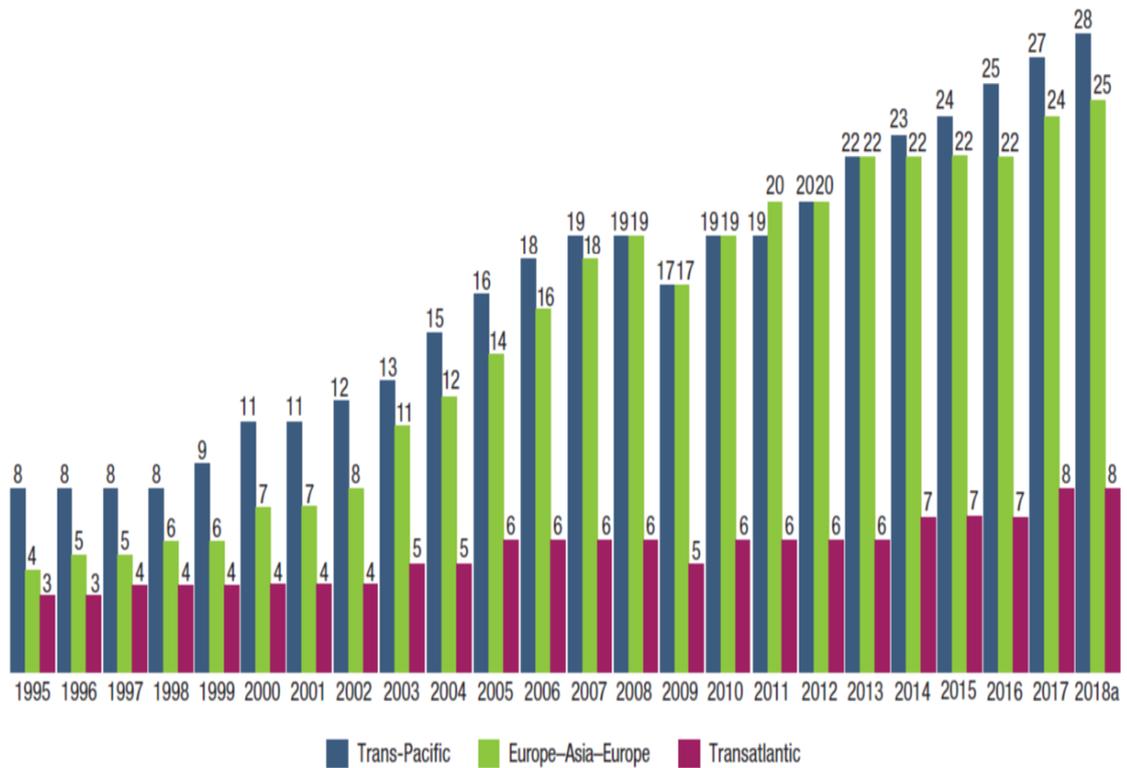


Source: UNCTAD, 2018.

These trends indicate a positive relationship between growth in seaborne trade and the world output growth. A growth in world output led to an increase in seaborne trade. However, the positive trend in international seaborne trade is under threat from inward-looking policies as well as the increase in protectionism. Of great concern is the Brexit, the current trade friction between United States and China, as well as between United States and Europe.

Containerization segment of seaborne trade has witnessed the fastest growth at an average of 8.1 percent in nearly four decades as shown in figure 2. A container is a standardized metal box of lengths 20, 40 and 45 feet and a width of 8 feet used for storage and transportation. The measurement of a standard container that can easily be transferred between different transport modes is Twenty-foot Equivalent Units (TEUs) and is the one used in the rest of the paper.

**Figure 2: The flows of containerized cargo on major international maritime trade routes
(Million 20 – foot equivalent units)**



Source: UNCTAD, 2018.

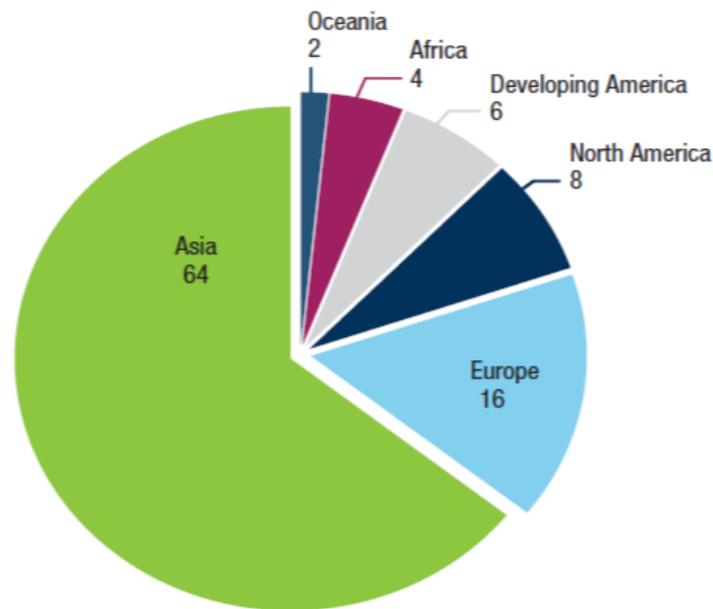
One factor that has led to this growth in containerization is the ability of the containers to easily blend to the changes in the mode of transport with a higher percentage being handled by an intermodal transport chain as well as providing good protection to the goods transported. It is also effective in longer distances because of higher first mile cost and lower distance elasticity (Cosar & Demir, 2018).

The choice of the mode of cargo movement involves balancing tradeoffs between time, cost and reliability of delivery to facilitate trade in the current global economy. The transportation system incorporate ocean and coastal routes, inland waterways, railways, roads and air freight which complement each other to ensure that goods move from start to finish (Corbett & Winebrake, 2008). The transportation of containers is provided by a network of regular liner shipping companies consolidated through mergers and acquisitions as well as formation of

alliances for better fleet utilization, supply management, improved efficiency, stability, less fluctuations in freight rates and increased bargaining power of the shipping companies over ports (UNCTAD, 2018). They provide transport connections involving both direct services as well as container trans-shipment through hub ports. These connections follow three main trade groups either 1) East-West routes linking North America, Europe and Asia, 2) North-South routes connecting major production and consumption centers and 3) intra-regional routes providing feeder and shorter sea services (United Nations,2005). Kenya is connected to the rest of the world through all these routes as it provides a link between America, Europe and Asia across the Indian Ocean making its seaport very significant in the transshipment business.

The increase in the volume of international seaborne trade indicate that seaports will continue to become important components in the trade process. According to UNCTAD (2018) the number of port calls continue to increase, and some 873 ports worldwide received regular scheduled calls made from fully cellular container ships across 141 countries contributing to over 560 million TEUs between 2016 and 2017. Overall, an estimated combined throughput of 336.6 million TEUs (45 percent of the world total) were handled by the leading top 20 container terminals in 2018. With nearly two thirds of the container port throughput and having the top ranked port being Shanghai, Asia continues to experience a rising trend in the number of port calls (see figure 3) thereby taking a key role in the container handling business (UNCTAD, 2018).

Figure 3: World container port throughput by region in 2018 (% Share in 20 – foot equivalent units TEUs)



Source: UNCTAD, 2018.

In order to measure the competitiveness in the maritime trade, UNCTAD developed liner shipping connectivity index. This index provides a framework for measuring the position of a country within the global liner shipping network reflecting both changes in demand and decision taken by carriers which are dependent on vessel deployment strategies and response to port investment and reforms in container ports of countries. In line with this is a growing trend in port investment by China Ocean Shipping Company (COSCO) being a principal port investor. This company is expected to emerge as a world leader among the terminal operators by the end of 2020 (Ma & Peverelli, 2019).

Countries with seaports have continued to invest in the ports and connecting infrastructure in a bid to reduce the cost of trade, improve their maritime connectivity and increase the economic growth through trade. The main objective of this study is therefore to examine the impact of investment in Kenyan port infrastructure on international maritime trade in order to determine whether the current port infrastructure development policies Kenya has undertaken since 2012 have generated economic returns.

To achieve the research objective, it was important to test the following hypothesis.

H1: Investments in port infrastructure has a positive impact on the cost of international maritime trade.

This research will therefore be useful in providing insight on the viability of the investments which will therefore help the port management, the ministry of infrastructure and the general public in evaluation of such projects while at the same time assisting stakeholders understand the impact of ports in promoting international trade therefore ensuring improved port efficiency and productivity. Moreover, it will provide information to investors who will be able to make strategic investment decisions considering the increasing attention on the investments in several port projects. Investors for future projects will therefore be able to apply the findings from this research in undertaking the analysis of such investment projects. Again, the findings will provide valuable information that will be easily applied in future research as it will expose several research gaps to be filled by upcoming researchers.

This chapter is the introductory chapter of this research. Chapter two provides information on the review of the international trade theories, international trade costs as well as economic impact of ports. It also provides an overview of the Kenyan economy, its trade and the port infrastructure. The third chapter presents the methodology of the study. This chapter explains the concept of the gravity model, the sources of data used in the research and the method used

to analyze the data. The fourth chapter provides the analysis and discussion of the findings related to the output. Chapter five is the final chapter of this research. It answers the research questions and summarizes the main findings. It then provides the policy implications, research limitations and suggestions for further research.

CHAPTER TWO

LITERATURE REVIEW.

International trade has been explained by several theories that have help in providing answers to some of the critical questions on trade liberalization.

The first theory, the *Absolute Advantage Theory*, was advanced by Adam Smith. It argues that a nation produces and exports commodities which it can produce more cheaply than other nations at the same time importing those commodities which it cannot (Schumacher, 2012). This is because each nation has absolute advantage in production either through resource or factor endowments. This results into the reduction of production costs in that nations will choose to produce those commodities which it can produce more cheaply therefore promoting international trade through exporting thereby creating a positive sum game in which all the countries involved gain (Khayumbi, 2015). This theory therefore helps explain the relationship between economic development and international trade and is dynamic in that it is integrated into a broader economic framework (Schumacher, 2012) which helps in building a network between nations through trade. The overall result is a simple concept of international competition and export marketing.

David Ricardo advanced another theory, the *Comparative Advantage Theory*, which explains the direction of flow of trade between countries and determines the gains each country gets from participating in international trade (Faccarello, 2015). Known as Ricardian model, this theory argues that countries specialize in production of output with abundant inputs relative to the others. More realistic assumptions resulted into a series of new models. The effect of different factor endowments on international trade is best explain by Heckscher-Ohlin (H-O) model where a country will exports commodity that uses the abundant factor of production while importing that that uses the scarce factors (Widodo, 2002). Supporting this theory is the product mapping research of exports of the ASEAN countries which suggest that there is a

positive relationship between comparative advantage and trade balance where higher comparative advantage of a specific product result into higher possibility of a country becoming a net exporter.

Internationalization Theory on the other hand uses the resource-based view and contingency approach to explain the framework of decision making. Resource based approach shade light into how firms resources and capabilities help them gain competitive advantage and goes beyond market failure by considering the choice of entry in all types of markets whereas the contingency approach links the decision of entry and the form of operation (Andersen et al., 2014). The choice of international trade and export marketing therefore depend on the lifecycle of the product and the decision of the parties involved in the trade process. The process of internationalization is innovative related (I-E) since it requires a pro-active approach through favorable attitude towards international expansion (Khayumbi, 2015) which takes place through stages. The nature and number of these stages varies depending on the perception of the parties involved. The innovation model is like the adoption of a new product (Silvia et al., 2009). The internationalization can also be understood by the behavior which is explained through the Uppsala model. Under this model, the process involves gradual increase in international involvement by establishment of chains as well as psychic distance occurring due to opportunistic export activities, achievement of intermediary exports, implantation of subsidiaries and production achievement abroad. This model creates a way in which the organization learn about the market and the direct way in which the knowledge affects the investments behavior (Silvia et al., 2009). The theory is highly influenced by linguistic and cultural differences which affects decision making within international transactions.

2.1 International trade costs.

The above theories explain the reasons for bilateral trade between countries. However, the flow of trade is affected by various constraints that leads to increase in costs measured using various functions. The commonly used functions in literature on international trade are production and cost functions. Whereas the primary goal of the production function is to maximize the output quantity, the cost function aims to maximize output while at the same time minimize costs. The cost function is therefore measured in monetary values. A recent development has been introduced called the distance function that combines both the production and cost functions together to eliminate the weaknesses of the individual functions.

The concept of international trade costs is built from the theory that the returns from trade tend to decrease as international trade costs rise. Kelly and La Cava (2014) defined international trade costs as the ratio of domestic to bilateral trade which also incorporate the industry specific elasticity of substitution brought about by product differentiation. This implies that the cost of international trade is the opportunity cost of moving goods across border relative to selling in the domestic market.

According to Keith (2007), the costs of international trade fall into four categories: the transport costs, travel and communication costs, trade policy costs and transaction costs. Transport costs involve moving goods across distances. The mode of transport is dependent on the location of the trading countries, the nature of trade and the level of infrastructure. International trade relies on transportation which facilitate physical movement of goods across borders. The cost of trade is expected to increase with increase in distance. As goods move across long distances, fuel and delay costs increase while at the same time there is high cost incurred in insuring such goods against high risks involved during transportation such as temperature, storm, piracy and damages due to mishandling.

There are significant variations in the cost of trade both across countries and across the product lines. According to Anderson (2004), developing countries on average have significantly larger trade costs by a factor of two or more while the variation across the product line by a factor of as much as 10 or more. In examining the effect of global production networks on the production and trade of Australia, Kelly and La Cava (2014) found that the value of international trade costs were 132 percent of the value of domestic production for manufactured goods and 234 for services. Their findings also showed that the world international trade costs have fallen by approximately 10 percent over the past two decades with the highest reduction having been experienced in developing economies. It is therefore true that freight costs are the most obvious reasons why it is costly to trade over longer distances.

Every mode of transportation requires complimentary infrastructure both at the ports, highways or the railways. While most stakeholders underestimate ports and inland charges, these costs add to the transportation costs. The high cost of transportation induce what Behar & Venables (2010) termed as a “trap” into low trade volumes which they suggested required a kind of “big push” through public investments in infrastructure to be able to eliminate home and foreign relative prices, an initiative that is only achievable when there is coordination between governments of the countries involved. Duval et al., (2018), suggested the implementation of trade facilitation measures such as developing legal and technical frameworks to support cross border paperless trade with trade partners will significantly reduce trade costs. Moreover, the partner countries should develop trade related infrastructure strategies that are able to promote maritime connectivity and access to a broader spectrum of financial services. Continued investment in various infrastructure projects therefore are geared towards increasing efficiency and reducing the cost of trade.

2.2 Port Development and Structure.

Ports are mostly categorized in terms of the level of operations and the number of Total Equivalent Units (TEUs) of containers they handle which are driven to a large extent by the world economy and the global demand in investment, production and consumption requirements. Stopford categorized ports into four level considering the nature of their development (Aaby, 2012). Level one ports are small ports providing intra-regional connections serviced by short sea vessels. The second level have more customized infrastructure to undertake large operations with multipurpose terminals and can accommodate large variety of cargo. The large regional ports form the third category and according to their size they handle large cargo volumes using more specialized equipment for handling large operations with additional storage space and large network of hinterland connection modes involving rail and trucks. The final category are regional distribution centers serving as logistical hubs with specialized terminals for different cargo segments equipped with large cargo handling facilities since they can accommodate and moor the largest Deepsea going vessels. These ports receive cargo from the hinterland and distribute them out intra and inter-regionally.

Trade liberalization and economic integration has increased pressure on the existing seaports due to the volume of cargo transported through the sea and the rise in the number of shipping vessels. Port concentration and inter-port competition calls for revitalization of ports through the investment in new ports elsewhere to reduce the competition and increase operational efficiency (Brian, 1999). This concept is also fundamental in improving efficiency of the Mombasa port in Kenya relative to other ports in the East African region. In line with this is port regionalization and associated hinterland concepts which demand new approaches to port governance and functional focus that goes beyond the traditional port perimeter to be in line with new patterns of freight distribution and new approaches to port hierarchy (Theo &

Rodrigue, 2005). This is achieved by logistic integration by both land transport and liner shipping which require the formulation of the right strategies that incorporate inland freight circulation. In order to strengthen the current seaports and reduce congestion, there is a need to move the port services inland through the creation of intermodal terminals (Jin & Gerald, 2015; Theo & Rodrigue, 2005). In addition to this is the facilitation of port integration through management, I.T and facilities to ensure speed, safety during transshipment and productivity within the transportation, clearance and supply chain. Investment in port infrastructure is aimed at improving port performance which eventually result into optimization of port output. The quality of port infrastructure together with the market structure of port services determines the efficiency of ports.

There exists a strong interrelationship between the set of measures of port performance and the various performance indicators. Parameters such as vessels stay at port, rate of loading and unloading, number of berth, quay cranes tugboats and storage capacity are used to come up with useful information for port planning and provision of optimum port capacity and infrastructure utilization (Dayananda & Dwarkish , 2018). There are various factors that significantly influence port performance. Berth utilization, the frequency with which ship lines call at a port, geographical location of a port and economic activity of the port hinterland are some of the factor that determine the efficiency of a port (Song & Han, 2004).

While focusing on the northern trade and transport corridor in East and Southern Africa (ESA) region Victor and Prem (Gekara & Chhetri, 2013) found out that poor hinterland connectivity undermines the performance of Mombasa port. They attributed this to the constricted economic environment and chronic logistic bottlenecks along the arterial corridor. Analyzing the performance of a port should therefore be seen in terms of the value delivered to shippers and to the third-party service providers as well as the customer segmentation. For example, the overall transit time through Panama canal has been cut by a fifth from 2000 through the

investment of more than one billion dollars since 1996 (World Trade Organisation, 2004). What should define a port and the port authorities is the value driven chain systems as opposed to a place of function (Vaggelas, 2019).

Investment in port infrastructure therefore involve elements such as the cranes, port operations, depth of water, bridge clearance, warehousing space, port capacity as well as connection with land-based transportation all of which are interconnected with the aim of reducing the cost of trade.

2.3 Economic Impact of Ports.

The fundamental benefit of improved port operations and connecting logistic performance is the fact that it reduces the logistic cost of seaborne trade. The level of development of a country determines the degree to which these investments affect export performance. As the economy becomes richer, the impact of transport efficiency on export performance decrease with other findings suggesting that the quality of port infrastructure positively affects the logistic performance in developing countries which eventually leads to higher seaborne trade and improved economic growth (Munim & Schramm, 2018). One reason is that most of developing economies highly depend on international trade to supplement their local production. The maritime trade costs in Sub Sahara African for example surpasses those of other regions due to the infrastructure issues in these ports which negatively impact the ability of the region to compete in the global export market (Jabara et al., 2009).

Other Studies have been done to justify investment into seaports as a stimulator of economic growth of countries involved in international trade. The economy of a country benefit significantly from the improvement in the quality of port infrastructure (Munim & Schramm,

2018). The GDP is positively related to the number of worldwide recognized ports in a country and the growth and development of ports leads to greater trading activities as well as reduction in commodity prices (Dwarakish & Salim, 2015). A study of several port regions across Europe revealed that there is a positive link between the increase in the GDP and the existence of ports an effect that spreads to the neighboring regions (Bottasso et al., 2014). It is therefore true that continuous improvement in port infrastructure should be done to prevent the substantial adverse impact on the economy of a country by improving regional economic growth.

In order to maximize the output and minimize costs, a country will adopt policies aimed at increasing the level of investment in port infrastructure. This is measured by the impact on export and import prices, balance of payments as well as the impact on project evaluation. The method of evaluating the contributions of these policies on the economy is macro-economic approach involving cost - benefit analysis performed by analyzing a situation with project and another without project similar to the micro-economic approach of measuring expected return on investment using the concept of internal rate of return (IRR).

Evaluation is therefore a mechanism of systematic accountability of a program with the aim of improving its quality and appraising the efficiency, effectiveness and impact. The methodological framework involves the identification of the needs for the investment in port infrastructure, definition of the specific objectives reflecting the desired policy change, monitoring and evaluation to assess the effectiveness and efficiency of the change to determine whether the targeted objectives have been achieved. The outcome of the policy implementation depends on the effect of the policy. To achieve this, it is important to benchmark for the effect using similar characteristics for a different country to collect information on the relative performance of the policy on the port output.

2.4 Port Infrastructure in Kenya.

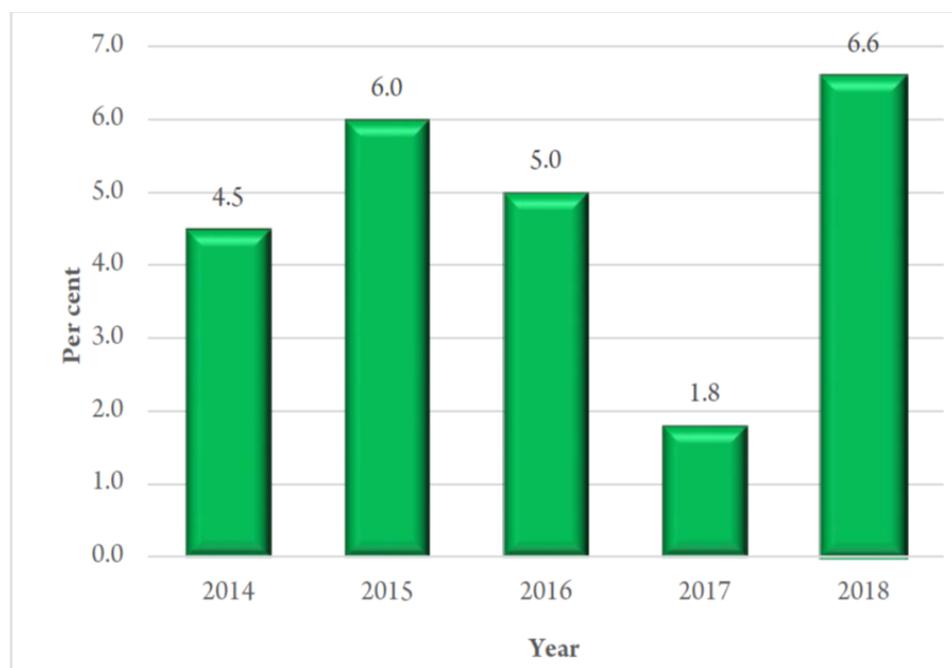
2.4.1 Background information on Kenyan Economy.

This study looks at the impact the investments in ports and connecting infrastructure has on the international maritime trade. It is based on Kenya, a country located in the Eastern Africa bordering the Indian Ocean to the South, Uganda and Tanzania to the East, Ethiopia and South Sudan to the North and Somalia to the West. Kenya is one of the fastest growing economies in sub-Saharan Africa boosted by stable macroeconomic environment, tourism, strong remittance inflows and a government led initiative in Infrastructure development. It has experienced a consistent economic growth from 2008 averaging 5.7 % in 2018 with the economy projected to grow by 6.0% in 2020 (World bank, 2019). This growth is expected to be as a result of robust macroeconomic environment including fiscal and monetary frameworks. The government focus on vision 2030 and Big four Agenda of provision of universal healthcare, robust manufacturing, affordable housing and food security are expected to help spur economic growth in the long term. With its average youthful population of 20 years, a new constitution, a highly skilled workforce and current investments in infrastructure, it has the potential to be the Africa's success stories through meeting the Millennium Development Goals targets. This is according to the report released by the World Bank on Kenya's vision 2030 strategy (World bank, 2019).

The Kenyan economy heavily rely on *agriculture* with most of the employment created by this sector. From independence, there has been a great focus on food production both for consumption and export market. The current government has also prioritized investment in this sector to ensure food sufficiency. Coffee, Tea and Horticulture constitute the bulk of products exported from Kenya with the country being the leading exporter of black tea in the world. These products are also the top foreign exchange earners. The last four years has seen an increase in the value of marketed agricultural production such as horticultural, livestock and

livestock products. On the other hand, coffee and tea has witnessed decreased earnings. This has been attributed to the reduction in international prices as a result of over-supply in the global market and rise in the cost of production. However, the real growth rate has been fluctuating with the least growth experienced in 2017. This was as a result of the hostile political environment during this time caused by the situation around the general election. Figure 4 shows the real agricultural growth rate between 2014-2018.

Figure 4: Real Kenyan agricultural growth rate, 2014-2018.



Source: Kenyan Economic survey, 2019.

In contrast, the general index of Agricultural output prices was highest in comparison with the other years with the term of trade in the agricultural sector changing only slightly as shown in table 1.

Table 1: Price indices and terms of trade for Agriculture, 2014 – 2018.

YEAR	2014	2015	2016	2017	2018*
General Index of Agricultural Output Price	150.9	162.9	166.4	180.1	173.8
PRICE PAID					
Purchased Inputs	191.3	198.9	196.6	208.1	196.0
Index of Purchased Consumer Goods in Rural Areas	420.7	499.7	478.6	513.1	536.5
Indices of price paid	306.0	324.3	337.6	360.6	366.2
Agricultural sector terms of payment	49.3	50.2	49.3	49.9	47.5

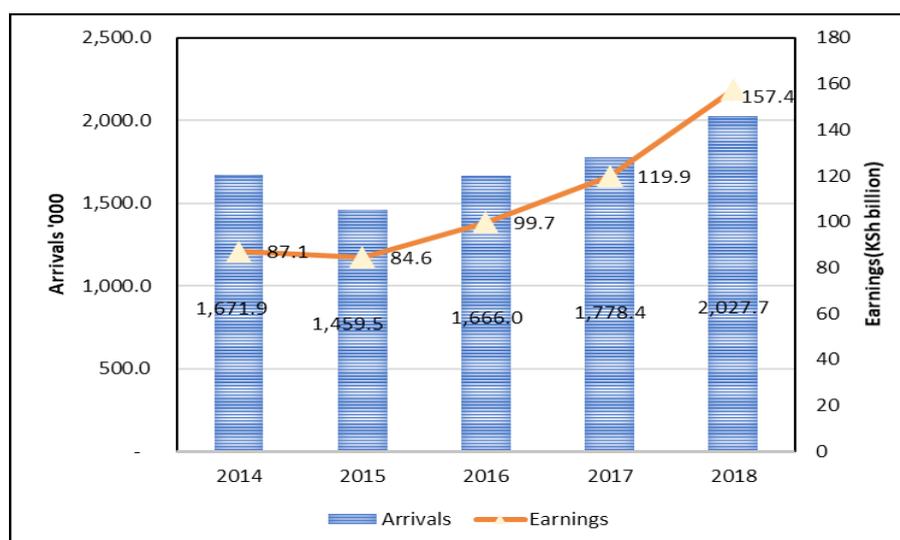
Base 2001=100 (*Provisional)

Source: KNBS, 2019

Moreover, Kenya is a destination of choice for *tourism* due to its strategic location and climatic conditions coupled with its international reputation on safari adventures. This sector has experienced a persistent growth over the past years both in times of the number of arrivals and earnings as shown in figure 5. It is also one of the top foreign exchange earners along with black tea, flower export and diaspora remittance. The factors behind this increase in performance is the growth in aviation, Investors confidence and withdrawals of foreign travel advisories. Africa accounts for the highest number of tourists (TRI,2018) followed by Europe and Asia with the highest point of entry being Jomo Kenyatta International Airport (JKIA).¹

¹ Jomo Kenyatta International Airport (JKIA) is an international airport in Nairobi the capital city of Kenya serving over 7 million passengers with scheduled flights to over 50 countries making it the seventh busiest airport in Africa.

Figure 5: Trends in international Visitors arrivals and tourism earnings, 2014-2018



Source: Kenyan Economic survey, 2019

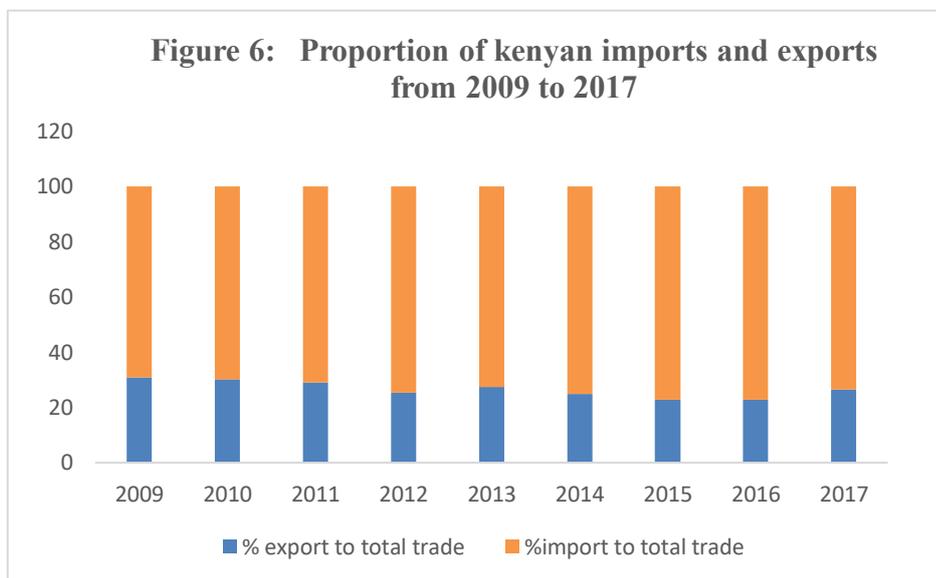
The contribution *Manufacturing* sector is however a concern considering that most of the exports from Kenya are in primary form. There is high emphasis in promotion of value addition to products which form part of the government immediate agenda. However, the volume of output in this sector has increased over time with improved investment in key sectors such as production of dairy products, tea, coffee and sugar. In 2018, the producer price index of wood, chemicals and their products increased by 0.9 % (KNBS, 2019). The same period also witnessed cumulative capital investments on machinery, equipment and zone infrastructure. Table 2 shows the producer price indices from 2014 to 2018. The year 2013 was used as the base year.

Table 2: The producer price Indices of wood and chemicals, 2014 – 2018.

Description	Weight	2014	2015	2016	2017	2018	% change
Total	100.00	109.17	113.44	113.67	118.89	119.92	0.9
Overall %change		3.03	3.91	0.20	4.59	0.87	

Source: KNBS, 2019

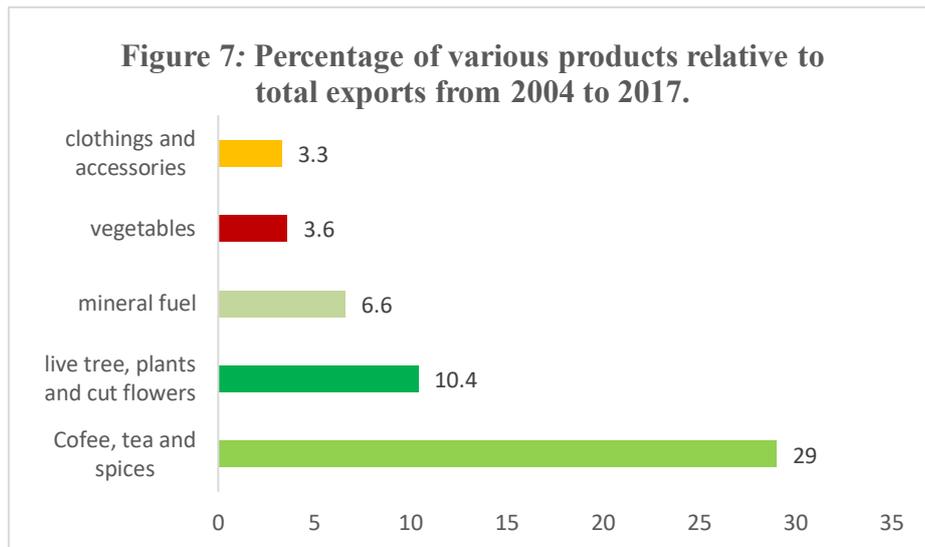
As for *International trade*, Kenya experience a high trade imbalance with high volume of imports relative to exports creating a high trade deficit. The government has tried to reduce this deficit through the investments in export processing zones (EPZ). These are areas set aside for the processing of export-oriented products at relatively subsidized costs. Data from Central Bank of Kenya for the year 2019 depict a decrease in the value of the trade deficit with the expenditure on imports having drop by 9.1% in relation to the year 2018 and at the same time, exports reducing by 4% during the same period. Figure 6 shows the level of trade deficit for Kenya during the period between 2009 to 2017.



Source: Author’s analysis of OEC data.

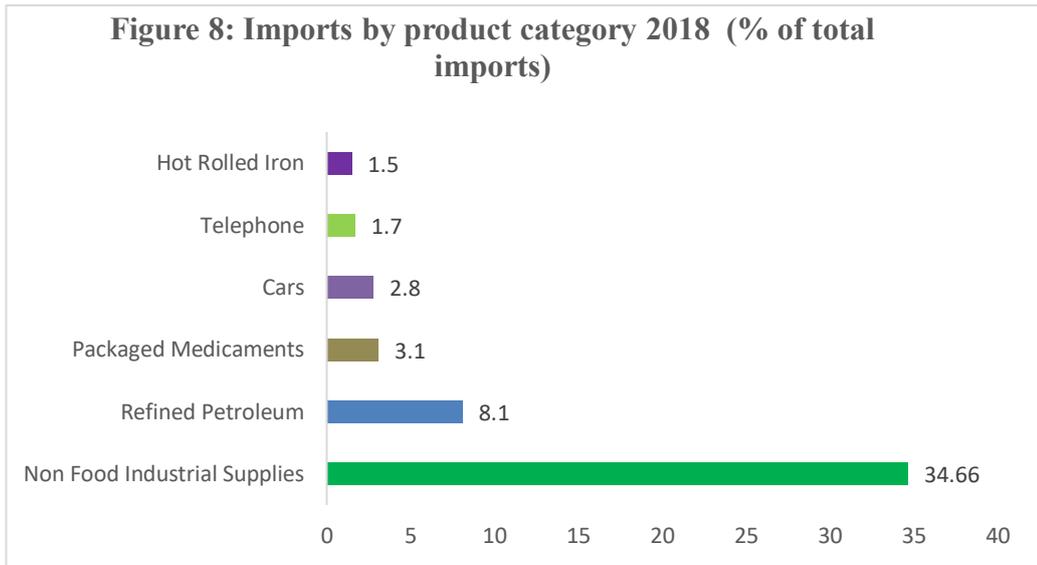
Major exports are primary products with food and beverages category accounting for the greatest share of exports volume which according to data from Kenya National Bureau of Statistics (2019) constituted 47.7 percent of domestic export in 2018. The other categories include industrial supplies (23.54%), machinery and other capital expenditure (1.25%), transport and equipment (1.12%), fuel and lubricants (0.86%) and other consumer goods (25.49%) (KNBS, 2019).

Figure 7 shows the percentage of products relative to exports. Between 2004 to 2017, coffee, tea and spices constituted 29%, live trees, plants and cut flowers 10.4%, mineral fuels including oil 6.2%, vegetables 3.6% with clothing and accessories at 3.3%. Moreover, manufactured export accounted for an average of 33.9% of total merchandise products during the same period. Overall, 13 products accounted for more than 75 % of exports.



Source: Author's analysis from KNBS data.

Imports on the other hand is dominated by non - food industrial supplies with 34.66% imported in 2018. This was an increase of 2.73 % compared to 2017 the period in which refined petroleum accounted for 8.1% of total imports way above packaged medicaments (3.1%), cars (2.8%), telephone (1.7%) and hot rolled iron (1.5%) as shown in figure 8. Fuel and lubricants also constitute a larger share of imports with the least volume being food and beverages (KNBS, 2019).



Source: Author's Analysis from KNBS data

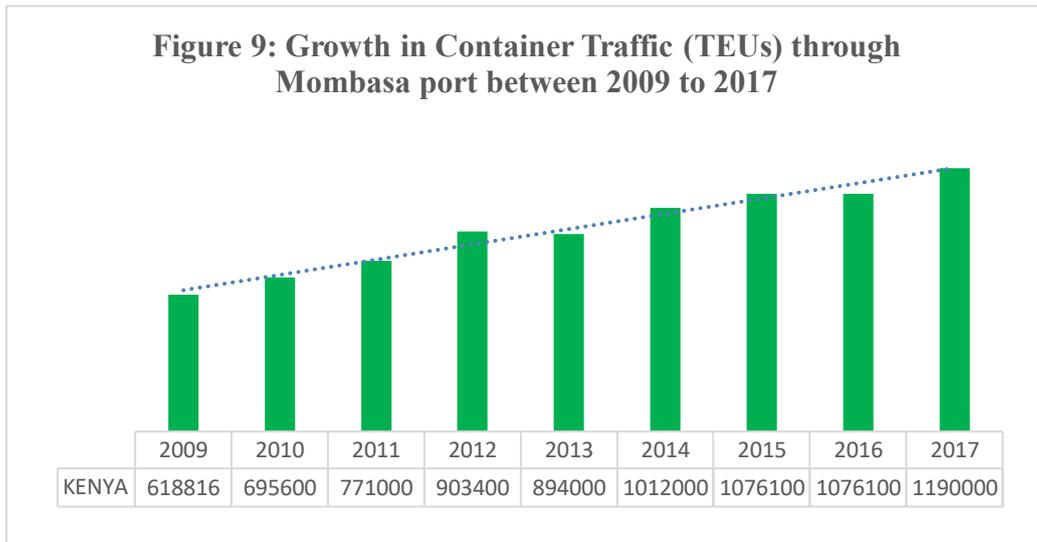
Corn is the staple food for most people ahead of rice and Irish potatoes. There is high production deficit which is supplemented by importation. The country has imposed a ban on GMO products thereby restricting imports to few countries. Apart from the East African Community (EAC) and Common Market for East and Southern Africa (COMESA), the few countries authorized to export to Kenya are south Africa, Mexico, Ukraine and Russia.

On the other hand, Asia is the major source of imports of rice mainly from Pakistan, China, India and Thailand while at the same time importing wheat from Australia, Germany, Poland, Russia, Argentina, Canada, Latvia and Lithuania.

2.4.2 Mombasa Port in Kenya.

Kenya has several ports along the Indian Ocean coastline. However, Mombasa port is the main seaport. It is a regional port serving the hinterland comprising Uganda, Rwanda, Burundi, Eastern Democratic Republic of Congo, Northern Tanzania, Southern Sudan, Somalia and Ethiopia and provides direct connectivity to over 80 Ports worldwide. The operations of Ports and shipping is under the Kenya Port Authority (KPA) with the powers to regulate shipping and ports, landlords of the infrastructure and port operations. It provides cargo handling services, maintains physical infrastructure and operate port equipment. Apart from managing the principal seaports along the Indian Ocean and lakeport, it also manages inland container depots in Kenyan towns of Nairobi, Kisumu and Eldoret as well as a recently constructed depot in the town of Naivasha.

Over the years, cargo volumes have increased at the port therefore raising the necessity for the port to increase its container handling and storage capacity as well as the ability to accommodate larger vessels without which the port would become less competitive in the region and eventually become a feeder port. This has facilitated a need to develop robust development policies geared towards ensuring that the port is able to adjust to the changing dynamics in international trade. The government through the ministry of Infrastructure has therefore initiated several infrastructure investments to modernize the port and facilitate efficient connections to the hinterland. Figure 9 shows the trend in the growth of container traffic through the port of Mombasa from the year 2009 to 2017.

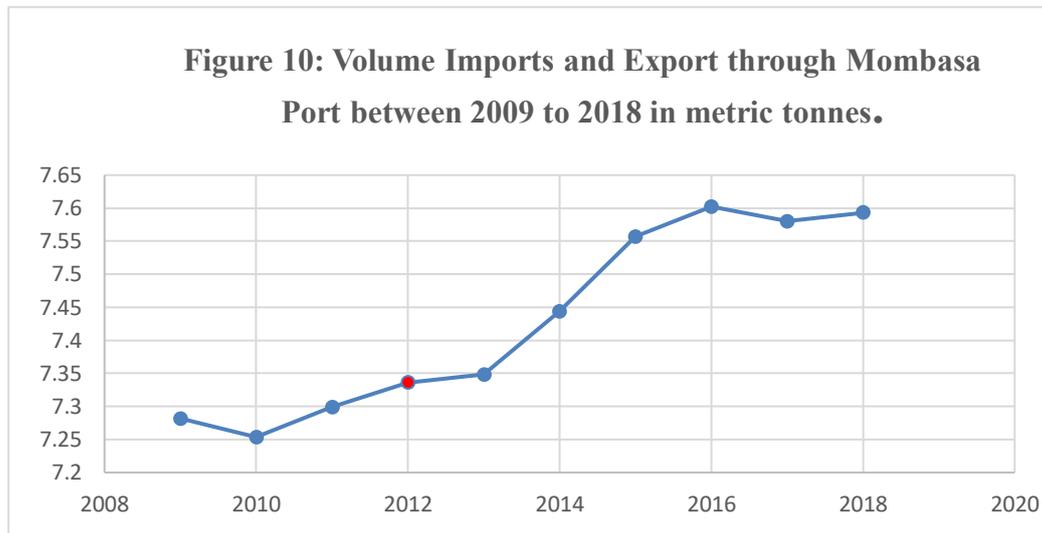


Source: Elaboration of the author's based on Kenya Port Authority data.

2.4.2.1 Mombasa Port Development Project (MPDP).

The Kenya Port Authority in collaboration with the government of Japan is undertaking the expansion and modernization of Mombasa port through construction of the second container terminal as well as the improvement of related infrastructure. This initiative called Mombasa Port Development Project (MPDP) began in March 2012 in collaboration with Japan International Cooperation Agency (JICA) within the special terms for Economic Partnership (STEP), funding the project on an area of about 110 ha. The entire project consists of construction of a new container terminal with a capacity to handle 1.5 million TEUs per annum making it one of the largest container ports in Africa together with Tanger Med port in Morocco, Durban in South Africa and port Said in Egypt. The project is divided into three phases. Phase I was completed and commissioned in March 2016 with capacity of 550,000 TEUs (Opportunities Kenya, 2019). Phase II on the other hand is being undertaken and is scheduled for completion by 2021 and is projected to give additional capacity of 450,000 TEUs of containers once it is fully completed.

The volume of international trade through the port of Mombasa increased significantly from the year 2012 reaching its peak in the year 2016 corresponding to the year when the phase one of the project was fully completed and commissioned. The graph in figure 10 shows this trend.



Analysis of data from Kenya Port Authority.

As part of this modernization, the Kenya Revenue Authority (KRA) has undertaken the installation of the Scanners Integration system to help customs officials monitor and analyze contents of cargo entering and leaving the country from the command center as well as reduce tax evasion through collusion by various actors at the border points. It connects all readers at the border entry point to the KRA headquarter in Nairobi. The installation of Regional Electronic Cargo Tracking System (ECTS) is also part of this modernization system that ensure the safety of cargo on transit from the port of Mombasa to the hinterland by both trains and trucks and the predictability of truck turnaround time. Moreover, the KRA has also introduced Automatic Container Number Readers at the rail entry and exit points to monitor the flow of cargo along the newly built standard gauge railway.

The European Union on the other hand has invested USD 200 million inform of a loan of USD180 million and USD20 million grant through the European Investment Bank (EIB) in the modernization of several berths at Mombasa port. Once fully complete, the project is expected

to have positive impact both to the local economy and the entire region. Latest data from Kenya Ports Authority shows that there was a 12% growth in the cargo traffic through the port in the year 2017 as a result of the construction of the first phase of the second container terminal (Thomas, 2017).

2.4.2.2 Infrastructure connecting Mombasa port to the Hinterland.

The function of the ports goes beyond the traditional port perimeter to include new patterns of distribution of freight that link the port to the hinterland. Port regionalization therefore involve logistic integration through land transport and liner shipping which require the formulation of the right strategies that incorporate inland freight circulation. This has been possible through investments in shipping, rail and road networks.

Kenya has not had its own active shipping line since the collapse of Kenya National Shipping Line (KNSL) established in 1987 by the government. However, the government under the ministry of transport partnered with Mediterranean Shipping Company (MSC) for its revival to expand its competence and enhance the services.

On the other hand, the introduction of East African railway Masterplan (EARM) set ground for the construction of new standard gauge railway lines across the East Africa that are of uniform standard as well as the maintenance of the existing lines to improve railway transport across the region. The initial plan was a line from Mombasa to Nairobi (Kenya), Kampala (Uganda), Kigali (Rwanda) and Juba (S. Sudan). The section between Mombasa and Nairobi (471.65 km) was completed in 2017. The completion of this section of the standard gauge railway has led to more containers being transported by trains to the hinterland since the freight services began in 2018. It is the biggest infrastructure project in Kenya since independence.

Moreover, the Kenya National Highway Authority (KENHA) has undertaken construction and improvement of the sections of the roads in order to link the landlocked countries to the seaport. The Investments in road infrastructure is therefore aligned to reduce the international roughness index, ensure smooth flow of cargo and to reduce the cost of trade. In line with this is the commitment to advance regional integration, accelerate socio-economic transformation, creation of employment and industrialization. Kenya hosted the 14th Heads of States Summit of the Northern Corridor Integration Projects whose aim was to expand the road infrastructure across the East African Community (EAC) and beyond through the Trans-African transit traffic and trans-shipment infrastructure.

2.4.3 Evaluation of the Impact of investment in Mombasa port.

As mention earlier, evaluation is the mechanism of systematic accountability of a program with the aim of improving its quality and appraising the efficiency, effectiveness and impact. In order to assess the impact of investment in the Kenyan Mombasa port, it is important to benchmark with a different country with similar characteristics. Tanzania is therefore a good choice for the benchmark. This is because of the existence of observable characteristics between Kenya and Tanzania both being the member states of the East African Community (EAC) therefore operating in the same trading bloc, the fact that like Kenya, Tanzania has a seaport, the port of Dar-Es-Salaam which serve the same region as Kenyan port of Mombasa while at the same time having similarity in the export products as both countries are major exporters of agricultural commodities mainly Tea, coffee, mate and spices.

The evaluation is therefore undertaken to find whether there has been any improvement in trade from 2012 when the Kenyan government began the modernization of it port infrastructure with the objective of gaining competitive advantage in maritime trade.

CHAPTER THREE

METHODOLOGY.

Introduction.

The purpose of this section is to explain and argue the methodology for this research, the data used and the method of estimation. This branch therefore gives detailed evaluation of the sources and identifies the methods used to increase the trustworthiness and weight of the sources.

3.1 Gravity Equation and Empirical Model Identification.

One of the standard models in the international macroeconomic literature is the ‘gravity model’. In this work, we specify this model that is built from the analogy of the Newtons law of universal gravitation which states that the gravitational attraction between two objects is directly proportional to product of their masses and inversely proportional to the square of their distances (Duong et al., 2010) . This is translated into linear form as shown:

$$G = \alpha + \beta_1 M_1 + \beta_2 M_2 + \beta_3 2D + \epsilon$$

(1)

Where

α is the constant term, ($\beta_1, \beta_2, \beta_3$) are estimated coefficients,

G – gravitational force.

(M_1, M_2) – masses of two objects.

D – distance between the two objects.

ϵ - is parameter representing the error term.

In international trade, it implies that a mass of goods (or other factors of production such as labor, capital or entrepreneurship) from the place of origin (i) is attracted to demand at the point of destination (j) with the flow affected by distance between the origin and destination (Salvatici, 2013).

This is presented mathematically as shown:

$$Y_{i,j,t} = A \frac{GDP_i GDP_j}{D_{ij,t}}$$

Here,

Y_{ijt} is the total flow of international trade from origin country i to destination country j during time t,

(GDP_i, GDP_j) are the gross domestic products measuring the economic sizes of two country i and j,

$D_{ij,t}$ is the distance between two country i and j,

A is a constant term interpreted as a function of the output at each time t,

(i) is the exporting country and (j) is the importing country.

The gravity equation was first applied in the analysis of international trade in 1962 by a Dutch economist Tinbergen. He used the trade flow from the country of origin to the country of destination as the dependent variable, GDP of both countries and the distance between them as the independent variables. His estimation showed that the GDP has positive impact on the trade flow contrary to the distance which showed negative relationship (Duong et al., 2010). The implication therefore was that the volume of trade is higher between countries that are closer

to each other and with larger economic sizes. In the model, the distance represents the bilateral trade barriers which increase the cost of international trade.²

The above model provides the general idea of the pattern of international trade. In order to maximize the output and minimize costs, a country will adopt policy aimed at increasing the level of infrastructure investment. The policy will affect the quality of infrastructure in the short run which eventually affect the output in the long run. In this section, we follow the model to estimate the effect of change in investment policy at the port level.

This paper analyzes the effect of investments in Mombasa port infrastructure on the Kenyan International Maritime trade by incorporate the policy (P) as the main variable in the model to determine the degree to which the changes in policy towards increased investment affect the cost of maritime exports from Kenya. The choice of Tanzania's trade export flows as a control group as explained above is the fact that Tanzania shares similar characteristics to Kenya but did not undertake massive infrastructure improvements at its major port, the port of Dar-Es-Salaam, during this period. This therefore makes the timing ideal for the evaluation of the policy impact. Then our estimating equation is as follows:

$$\ln (1+\text{Exp})_{ijt} = \alpha + \beta_1 \ln \text{GDP}_{it} + \beta_2 \ln \text{GDP}_{jt} + \beta_3 \ln \text{DIST}_{ij} + \gamma P_{it} + \mu_{ij} + \lambda_t + \epsilon_{ijt} \quad (2)$$

Where:

γ is parameter used to measure the policy impact.

P - stands for policy.

² The coefficients illustrate the effects of exporter's and importer's gross domestic products and the distance on the output and are calculated as $(\beta_i - 1) \times 100$.

Here, (μ_{ij}) and (λ_t) are the pair and time fixed effects respectively.³ As recommended by Yotov and Piermartini (2016), it is necessary to include pair fixed effect to control for the influence of bilateral trade brought about by possible characteristics of both exporter and importer. Additionally, time fixed effect is introduced in the model to control for observable and unobservable characteristics common to both importer and exporter that vary over time.

In the second instance, we check whether the effect of the policy is shaped by the distance between the exporter and the importer by incorporating the interaction between policy and distance. This gives an equation as shown.

$$\ln(1+\text{Exp})_{ijt} = \alpha + \beta_1 \ln \text{GDP}_{it} + \beta_2 \ln \text{GDP}_{jt} + \beta_3 \ln \text{DIST}_{ij} + \beta_4 \text{P_DIST}_{ij} + \gamma \text{P}_{it} + \mu_{ij} + \lambda_t + \epsilon_{ijt} \quad (3)$$

Where

P_ _{DIST} is the interaction of policy with distance.

The coefficient shows the relationship between policy distance combination on the value of exports.

³ (μ_{ij}) is the pair fixed effect dummy variable for country pair. It is used to account for the characteristics of policy impact that always arise due to the selection of the country used in bilateral trade while at the same time absorbing for observable and unobservable effects that are independent of time (Yotov and Piermartini, 2016).

(λ_t) is time fixed effect dummy variable for the year. It controls for observable and unobservable characteristics that vary over time for each exporter and importer. It is useful in estimating the general equilibrium effects of policy change while at the same time used to construct the indices for summarizing the policy effect.

In the third instance, we check whether the effect of the policy is shaped by any importer characteristics. For this we introduce the GDP per capita of the importer and the interaction between this GDP per capita with the policy as follows.

$$\ln (1+\text{Exp})_{ijt} = \alpha + \beta_1 \ln \text{GDP}_{it} + \beta_2 \ln \text{GDP}_{jt} + \beta_3 \ln \text{DIST}_{ij} + \beta_4 \ln \text{GDPPC}_{jt} + \beta_5 \text{P_GDPPC}_{jt} + \gamma \text{P}_{it} + \mu_{ij} + \lambda_t + \epsilon_{ijt} \quad (4)$$

Where

GDPPC is the Gross Domestic Product per capita.

P_ GDPPC is the interaction between policy and Gross Domestic Product per capita

The variables are explained as under:

(1+Exp).

Considering that ports are the main gateway for maritime trade connecting the sea to land and back to the sea, the output therefore is the value of exports (or imports) through the port per annum. According to Head and Mayer (2014), the unit value 1 is added to the export values to solve for the effect of zero trade flows that are often characterized in panel data which are dropped when the values are transformed into logarithmic form during OLS estimation. Piermartini, Roberta; Yotov, Yoto V. (2016) however, recommended that the approach should be avoided since there is no standard unit of measurement to be used while at the same time it makes it difficult to interpret the coefficients due to the fact that elasticities are lost.

Gross Domestic Product (GDP).

It is an independent variable for the value of Gross Domestic Product. It indicates the wealth of a country which eventually determine the supply and demand of the whole country. According to Leung (2012), it measures the national income and the output of an economy. This variable is measured in US Dollars and should be positive since trade is expected to increase with increase in the size of the economy. For the country of origin (GDP_i), a higher GDP is expected to have positive effect on the value of exports as a result of increased supply. On the other hand, for the country of destination (GDP_j), it determines the purchasing power of the whole country and is expected to be positive since a country with higher GDP should import more commodities in general as a result of increased demand.

Gross Domestic Product per Capita (GDPPC).

This is the value of production of a country that is allocated to each resident. It determines the individual wealth of the country and has different function to GDP as a country with a higher GDP may not necessarily have a higher GDP per capita (Leung, 2012). This variable is included due to its close connection with the GDP since both indicate the level of income of a country. According to microeconomics theory, the personal income of the residents of a country affects the demand and supply of commodities. Macedoni and Davis (2015) found out that the differences in per capita income across countries affects the choice of exporters beyond the scope of the exports to include factors such as products quality and prices.

Distance from Origin to Destination (DIST).

This variable is part of the initial gravity model and as explain above, it represents the cost of transportation and other constraints that affect the flow of international trade. An increase in the distance between the exporting and importing countries increase the cost of trade hence it leads to negative effect. The coefficient of this variable is therefore expected to be negative (Yotov & Piermartini, 2015 and Duong et al., 2010). Most of the standard gravity equations use time invariant coefficients like the physical distance, contiguous borders or common language while other use very slowly time varying estimates. It is important to note that this research use the physical distance hence does not vary with time.

Port Infrastructure Investment Policy (P).

This is the main variable used to measure the impact of the investment policy change undertaken by country i at time t presented as $t_0 < k$ for before the policy change and $t_1 > k$ for after the policy implementation where k is the time the change was initiated. According to Piermartini, Roberta; Yotov, Yoto V. (2016) it is important to use pair fixed effects when determining the policy impact to absorb and control for the factors that determine trade flows.

This is the main objective of this research and helps in analyzing the impact of the investment policy by examining the actual implementation through mapping of the external factors and comparing the outcome with other countries in the same region. The implementation of the port infrastructure evaluation plan is undertaken by looking at the previous and the current periods to determine the change. The outcome benefit stakeholders in understanding the policy measures and ensure continuous check on the progress of the investments being undertaken which therefore helps in creating various opportunities that lead to common understanding of the policy goals, checking on the progress towards the expected results with the overall outcome of improved trade and economic growth.

Interaction of Policy and GDP per capita.

This measures the extent to which the policy is shaped by the gross domestic product per capita. the coefficient is expected to be positive since increased investments together with GDP per capita often results into increased growth. For importing country, it is presented as $- p_GDPPC_j$, the interaction of policy and the gross domestic product of the importer i.e. $(policy \times \ln GDPPC_j)$. It is used to check whether the effect of the policy is shaped by the per capita GDP of the importer.

Interaction of Policy and Distance.

This variable determines the degree to which policy change is shaped by distance. As explained in the gravity equation above, distance increase the cost of trade hence have negative relationship. However, the interaction of the policy and distance is expected to be positive as the main reason for investment in port infrastructure is to reduce the cost associated with the movement of goods from the point of origin to the point of destination. This variable is represented as $- p_DIST_{ij}$ which is the interaction between policy and the distance from country i to j i.e. $(policy \times \ln DIST_{ij})$.

3.2 Data.

In the research, panel data was used constituting 968 observations covering the period of 21 years between 1997 to 2018. The countries chosen cover those with larger ports that also act as transshipment to other feeder ports.⁴ A total of 40 countries are selected to ensure consistency in the analysis and more representation.

The availability of trade flows data determined the dimension of the data set which is very important for the analysis in this work. In order to ensure consistency, exports data were used. This is because it sometimes occurs that the import values reported by a country of destination is different to those reported by country of origin due to either difference in reporting period or methods of reporting. The exports data are predetermined to focus on aggregate agricultural commodities exported from Kenya and Tanzania. They were extracted from UN COMTRADE database of United Nations website and are measured in US dollars.

The data on Gross Domestic Product (GDP) and GDP per capita for Kenya, Tanzania and the importing countries are drawn from world bank open database. They are also measured in US dollars.

Finally, the distance data is taken from *Centre d'Etudes Prospectives et d'Informations Internationales* (CEPII)⁵. This is calculated using the great circle formula using the lines of latitude and longitudes from the capital city of the pair of countries.

⁴ Partner countries used are Belgium, France, Germany, Greece, Australia, China, Egypt, Brazil, Italy, India, Japan, Ghana, Canada, Malta, Korea Rep, Morocco, Ecuador, Netherlands, Malaysia, Nigeria, Indonesia, Poland, Pakistan, South Africa, Jamaica, Portugal, Mexico, Russia Republic, Saudi Arabia, Panama, Spain, Singapore, Peru, Turkey, Sri Lanka, Philippines, United Kingdom, United Arabs Emirates, United States and Vietnam.

⁵ CEPII is the leading French center for research and expertise on the world economy founded in 1978, as part of the network coordinated by France Strategy, within the Prime Minister's services. It produces databases for independent in-depth analyses on international trade, migrations, macroeconomics and finance and contributes to the policy making process by offering a platform for

3.3 Method of Estimation.

The Ordinary Least Square estimator is the best linear unbiased estimator for the model since it fit the average line through the data representing the degree of return to scale brought about by cost minimization (Rautala, 2015).

This method of estimation has several advantages in that that it offers potential explanations for cost structures which makes it easier to identify the extent to which different variables affect the output and that the analysis can be tested under several standard statistical tests.

The empirical analyses are done using the GNU Regression, Econometric and Time-Series Library (GRETTL) software⁶. This software provides a simple regression output in which we can easily extract variables for the analysis. However, the assumption from this estimation is that there is efficiency and rationality of the economic variables which may not be the real case. It is therefore important to put this into consideration when dealing with the output results.

debate among academics, experts, practitioners, decision makers and other private and public stakeholders.

⁶*GRETTL is a cross-platform software package for econometric analysis, written in the C programming language. It is a free, open-source software therefore may be redistributed and/or modified under the terms of the GNU General Public License (GPL) as published by the [Free Software Foundation](http://www.gnu.org/licenses/gpl.html). The information about this software program may be obtained at <http://gretl.sourceforge.net>*

The first international gretl conference was held in Bilbao, Spain on May 28-29, 2009.

CHAPTER FOUR.

FINDINGS AND DISCUSSION.

Introduction

The main objective of the research is to establish the impact of port infrastructure on international maritime trade with specific reference to Kenya. This chapter is the most important part of this research. It provides analysis of the findings from the output of both the descriptive statistics and the Ordinary Least Square regression to explain the outcome of the work in relation to the mentioned objectives as well as the discussion of the findings.

4.1 Analysis of the Output.

4.1.1 Descriptive Statistics.

Table 3 provides the summary statistics for both the dependent and independent variables.

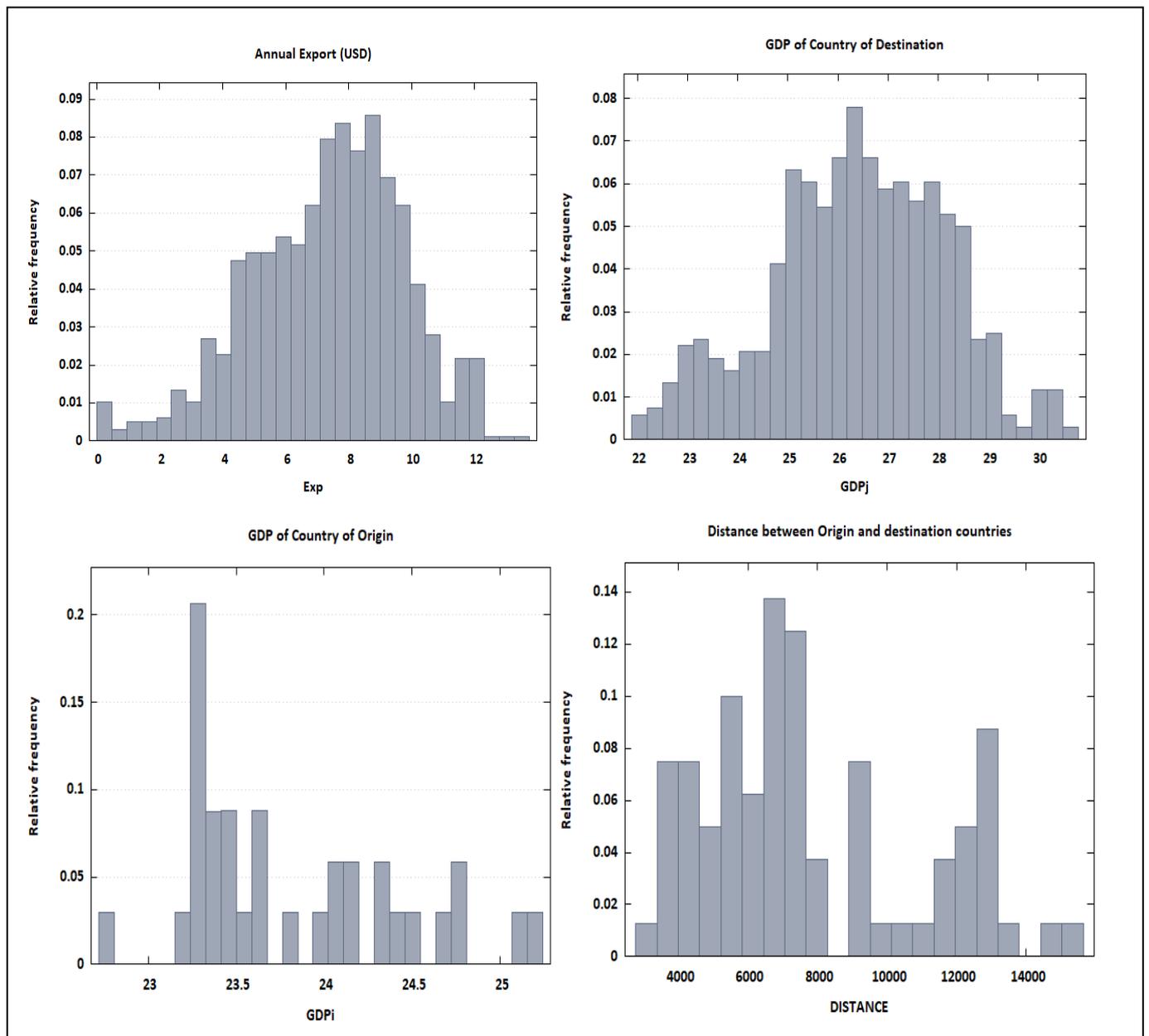
Table 3: Summary Statistics.

Variable (logarithm)	Mean	Std. Dev	C.V.	Skewness	95% Percentile	Number of observations
$(1+Exp)_{ijt}$	5.68	2.45	0.33	-0.41	11.31	968
GDP _i	24.527	0.61	0.03	0.60	25.09	968
GDP _j	26.90	1.77	0.07	-0.20	29.14	968
GDPPC _j	9.52	1.30	0.14	0.02	11.00	968
DIST _{ij}	8.87	0.40	0.05	0.87	9.48	968
P	0.30	0.28	1.53	2.90	1.00	968

As can be observed, the covariance of all the variables are positive. Moreover, the dependent variable has the highest standard deviation at 2.45 with a mean of 5.68 while the policy variable has the least standard deviation at 0.28 with a mean of 0.30.

Moreover, the distribution of the variables is close to normal as depicted by the nature of skewness. The histograms in figure 11 shows the relative frequencies of the variables with the horizontal axis showing the values broken into intervals while the vertical axis show the number of observations belonging to the intervals. As can be seen, the variables have most of their observations concentrating at the center with thin tails at either side depicting symmetrical distribution.

Figure 11: Histogram of the variables.



7

⁷ Note: All the values for Exports, GDP and GDP are measured in US dollars as the standard unit for international trade transactions. Distance on the other hand is measured in Kilometers from the center of the capital cities of the trading countries i.e. the geographical coordinates of their capital cities.

It was also important to find out if there is any relationship among all the variables. To achieve this, the correlation test was performed as shown in table 4.

Table 4: Correlation coefficients.

Variables	In (1+Exp) <i>ijt</i>	In GDP _i	In GDP _j	In GDPPC _j	In DIST _{ij}	P
In (1+Exp) _{ij}	1.00					
In GDP _i	0.13	1.00				
In GDP _j	0.54	0.12	1.00			
In GDPPC _j	0.21	0.11	0.22	1.00		
In DIST _{ij}	-0.31	-0.02	-0.03	0.00	1.00	
P	0.19	0.69	0.76	0.05	-0.04	1.00

As can be seen from the table, there exists a relationship between the dependent and the independent variables. Apart from distance, the dependent variable (international trade) is positively related to the other independent variables with the highest positive relationship being with the gross domestic product of the country of destination (GDP_j) at 0.54 while gross domestic product of the exporting country (GDP_i) has least positive correlation at 0.13. This therefore show a relative importance of the importer's GDP, supporting its use in the research.

Among the input variables, the gross domestic product of the exporter (GDP_i) has the highest positive relationship with the policy variable at 0.69 with 95% confidence level with the least positive relationship being with GDP per capita for the country of destination (GDPPC_j) at 0.11. Moreover, the policy variable has the highest positive relationship with the GDP of the country of destination (GDPPC_j) at 0.76.

However, distance has negative relationship with all the variables as expected with the highest negative relationship being with the dependent variable (1+Exp) at -0.31. No relationship was witnessed with the importer's GDP per capita (0.00) an indication that a change in income of the households at the country of destination does not in any way affect the cost of international maritime trade.

These outcomes therefore imply that the data can therefore be used to perform further analysis. The next step was therefore to perform a regression analysis which is explained in the subsequent section.

4.1.2 Regression results.

The relationship between the output and the inputs is best analyzed by measuring the degree of elasticity which indicate the number of times the output change when there is a unit change in input, *ceteris paribus*. The coefficients of the independent variables give the level of elasticity of the variables which in this case is point elasticity being that the sample mean of all the quantitative variables were used. The Ordinary Least Square regression has taken into consideration two exporting countries, Kenya and Tanzania and 40 importing countries for a duration of 21 years with 968 observations.

The statistical test is conducted by looking at the values of both R-Squared and adjusted R-Squared. The value of R^2 is high at 0.80 hence the models best fits this dataset. The value of adjusted R^2 is lower than that of R^2 which is always the case. The fact that this value is the same in all the three models imply that the introduction of additional variables is not worth the cost of the degree of freedom. The output gives a standard error 1.15 in all the models indicating that the overall error is dominated by the dependent variable i.e. value of exports. The output of the regression is in the table 5 below.

Table 5: Gravity Equation of International Trade Costs, 1997 – 2018.

Model	2	3	4
Variables			
In GDP_{it}	0.58 (0.44)	0.58 (0.44)	0.54 (0.44)
In GDP_{jt}	1.07*** (0.17)	1.09 *** (0.17)	0.43 (0.29)
P _{it}	0.54*** (0.21)	-2.47 (2.99)	1.82 * (1.02)
P_DIST _{ij}		0.34 (0.34)	
In GDPPC _{jt}			1.87 ** (0.76)
P_GDPPC _{jt}			-0.13 (0.10)
No. Obs.	968	968	968
Pair FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
R ²	0.80	0.80	0.80
Adj R ²	0.78	0.78	0.78
S.E.R.	1.15	1.15	1.15

8

⁸ Note: the level of significance are * 10%, ** 5%, *** 1%. The distance variable was dropped due to collinearity hence nor reported in this output. The standard errors are reported in brackets.

4.2. Discussions of Findings.

4.2.1. Gross Domestic Product of country of Origin.

According to the output in table 5, a unit increase in exporter's GDP increased the value of maritime exports by 0.58 in model 2 and 3 while this unit change increased the value of maritime exports by 0.54 in model 4 other factors remaining constant. Kenya has experienced increased growth in the level of GDP over the year, a growth which as explained before is associated with robust macroeconomic environment including fiscal and monetary frameworks which are as a result of adoption and implementation of new and more development-oriented policies. The implication is that this should lead to increase in exports of commodities due to increased output and surplus production. However, the relationship between the increase in Kenyan GDP and the value of maritime exports was not significant according to output from this research. This could be due to several factors such as high trade imbalance with more imports relative to exports as explained previously.

4.2.2. Gross Domestic Product of country of Destination.

The coefficient of Gross Domestic Product of importing countries (GDP_j) during this period was positive relative to the expectations from the model. A unit increase in exporter's GDP increased the value of maritime exports by 1.07, 1.09 and 0.43 in models 2, 3 and 4 respectively. An explanation to this is that as the wealth of importing countries increased the purchasing power of their also increased thereby increasing the demand for more goods eventually creating a need for increased importation. While this positive relationship was significant in model 2 and 3, it was not significant in model 4 indicating that the degree of elasticity reduced with addition of more variables in the model.

4.2.3. Investment Policy.

This variable is of most interest in this work and from the output, a unit change in investment policy at the port increased the value of maritime export by 0.54 and 1.82 units in model 2 and 4 both of which are significant at 1% and 5% respectively. This is equivalent to 46% and 82% reduction in the cost of international maritime exports calculated as $(0.54-1) \times 100\%$ and $(1.82-1) \times 100\%$. Therefore, increased investments in port infrastructure significantly increased the value of international maritime trade which is consistent with hypothesis one of this study:

H1- Investments in Port Infrastructure has a positive impact on the value of International Maritime Trade.

The quality of infrastructure goes hand in hand with the improvement in trade and the gross domestic product. Investments at the Kenyan port of Mombasa from the year 2012 led to the expansion of the port and improvement of the efficiency and productivity with the overall significant impact on the international trade. The port has a total of two container terminals. The infrastructure investments involved the elements such as the cranes, port operations, dredging the depth of water, bridge clearance, warehousing space, port capacity as well as connection with land-based transportation all of which are interconnected. The construction of additional berths at the first container terminal as well as the completion of phase one of the second container terminal brought the total number of berths to five. These together with the upgrading of the information and communication technology has facilitated improvement in the operations at the port.

Moreover, the Kenya ports authority invested in new handling equipment including one ship to shore (STS) gantry crane and 12 Rubber Tyred Gantry (RTGs) Cranes ordered from Japan which brought to a total of 13 STS and 50 RTGs. According to the Kenya Ports Authority (KPA, 2019) the new STS main features include; capacity to lift two 20 foot containers in one

move, safe working load (65 tons), ability to handle ships up to 18 containers (45 meters across), advance crane monitoring system while the RTG has a hybrid power system which resulted into improved fuel efficiency of up to 50 percent and reduced carbon emissions. It also has an advanced crane monitoring system, automatic steering and is installed with accurate container load weighing system. This means that each berth can be served by two cranes as two more wait on standby in line with international standards. The port also has tugboats boosting the berthing services. These findings were found to be consistent with those of Brenda (2015) who established that the upgrading of infrastructure at the port of Mombasa resulted into further movement of goods through the port and the docking of larger ships.

4.2.4. Interaction of Policy and distance.

The interaction between policy and distance is positive, an indication that a unit change in policy-distance together increased the value of international maritime exports by 0.34 units other factors held constant. However, this coefficient is not significant in this research which therefore imply that as much as the constraints brought about by distance reduce, the reduction was not enough to be fully eliminated by the changes undertaken at the port alone.

4.2.5. GDP per capita of country of Destination.

The value of Gross Domestic Product per capita of importing countries (GDPPC_j) during this period was positive. This is what was initially expected from the model. A unit increase in importer's GDP per capita increased the value of maritime export by 1.87. As the wealth of individual households in the importing countries increased their purchasing power also increased thereby increasing the demand for more goods eventually creating a need for increased importation. This could be associated with the increased consumption as a result of

more disposable income. This positive relationship was significant at level 5% reinforcing the argument of the importance increased household income at the country of destination in determining the level of demand for commodities.

4.2.6. Interaction of Policy and GDP per capita of importer.

The interaction between the policy and the importer's GDP per capita i.e. (P_GDPPC_{jt}) was negative i.e. -0.13. The fact that the coefficient is not significant confirms that policy change did not affect the GDP per capita at the county of destination. It is therefore important to note that according to the findings from this research, the infrastructure changes undertaken at the country of origin did not significantly shape the characteristics of the importers used in this research.

CHAPTER FIVE

CONCLUSION AND POLICY IMPLICATIONS.

5.1 Conclusion.

This research used the argument of the gravity model of international trade to determine the extent to which a change in investment policy undertaken by Kenya at the port of Mombasa from the year 2012 impacted the cost of international maritime exports of agricultural commodities. The data used covered a period of 21 years from 1997 to 2018 for a total of 40 importing countries.

The findings established that the increased investments at the port of Mombasa from the year 2012 resulted into a significant increase in the value of international maritime exports. The efficiency and productivity improved due to these investments thereby increasing the competitiveness of the port relative to the port of Dar-Es-Salaam in Tanzania which also serve the same region. This therefore improved the living standard of the individual households.

Moreover, there was a significant positive relationship between the value of maritime exports and both the gross domestic product and the gross domestic product per capita of the countries of destination.

5.2 Limitations of the study.

During this research, several limitations were present. The research used data on exports while international trade involves both exports and imports. As such the effect on import was not analyzed.

The sample size used in the study was also small. The research used exports of agricultural commodities and forty destination countries. It would have been reasonable to increase the product category and number of export destinations by including landlocked countries served by the ports used in the study as well as other countries with seaports not covered in this research either due to their size or unavailability of data.

5.3 Policy Implications.

The study found out that the investments in the infrastructure at Mombasa port reduced the cost of international maritime exports and in order to further increase the level of competitive advantage, the Kenyan government should oversee the commencement of the operations the new ports of Lamu and Kisumu that have been undergoing construction and revitalization. This will ensure that the level of congestion at Mombasa port is reduced therefore lowering future constraints on the available infrastructure while at the same time improving trade within the East African Community.

In order to further increase the value of international maritime trade, the government should come up with measures that will ensure increased international involvements with initiatives such as trade promotions through diplomatic missions abroad. This will ensure the expansion of imports and exports in the existing markets while at the same time venturing into new markets.

To ensure smooth operations, this study recommends that the port management should undertake continuous training of port employees on the use of new technology since most of these new investments require improved standardized functional procedures that may not be understood by all the workforce involved while at the same time ensuring improved efficiency of hinterland transportation and at Inland container terminals.

Finally, the level of security is of great concern considering the increasing terror networks. Ports therefore have become the target points of terrorism. This study therefore recommends that all the stakeholders involved should ensure increased vigilance by ensuring improved Security at and around the port to prevent smuggling of dangerous weapons and attacks by terrorists.

5.4 Suggestions for further research.

The study looked at the impact of investment in port infrastructure on international trade for Kenya a country located in the Eastern Africa. However, there is an increasing level of foreign direct investments in the entire continent of Africa from countries such as China and the United States. Further studies should therefore be undertaken to find out the contributions of China-African investment relations on trade and economic development of the African countries and the implications of such investment in reducing the infrastructure gaps between developing and developed economies.

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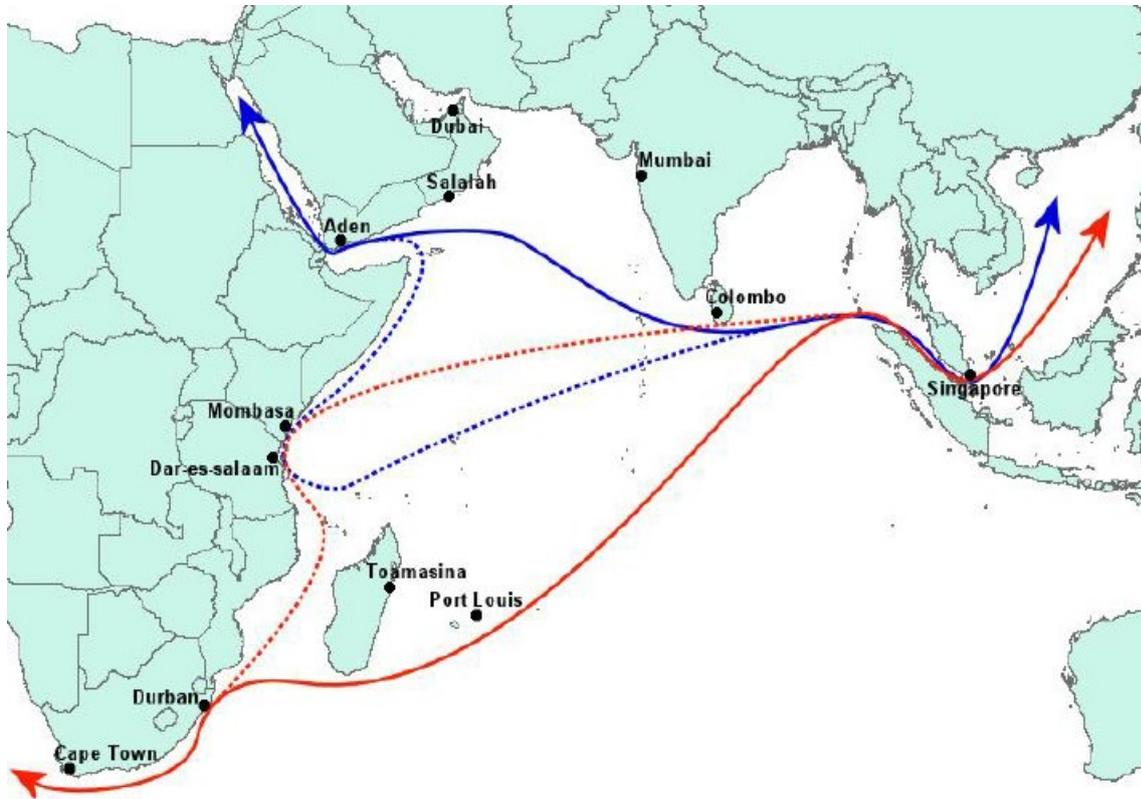
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Appendix 1:

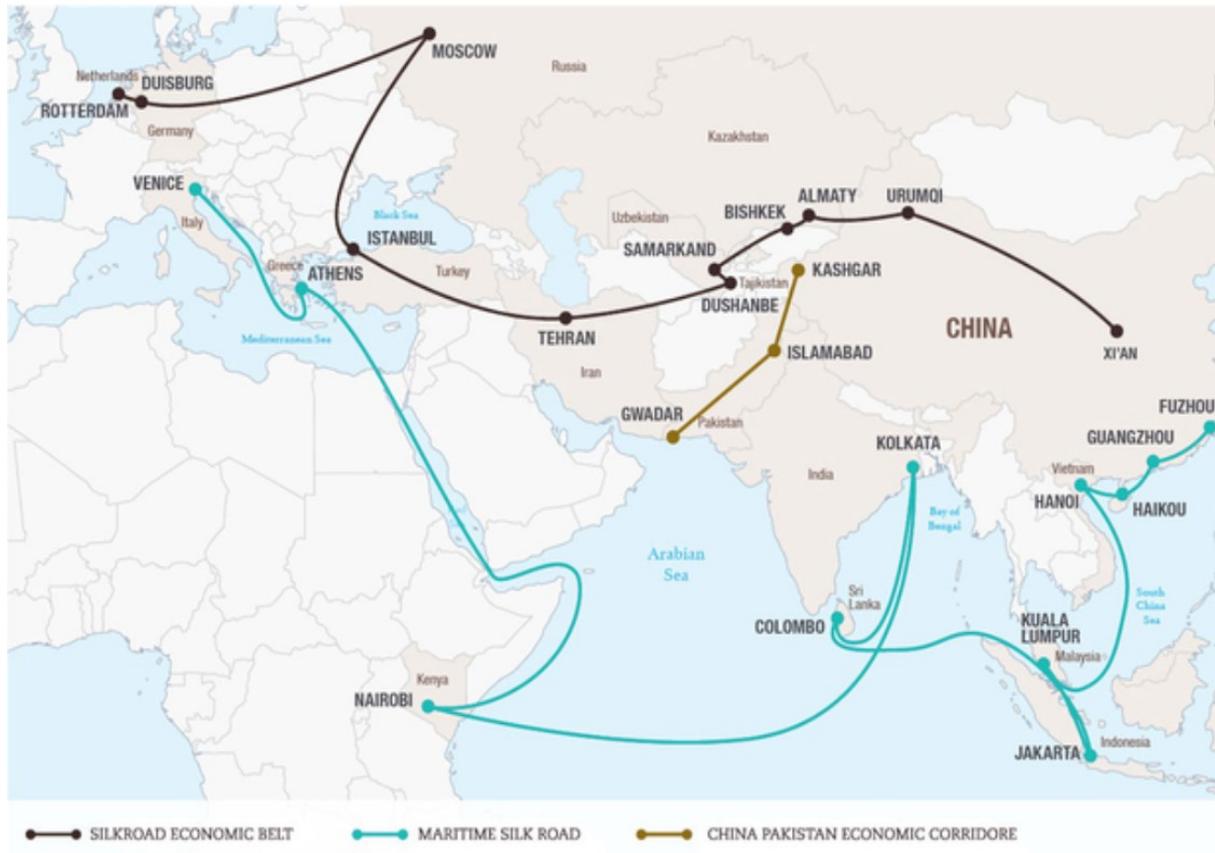
Map showing the location of Mombasa and Dar-es-Salaam Ports in relation to the International Maritime Trade Routes.



Source: Researchgate.net

Appendix 2:

The strategic location of Kenya in the Maritime Silk Road of the Belt and Roads Initiative.



Source: <https://www.lotus-containers.com>