International Journal of Economics, Business and Management Research

Vol. 4, No. 12; 2020

ISSN: 2456-7760

EFFECTS OF INFRASTRUCTURE DEVELOPMENT ON KENYA'S MANUFACTURING EXPORTS TO COMESA REGION

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Abstract

Kenya's manufacturing value added as a percentage of GDP (Gross domestic product) continues to decline over years for example from 12% in 2008 to 9.2% in 2016, this could be attributed to heavy reliance on agricultural exports. Manufacturing sector could be improved by enhancing manufacturing exports to regional trade blocs; such as COMESA (Common Markets for Eastern and Southern Africa). Kenya is an active participant in regional trade and the main exporter to COMESA. Many studies have been conducted to establish the determinants of general exports in relation to population, GDP and exchange rates. However, the studies fell short of considering the importance infrastructure development (ID). The purpose of this study was to explain the effects of infrastructure development (ID) on Kenya's manufactured exports to COMESA region. Gravity model anchored on the theory of international trade was used and adopted a correlational research design. Panel data was sourced from World bank and African Development Bank for eighteen COMESA members for the period 2005–2016. Unit root tests were estimated using Im-Pesaran and Shin, and Levin-Li-Chu tests. Hausman Test was used to choose between fixed and random effect models. Results of fixed effect model indicated that manufactured exports were positively and significantly ($\beta 3 = 0.4989$) determined by infrastructure development with (p–value $0.0010 < 0.05$). This study recommends that Government of Kenya and other stakeholders should invest more in infrastructure and create good investment climate by providing subsidies to exporters in order to foster Kenya's manufacturing exports.

Keywords: Infrastructure, Comesa, Fixed effect model, Hausmann Taylor, manufacturing exports.

1.0 INTRODUCTION

Manufacturing is the value-added production of merchandise for use or sale using labor and machines, tools, chemicals and biological processing (Lundvall, Johnson, Andersen, & Dalum, 2002). The term is commonly applied to industrial production in which raw materials are transformed into finished goods on a large scale (Lundvall *et al.*, 2002). Manufacturing exports is the shipping of value-added goods and services out of the jurisdiction of a country Kenya Association of Manufacturers (KAM, 1988). The transition from agriculture to manufacturing is still the route to higher productivity and rising living standards for developing economies. In advanced economies, manufactured goods stand as the tangible expression of innovation and competitiveness (Banga, 2006).

In the 21st century, the role of manufacturing in the global economy continues to evolve and developing countries are likely to drive global growth in demand for manufactured goods

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through foreign trade (Rothstein, 2015). Foreign trade is the transaction on funds, products over global regions in legally acceptable ways. (Hill, 2008). A nation's trade with others consists of buying and selling products across other nations respectively. International market arises from the lack of any nation that is completely self-sufficient (Deardorff, 2015). Exports are important for the process of growth (Bosworth, Collins, & Reinhart, 1999). Exports produce money transactions that facilitate a country's buying behavior, enrich its manufacturing and production sector as well as other economic endeavors that multiply its profit-making extension. Exports also enable them to expand their selling arenas hence identify opportunities that result from production, selling of products, as well as regional markets (Giles & Williams, 2000) The monetary gains resulting from global sales encompassing manufactured goods rose to over sixty seven percent for nine years since 2005 attaining a value of approximate $12.3 trillion at the end of the nine years. Despite this, the rise of international productive failure together with recessive extension ratios for rising and established manageable resources nations international markets declined by less than 2% annually from 2011 to 2014 (Hoekman & Nicita, 2008). More to that, declining yearly extensive means on manufactured sales from 2011 together with recessive percent of producers on the sum of product markets by 5% proved this decline. (Rothstein, 2015). The total income resulting from selling of locally manufactured goods from established nations multiplied during this period approximately attaining a total of $5.4 trillion by the end of this period. Most of this extension was facilitated on the growth of international sales by producers based in Low income countries as well as developed nations (Hoekman & Nicita, 2008). International sales extension of locally produced of low income nations has also been great with a mean expansion frequency ranging over 12.5%. As a group, developing countries (little-, middle-, and great-earning advanced nations including China) had a value of approximate sixty percent of the global product sales by 2014 compared to fifty percent in 2005.

The world merchandise has witnessed momentous growth, and the worldwide trade pattern has also observed theatrical shifts, as emerging and developing economies have progressed to major centers of global trade from peripheral players (Rault, Sova, & Sova, 2009). Trade was in the early 1970s, largely restricted to only a few developed economies, particularly Japan, Germany, and the United States and which in combination dominated a majority of global trade (Cherunilam, 2010). The worldwide trading landscape by 1990 had been more varied to include numerous emerging and developing well managed resources mostly on eastern part of Asia. By 2011, the sum of international sales of these nations reached 42.75% of world exchange, steadily rising from 24.17% in 1990 (Davies, 2012).

Whereas advanced countries continue to be a considerable export market from the South, a noticeable characteristic of this extraordinary degree of trade diversification has been the increasing prominence of commerce conducted among emerging economies (South-South trade), at a pace faster than the global average (Gumede, 2009). By 2011, 54.9 percent of the international sales were absorbed by developing nations, compared to 40% in 2000, 42.55% in 1995, and less than 25% in 1960. On the other hand, the proportion of the products bought among other well resource managed nations also grew steadily by 10.16% between 1970 and 2000 and then to 38.33 percent by 2011 (Davies, 2012). One more significant characteristic is the proliferation of fast-growing and large emerging countries, particularly China, as the chief

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commercial ally of a growing quantity of emerging economies. At the international scale, the share of Africa in international exports has also grown from 2.9% in 2007 to 3.24% in 2011 after taking a downturn from 5.53% in 1960 to 3.02% in 1990 and further down to 2.4% in 2000 (Davies, 2012).

For Kenya, industrial growth has stagnated with a GDP contribution of 10 % over the last 10 years, and a further reported decline to 9.2 % in 2016. Hence the need to promote the competitiveness of local industries should be prioritized in the rejuvenated endeavor to focus on the manufacturing sector as a country. Most of nations termed to have flourished resources achieved this mark via the phases of industrial revolution (Sheena, 2008). Industrial enterprise consists of work force changes as well as income generated from farming revolving to manufacture section thus resulting in the growth of industrial income summed up with the country's GDP. However, Kenya has had a reducing manufacture to GDP ratio of 3.4% between the years 2005 and 2016. The ideal situation for manufactures should be 15% of GDP as exhibited by the newly industrialized countries (NICs).

Due to this, the government strategizes in turning round the reducing manufacture to GDP ratio with the help of well policed plans. Among them is the Big Four Initiative that focuses to uplift the local production of goods and services. This Initiative stipulates that the production portion will grow to 15% of the Gross Domestic Product by 2022. Kenya aims to bridge the difference by 6.6% once the aim set by this initiative is realized. Due to this, the Manufacturing Priority Agenda (MPA) terms its goals as ―Ending of production difference via the Big Four Agenda to achieve equalized growth‖. KAM (2018b) Observed that since 1980s, the manufacturing sector's contribution to gross domestic product has been fluctuating, stagnating at 11 per cent over the past five years to decline to 9.2 per cent in 2016.

Manufacturing sector value addition outputs has seen continuous growth, meaning as its pie expanded other sectors gained more space. In 2011-2017, its value grew from Sh438 billion to Sh648 billion and is projected by the Integrated National Exports Development and Promotion Strategy to hit Sh2,235 trillion by 2022 for Kenya to achieve a 15 per cent share of GDP as envisaged in the _Big Four' agenda. Industrial transformation would require 60 per cent of outputs, especially from manufacturing, to be exported. Africa presents an opportunity of a 17 per cent share of the world market for Kenya with others being Asia (6.0 per cent), the European Union (nine), and Middle East (2.9), Latin America and Caribbean (8.3) and the Nafta bloc (5.9). Vision 2030 economic pillar the country's quest for industrial transformation. Improved healthcare, housing and food security are a prerequisite for a productive human capital necessary for a competitive manufacturing sector.

The deliberate focus on manufacturing subsectors such as leather, textile and agro-processing will enable Kenya to achieve targets and, by extension, value added exports, realizing the objective of 1.3 million jobs. A healthy economy anchors exports as an ingredient for manufacturing sector expansion. The public and the private sectors need to partner to foster competitiveness towards an export-oriented economy (KAM, 2018b). Over the years, the government has created a robust infrastructure network including the standard gauge railway (SGR), lowered energy costs, improved customs services and eased the cost of doing business.

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Kenya is ranked 80th in the ease of doing business index and aims to be ranked below 50. The government's bid to continually improve the business environment is a show of commitment to improving the wellbeing of Kenyans.

One of the key areas of focus to take advantage of the market access opportunities is to enhance our productive capacity. The realization of the 15 per cent share of the manufacturing sector would require massive investments in the production of raw materials and value addition and fully taking advantage of the infrastructure to reach the world with the _Made in Kenya'brand. Kenya being a member of COMESA and EAC may realize increased manufacturing exports. Economic history shows improving productive capacity and enhancing market access to neighbouring countries builds a nation's or region's base for economic transformation. The history of the EU, where about 28 countries created a monetary union, invested in massive infrastructure such as SGRS and affordable energy, can be emulated. In addition, they have created efficient labour and services frameworks.

Infrastructure Development (ID) and Manufactured Exports

Infrastructure forms the basic physical systems which include roads, highways, railroads, airports, seaports, electricity, telecommunications, water supply and sanitation that countries rely on to foster development (Shinyekwa & Ntale, 2017). This infrastructure plays a positive and significant role in the growth performance of countries to the extent that countries that have developed economic infrastructure have reaped significant benefits and the opposite is true. For the purposes of trade, trade enablement is touted as the next key option to reduce trade costs in developing countries (Shinyekwa & Ntale, 2017). Kenya as country in collaboration with neighbouring countries in the last one decade embarked on rigorous infrastructure development to spur growth. For example, according to Shinyweka and Ntale (2017), the EAC road infrastructure development plan highlights and identifies a total of five transport routes or corridors covering up to 12,000 km that will be upgraded to facilitate trade.

Infrastructure development has significant multiplier effects through linkages with other sectors of the economy. Significant efforts have been made in development of Kenya's infrastructure–transport, energy and information technology–with a view to enhancing efficiency in production, trade and investments. In 2016, the transport, energy and communications sectors contributed 8.4 per cent, 9.1 per cent and 9.7 per cent to GDP, respectively. So far electricity installed capacity has expanded access to electricity increased, and electricity tariffs reduced. Despite the significant reduction in electricity tariffs, they remain relatively high at regional level and this could undermine the country's industrial competitiveness. In the transport sector, there is increased kilometers of paved roads, air passenger traffic, and improved port performance in cargo tonnage and reduced dwell time. Similarly, the Information and Communication Technology (ICT) sector shows growth in cellular mobile services, data and internet usage as well as acquisition of television and radio frequencies and transceivers. However, to be a regional hub, Kenya needs to market a package of infrastructure services.

Regional infrastructure development has been critical in facilitating regional trade. In this respect, Kenya hosts the Northern Corridor Infrastructure Project (NCIP), which constitutes a

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multimodal transport corridor consisting of surface transport modes that include the Port of Mombasa, road, rail, inland waterways and oil pipeline networks. A modernization programme has improved productivity and efficiency of the Port of Mombasa. For instance, container traffic has increased from 903,463 twenty-foot equivalent-unit (TEU) in 2012 to 1,091,371 TEU in 2016 over the same period, while dwell time has reduced from 10 to 4 days. This has aided the manufacturing exports to the regional markets. Infrastructure development ID aids Kenya's manufactured goods to reach its destination with a low cost thereby increasing the productive capacity. For importing countries better infrastructure will encourage absorption of Kenya's manufacturing exports. Several studies to analyze the relationships between infrastructure developments have been undertaking in different countries. For example,(Tong, Yu, & Roberts, 2014) in United States, (Hernandez & Taningco, 2010) in East Asia, (Shepherd & Wilson, 2008) in Southeast Asia, (Wilson, Mann, & Otsuki, 2003) for 124 developed countries among other researchers. The results from various studies indicated consistency. However, the studies are based majorly on the developed economies such as United States, Germany and China which have highly developed infrastructure with none having been conducted in the COMESA region. The results on the effect of ID on manufacturing exports could be varying as one move from the developed world to less developed and developing world, thus the findings in one region cannot be generalized to another region. This therefore calls for the need to determine the effect of infrastructure development on Kenya's manufacturing exports to COMESA region.

2.0 LITERATURE REVIEW

Theoretical literature

The Gravity model has often been used to explain Origin-Destination (i j) flows such as international or regional trade, transportation flows, population migration, commodity flows and information flows along a network. Reasons for the prosperity of this model are the simplicity of its mathematical form and the intuitive nature of its underlying assumptions, as Sen and Smith (1995) noted in their monograph.

In relation to international trade, there exists a large literature on theoretical foundations for these models (Anderson, 1979; Anderson and Wincoop 2004). In the regional science literature, the gravity model has been labeled a spatial interaction model (Sen and Smith, ibid), because the regional interaction is directly proportional to regional size measures. The Gravity model relies on a function of the distance between origin and destination as well as explanatory variables pertaining to characteristics of both, origin and destination countries. The principal explanatory variables used to explain trade flows include size of importing economy, per capita income differential of the two countries involved, their degree of openness, the existence of general trade agreements, the existence of a common official language and/or currency, a shared colonial past or the existence of a favorable exchange rate and transport cost.

Gravity model is borrowed from Newton's gravitational theory and utilizes the concept of gravitational force to explain the volume of trade, capital flows, and migration among countries of the world. Newton's theory postulates that the force of attraction between two separate entities i and j is positively related to entities' respective masses and inversely related to the square of distance between the objects as shown in equation 1.

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$$F_{ij} = \frac{GM_iM_j}{D_{ij}^2} \quad \text{..... (1)}$$

Where F_{ij}=gravitational force between i and j; M_i M_j=masses; D_{ij}=Distance between i and j; G=gravitational constant.

In the gravity model of international trade, gravitational force in Newton's law is replaced by trade flows or exports from country i to j, while GDP is used as a proxy for a country's mass, while distance is often measured using 'great circle' calculations in accordance with equation 1. Gravity model of international trade between countries is represented by equation 2.

$$X_{ij} = \frac{KY_i^{\alpha}Y_j^{\beta}}{T_{ij}^{\theta}} \quad \text{..... (2)}$$

Where X_{ij}=exports (in value) between country i and j; K=gravitational constant; Y_{ij}=economic size (GDP or Population) for country i and j; T_{ij}=trade costs between country i and j. If $\alpha=\beta=1$ and $\theta=2$, we get the Newton's law.

The above equation can be converted into a Log-log form

$$LnX_{ij} = LnK + \alpha LnY_i + \beta LnY_j - \theta LnT_{ij} + \delta Z \text{ ..... (3)}$$

Where δZ denotes other factors that positively or negatively affects export flows.
According to the generalized gravity model of trade, the volume of exports between pairs of countries, X_{ij} is a function of their incomes (GDPs), their population, their geographical distance and a set of dummies. The general gravity model is specified as follows:

$$X_{ij} = \beta_0 Y_i^{\beta_1} Y_j^{\beta_2} N_i^{\beta_3} N_i^{\beta_4} D_{ij}^{\beta_5} A_{ij}^{\beta_6} DU_{ij}^{\beta_7} \text{ ..... (4)}$$

Where Y_i (Y_j) represents the GDP of the exporter (importer), N_i (N_j) are the populations of the exporter (importer), D_{ij} measures the distance between the two countries' capitals and A_{ij} represents other factors that could aid or impede trade between countries, DU_{ij} is a vector of dummies.

In Log-log form

$$LnX_{ij} = \beta_0 + \beta_1 lnY_i + \beta_2 lnY_j + \beta_3 lnN_i + \beta_4 lnN_j - \beta_5 lnD_{ij} + \beta_6 lnA_{ij} + \beta_7 lnDU_{ij} \text{.....(5)}$$

Introducing the new variables (FDI, HDI and ID)

$$LnX_{ij} = \beta_0 + \beta_1 lnY_i + \beta_2 lnY_j + \beta_3 lnN_i + \beta_4 lnN_j - \beta_5 lnD_{ij} + \beta_6 lnA_{ij} + \beta_7 lnDU_{ij} + \beta_8 FDI_{ij} + \beta_9 HDI_{ij} + \beta_{10} ID_{ij}$$

.....(6)

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Trade between two countries is positively affected by the economic mass of trading partners and inversely related to distance between them. Additional variables, such as physical area, population, indicators of cultural affinity, and sharing contiguous boarders are usually added to empirical gravity models to elaborate on the 'economic mass' and distance variables (Clarete *et al.*, 2012). Tinbergen (1962) was the first to publish an econometric study using the gravity equation for international trade flows. In his first study involving data on 18 countries in 1958, the volume of trade between two countries was specified to be proportional to the product of an index of their economic size, and the factor of proportionality depended on measures of trade resistance between them. Among the measures of trade resistance, he included the geographic distance between them, a dummy for adjacency (common borders), and dummies for British Commonwealth and Benelux memberships. Tinbergen found that both incomes and distance had their signs and were statistically significant. He also found that adjacency and membership in the British Commonwealth (Benelux FTA) were significantly associated with 2 percent and 5 percent higher trade flows respectively (Bonuedi, 2013).

Empirical Review

Infrastructure Development and manufacturing Exports

A study done by (Tong *et al.*, 2014) analyzed the dynamic relationships among transport infrastructure, economic output, and exports in the United States using the VAR approach developed by (Toda & Yamamoto, 1995). The results can be summarized as follows. First, in contrast to some previous studies supporting a direct economic impact of transport infrastructure, results from both Granger causality tests and generalized impulse response functions in the study did not suggest a direct effect of transport infrastructure on aggregated economic output, while causality from economic output to transport infrastructure formation was observed.

Second, aggregate non-transport infrastructure capital (e.g., educational structures, power, sewer and water systems, and residential, office and commercial structures), excluding national defense, had sustainable positive effects on economic output and exports over several years. Third, evidence showed that both transport and non-transport public infrastructure Granger cause aggregated exports. Fourth, impulse response functions suggested that economic output and exports react to each other immediately. Finally, results suggest that the development of non-transport infrastructure capital creates multiple-year positive impacts on private capital formation and employment.

Similar to (Cullison, 1993), the findings suggested that expanding transport infrastructure capital, represented by highways and streets, provides relatively short and indirect impacts on aggregated economic output compared to expanding non-transport public infrastructure. The relatively vague economic impact of transport infrastructure capital found in the study was of little surprise, since a developed economy, where substantial highway and street infrastructure already exists, may experience a weaker influence of transport infrastructure investment than observed in developing economies (Talley, 1996). Also, public transport infrastructure, such as interstate highways, may only affect the spatial allocation of economic activity, leaving the total net economic impact unaffected (Chandra & Thompson, 2000). This finding does not suggest

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overlooking the contribution of transport infrastructure capital, since both causality tests and impulse response functions implied that improving road systems and enhancing accessibility affected the formation of both non-transport public infrastructure capital and private capital, which have positive impacts on economic output. The above studies were done using VAR approach of analysis in relation to exports and infrastructure, a gravity model approach would give an insight in this study.

Daviron & Ponte (2005) used a new panel dataset for 124 developed and developing countries, available for the period 2003-04, to assess the impact of trade facilitation and other trade-related institutional constraints on manufacturing export performance with particular reference to Africa. He estimated a standard gravity model augmented with trade facilitation, regulatory quality and infrastructure indicators, and control for endogeneity and remoteness. On a comparative basis, Sub-Saharan Africa (SSA) has been shown to lag behind other regions in providing investment and business environment that is conducive to private sector development. In the context of trade performance, it is argued that Africa can be characterized as a high cost and high risk environment that constrains private sector investment and tradable production.

This constraint is particularly severe on manufacturing, and has held responsible for reducing Africa's international competitiveness and acting as a brake on diversification into manufactured exports. Trade facilitation, defined as reducing the transaction costs associated with the enforcement, regulation and administration of trade policies, has been at the forefront of discussions on policy measures for reducing the costs of producing for export in developing countries. The results of the study showed that trade facilitation reforms can indeed contribute to improved export performance in Africa. But other reforms, including the quality of the regulatory environment and the quality of the basic transport and communications infrastructure are also needed and are often more important than on the border trade facilitation reforms in facilitating export growth.

Limao & Venables(2001) employed a gravity model similar to that developed by (Bougheas, Demetriades & Morgenroth,(1999) which included dummy variables representing possibilities of transit. Infrastructure was measured by variables including paved and unpaved roads, railways, and telephone lines. Infrastructure was found to be an important factor in determining transport costs, especially for landlocked countries. They estimated that differences in infrastructure accounted for 40% of transport costs for coastal countries and 60% for landlocked countries. A study by(Limao et.al 2001), (Nordås & Piermartini, 2004) investigated the role of infrastructure on trade in the clothing, automotive, and textile sectors. Indicators included the quality of airports, roads, ports, and telecommunications, and the time required for customs clearance. In addition, it incorporated bilateral tariffs. Their study proved that trade performance was significantly affected by infrastructure quality, especially port efficiency. Timeliness was more significant for export competitiveness in the clothing sector, while access to telecommunications in the automotive sector was more significant. It also concluded that, even after the quality of infrastructure was included, distance remained a significant factor.

Djankov, Freund, & Pham (2010) claimed that infrastructure directly affected transport costs by influencing the type of transport used and delivery time of the goods. By using data on time to

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export and import, they estimated the impact of delays on trade, showing that trade decreased by at least 1% for every extra day taken to move goods from the warehouse to the ship, comparable to an increase in the distance of an economy from its trading partner by 70 kilometres. (Anderson & Van Wincoop, 2011) demonstrated that trade costs were equivalent to a 170% ad-valorem tax for industrial economies. They estimated that transport costs were equivalent to 21% of 170% total trade in industrialized economies, while border-related barriers represented 44%, and distribution costs represented 55%. Time cost was particularly significant for perishable or other time-sensitive goods. (Hummels & Schaur, 2012) discovered that the time cost of 1 day in transit for United States imports was equivalent to an ad-valorem tariff rate of 0.8%, suggesting a corresponding 16.0% tariff rate on an average trans-Pacific shipment of 20 days. Thus, improvements in infrastructure services that reduce delays in transit times, border-crossing procedures, or ports affect an economy's propensity to export.

A study done by Tingting et al., (2014) analyzed the dynamic relationships among transport infrastructure, economic output, and exports in the United States using the VAR approach developed by Toda and Yamamoto (1995). The results can be summarized as follows; First, in contrast to some previous studies supporting a direct economic impact of transport infrastructure, results from both Granger causality tests and generalized impulse response functions in the study did not suggest a direct effect of transport infrastructure on aggregated economic output, while causality from economic output to transport infrastructure formation was observed. Similar to Cullison (1993), the findings suggested that expanding transport infrastructure capital, represented by highways and streets, provides relatively short and indirect impacts on aggregated economic output compared to expanding non-transport public infrastructure. The relatively vague economic impact of transport infrastructure capital found in the study was of little surprise, since a developed economy, where substantial highway and street infrastructure already exists, may experience a weaker influence of transport infrastructure investment than observed in developing economies (Talley 1996). Also, public transport infrastructure, such as interstate highways, may only affect the spatial allocation of economic activity, leaving the total net economic impact unaffected (Chandra and Thompson 2000). This finding does not suggest overlooking the contribution of transport infrastructure capital, since both causality tests and impulse response functions implied that improving road systems and enhancing accessibility affected the formation of both non-transport public infrastructure capital and private capital, which have positive impacts on economic output.

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3.0 RESEARCH METHODOLOGY

Model specification

The study utilized a correlational research design which provides empirical evidence suggesting two or more variables are or are not related. A positive relationship was expected between infrastructural development and trade flows due to productivity and absorptive capacity on exports. A negative relationship was expected between trade flows and distance. Beyond some distance, transaction costs may be such that trade volumes do not increase.

Population in the gravity model was used as a measure of country size. Countries that have large population were more inwardly oriented than smaller countries because they were better able to exploit economies of scale in their large domestic market (Frankel, 2012). Thus, an inverse relationship was expected between population and trade flows. Distance (in kilometres between Kenya's capital city and that of trading partner) between two countries is an important factor in determining geographic pattern of trade and is used as a proxy for transaction costs. Trade will

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be meaningful to a country if gains from trade are higher than the costs incurred in realizing those gains. The larger the distance, the higher the transaction costs.

Empirical model used closely followed the one used by (Gilbert et al., 2001). The model among other things was to find out whether RTA membership will likely produce trade creation (this was carried out using dummy variables to capture participation in RTAs). A sample of 20 countries who are Kenya's trading partners (Kenya included) were included in the study. The study period was 2003-2014;

Empirical model that was used in this study is specified as follows:

$$LnX_{ijt} = \alpha_{ijt} + \beta_1 Ln(GDP_{ijt}GDP_{ijt}) + \beta_2 LnPoP_{ijt} + \beta_3 LnD_{ijt} + \beta_4\ LnFDI_{ijt} + \beta_5\ LnHDI_{ijt} + \beta_6 LnID_{ijt} + \beta_7 COMESA_{ijt} + \beta_8 EAC_{ijt} + \beta_9 T_{ijt} + \varepsilon_{ijt} + \nu_{ijt} \quad \text{.....(7)}$$

Where: Ln denotes variables in natural logs. α_{ij} is a constant. GDP_{ij} is Gross Domestic Product for country i and j. PoP_j is the population for country j and D_{ij} is the distance from i to j.

Three dummy variables were introduced; COMESA, EAC and New variables introduced are FDI_{ij}, HDI_{ij} and ID_{ij}. Time dummy (T) captured the effects of time. An F-test was carried out to find out whether time was jointly significant in determining export flows. The null hypothesis was that time dummies were not jointly significant, if the null hypothesis was rejected; this meant that time was important and therefore should be included in the regression. The error term was decomposed into ε_{ij} which denoted the unobservable individual-specific effect and ν_{ijt} being the stochastic error term which changed across time and cross-section.
The expected signs of coefficient of D_{ij} are negative while that of PoP_{ij}, HDI_{ij}, FDI_{ij}, ID_{ij} GDP_i GDP_j are all positive. The coefficients of variables in logarithmic form are interpreted as elasticities, that is, proportionate change in X_{ijt} due to a 1% change in these variables.

The first dummy variable takes the value of one when the two countries are both members of COMESA and zero otherwise, the second dummy variable takes the value of one if both countries are members of EAC and zero otherwise. A positive coefficient was expected for COMESA, and EAC dummies.

Estimation Procedure

The study estimated a gravity model using panel data econometrics techniques. This panel data specification allows analysis of relative competitiveness of COMESA and EAC member country competitiveness. To estimate the long-run relationship between the variables in the gravity models, we employed Pooled Mean Group (PMG) and panel dynamic OLS (DOLS) co integrating estimators due to Pesaran, Shin and Smith (1999) and Kao and Chiang (2000) respectively.

The PMG estimator which was developed by Per saran *et al.,* (1999) offers a new technique for estimating non stationary dynamic heterogeneous panels, and it relies on a combination of pooling and averaging of coefficients across groups (Blackburne III and Frank, 2007). A

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superior method to both the FEM and REM that can estimate time invariant variables and address the problem of endogeneity was proposed by Hausman and Taylor (1981) and is called Hausman Taylor Method (HTM). The source of potential endogeneity bias in gravity model estimations is the unobserved individual heterogeneity (Rault et al., 2008). HTM uses variables that are specified in a regression equation as instruments to solve the problem of endogeneity. This makes it possible to eliminate the correlation between the explanatory variables and the unobserved individual effects that undermined the appropriateness of the REM in the gravity model context (Keith, 2006). Another advantage of HTM is that it is usually difficult to find variables not specified in an equation that can serve as valid instruments for endogenous regressors. Haussmann Taylor method will be used to choose between fixed and random effect models.

4.0 RESULTS AND DISCUSSION

Regression analysis was done to test the hypotheses and the results from fixed effects were presented in Table 4.1 below. The F – statistic found to be significant (p–value 0.0000 < 0.05) showing that the variables fitted the model very well (the model was well-identified). The overall R Square wass 0.4169 showing that the independent variables explained 42 % of the manufacturing Exports dependent variable. This is high given the fact that fixed and random effects model do not compute R from the mean of the dependent variable. In such case the main focus was model specification and overall significance of the coefficients. This has been achieved in the current research since the overall fit is F stat 0.0000 < 0.05.

The variance due to observed covariate (sigma_u) is 0.3857 and is smaller than the variance due to time invariant covariates (sigma_e, (1.1623). The fraction of the variance due to u_i is 0.0992 and lies between sigma_u and sigma_e showing that the model is not distorted. Having established this, Hausman test was conducted to choose between the coefficients of fixed and random effects. Results are presented in table 4.10 and shows that there fixed effect was the feasible model for interpretation (p–value 0.0361 < 0.05). The difference between random and fixed effect models is based on the assumptions of the distribution of the residuals of the regression estimates. In such case fixed effect model is normally preferred for interpretation because it limits the number of assumptions and follows well established normal probability distribution (Arellano & Bond, 1991; Baltagi, 2008; Hsiao, 2014). The following were the regression results obtained from the fixed random effect test

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Table 4.6: Fixed Effect Regression

Fixed Effect (Within) Regression		Number of Observations		
Group Variable	Year	Number of Groups		
				=204
				=12
		Observation per group		
		Minimum		16
R^2 Within	0.4277	Average		16.7
R^2 Between	0.6732	Maximum		17.0
R^2 Overall	0.4169	F(6,198)		22.67
Corr$(\mu_i, X\beta)$	0.0686	Prob. > F		0.00000
Log of Manufactured Exports	Coefficient	Std. Error	T	P>|t|
Log of Human Capital development	2.4183	0.6648	3.6400	0.0000
Log of Foreign Direct Investment	0.0774	0.0371	2.0900	0.0380
Log of Infrastructural Development	0.4989	0.1486	3.3600	0.0010
Log of Distance	-0.9889	0.2474	-4.0000	0.0000
Neighboring Countries	1.5341	0.3335	4.6000	0.0000
Common Colony	0.7803	0.2200	3.5500	0.0000
Constant	-23.2901	2.4413	-9.5400	0.0000
Sigma_u	0.3857			
Sigma_e	1.1623			
Rho	0.09918			
F-Test that all u_i = 0: F(11, 198)	1.58	Prob. > F		0.0067
Source: Authors Survey Data, 2019				

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Having established the model specification test, diagnostics tests and selection of the coefficients to be estimated within random and fixed effect, the next step was to test the hypotheses, give their economic implications and compare them with prior results from the existing theoretical, empirical and scientific studies.

The main objective of the study was to determine the effect of infrastructure development on Kenya's manufacturing exports to COMESA. The study hypothesis stated that infrastructure development does not have an effect on Kenya's manufacturing exports to COMESA trading. However the regression results shows that infrastructure development had positive and significant effect on Kenya's manufactured exports to COMESA countries (p–value 0.0010 < 0.05) hence the null hypothesis was rejected. Further, the beta coefficient for infrastructure development is 0.4989 meaning that when infrastructure development changes by one percent, Kenya's manufacturing exports increases by about 0.5 percent units. The export-led growth hypothesis suggests that exports can be an engine for economic growth to increase employment and income in the exporting country, increase the efficiency of resource allocation, and achieve economies of scale (Giles and Williams 2010). Similarly, trade expansion through manufacturing exports potentially stimulates the need for and development of transport infrastructure (Tong et al., 2014), (Lee & Rodrigue, 2006), (Beningo, 2008). Conversely, infrastructure development in a country can affect trade on manufactured exports. Domestic economic conditions, including strong product demand and/or agglomeration economies, can promote the growth of exports (Levchenko, 2007) and (Zestos & Tao, 2002). Previous researchers have confirmed a positive relationship between transport infrastructure and trade through lower transportation costs or better infrastructure quality (Limao & Venables, 2001), (Nordås & Piermartini, 2004), (Tong et al., 2014).

However, (Estache & Fay, 2007) and (Yamin & Sinkovics, 2009) note that correlation between infrastructure development more generally and economic growth and poverty reduction is neither definite nor automatic. But infrastructure provides links to the world market that are important for export competitiveness and manufacturing, which in turn are regarded as vital drivers of economic performance. More generally, empirical evidence indicates that quality of infrastructure is an important determinant of trade performance (Francois & Manchin, 2007), (Limao & Venables, 2001), (Nordås & Piermartini, 2004), (Portugal-Perez & Wilson, 2010), Brandi, 2013). (Jaen & Rodrigue, 2010) argues that efficient transport and logistics services have emerged as strategic elements of trade facilitation in explaining market access: ―Trade facilitation means providing a more predictable, secure and efficient international trading environment, through the simplification, standardization and harmonization of administrative formalities‖ (Sourdin & Pomfret, 2012). (Nugroho, 2014) notes that the effects on trades are complex due to lack of harmonization in standards. (Helble, Shepherd, & Wilson, 2009) add that the gains of greater predictability obtained from trade facilitation can be perceived in terms of falling trade costs and increasing domestic gains.

The results further support the findings which provide evidence that improvement in economic infrastructure generates huge gains in terms of export of manufactured exports; and there are more gains from hard infrastructure compared to soft infrastructure. Therefore, the electricity, rail, road, airports infrastructure is paramount in boosting exports of manufactured products in

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the EAC region. It emerges that, transparency and accountability, internet connectivity and telephone subscription improve the efficiency and business environment, which support the exportation of manufactured products. It is concluded that the mobilization of resources for investment in economic infrastructure to promote exports of manufactured products is inevitable for the EAC region.

These results are in line with (Francois & Manchin, 2007), who used principal components to construct two indicators on infrastructure and institutional quality, and found that institutional quality, along with transport and communications infrastructure, was a significant determinant for an economy's export levels as well as for prospective exports. The results support the belief that export performance depends on institutional quality and access to communications and transport infrastructure. In addition, (Meon & Sekkat, 2006) observed a positive relationship between poor institutional quality and low-quality manufacturing exports. Compared to government effectiveness or the rule of law, control of corruption was the most significant factor related to manufacturing exports. Another study by (Anderson & Van Wincoop, 2011) and (Francois & Manchin, 2007), who used data on contractual enforcement and corruption, discovered that lower institutional quality was associated with a negative effect on trade. Other similar empirical evidence is found in (Depken II & Sonora, 2005) and (Levchenko, 2007). Adopting the study by (Limao & Venables, 2001), (Nordås & Piermartini, 2004) investigated the role of infrastructure on trade in the clothing, automotive, and textile sectors of manufacturing exports. Indicators included the quality of airports, roads, ports, and telecommunications, and the time required for customs clearance. In addition, it incorporated bilateral tariffs (Nordås & Piermartini, 2004). Their study proved that trade performance was significantly affected by infrastructure quality, especially port efficiency. Timeliness was more significant for export competitiveness in the clothing sector, while access to telecommunications in the automotive sector was more significant. It also concluded that, even after the quality of infrastructure was included, distance remained a significant factor.

From the foregoing analysis it is concluded that the pattern of manufacturing export performance is linked to the political economy of policy reform, to institutional development, infrastructural development, colonial history, development assistance, and the general North-South dialogue facing COMESA countries. The study revealed that distance had negative and significant effect on Kenya's manufactured exports to COMESA region (p–value 0.0000 < 0.05). This implies that for a one percent increase in distance Kenya's manufactured exports to COMESA region was expected to reduce by 0.98 percent.

Radelet and Sachs (1998) examine some empirical evidence on differences in shipping costs across developing countries, and its impact on manufactured exports and economic growth. They find that geographical considerations specifically access to the sea and distance to major markets, have a strong impact on shipping costs, which in turn influence success in manufactured exports and depresses real investment and long-run economic growth. (Weerahewa, 2009) found the coefficients for the distance variable to be negative and highly significant indicating that if countries are further far apart by 10% the value of exports would decrease by around 9.22-19.87% in all specifications. However, the coefficient for manufacture

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is smaller than those for agricultural good suggesting that distance makes a bigger difference when exports of agricultural items are concerned than that of manufacturing items. Among agricultural product categories preparatory food items affected lesser by distance.

The dummy variable DVNC (Dummy Neighboring Country, DVNC) was positive and significant (p–value 0.000 < 0.05). In addition, the second dummy variable DVCL (Dummy Variable Common Language) had positive and significant effect on Kenya's manufactured exports (p–value 0.000 < 0.05). Thus, it implies that language encourages trade because it eases communication. The DVCC (Dummy Variable Common Colonizer (DVCC) had positive and significant effect on Kenya's manufactured exports (p–value 0.000 < 0.05). The implication of this is that countries that were colonized by common colonizer developed similar political, social, economic and cultural ties that still link them together to date. In the ASEAN for instance social and cultural factors (such as a common language) appear to have been important in their choice of countries for relocation.

Weerahewa (2009) notes that common language has a significant and positive effect on value of exports of agricultural commodities, vegetable products, prepared food stuff and manufacture products. According to the results of the study the export values of countries which speak the same official language tend to export 6.12-12.6% more than those of other countries. This is particularly recorded for exports of vegetables, prepared food and manufacture products. A positive and significant impact of common colony on the value of exports of agricultural commodities, live animals, and vegetable products was also observed by Weerahewa (2009) and further notes that countries which were under the same colony tie tend to export 9.4%, 11.12% and 12.38% more of agricultural items, live animals and vegetables supporting the results of the current study. The research results proved that manufactured exports were positively determined significantly ($\beta 3 = 0.4989$) by infrastructure development with (p–value 0.0010 < 0.05). This shows moderate effect and which could be an indication that Kenya is trying to fix infrastructure.

5.0 SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Summary of Findings

The general objective of the study was to estimate the effects of infrastructural development on kenyas manufacturing exports to COMESA region. The study established that infrastructure significantly determined Kenya's manufactured exports to COMESA region. region based on the null hypothesis that Infrastructure Development does not have an effect on Kenya's manufacturing exports to COMESA region tested at 5% level of significance. Results indicated a positive significant relationship therefore leading to the rejection of the null hypothesis. Generalized Least Squares panel data estimates provide evidence supporting the importance of Infrastructure Development as significant drivers of Kenya's manufactured exports. Better infrastructure leads to more production of manufactured goods as evidenced by the results.

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Conclusions

Infrastructure Development had a positive coefficient which means that Kenya's manufactured export relies heavily on infrastructure development. The effect of distance however was negative leading to the conclusion that a unit increase in distance resulted in reduction in manufactured exports. Distance reduces international trade because of increasing the costs of transportation, cause delays and other logistical problems. This same conclusion was reached for common neighbours and common colony.

Recommendations

The key findings of this study, as summarized above, have important implications for the manufactured export policy in Kenya. Based on these key findings, The lower impact of current level of infrastructural development on Kenya's manufacturing exports, as found in this study, accentuates the urgent need to radically expand, improve and modernize manufacturing-related infrastructure in Kenya. The current government's focus on infrastructural development is a stride in the right direction as this would not only facilitate Kenya's external trade, but also enhance manufacturing export supply capacity, reduce transportation and other transactions costs and increase the relative competitiveness of made-in-Kenya goods on the regional trade bloc and the entire global market in the long run.

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