Analysis of Factors Determining Performance of Kenya's Manufactured Exports

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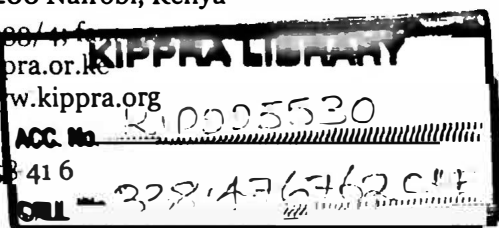
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Abstract

This paper examines the factors that influence the performance of Kenya's manufactured exports, and covers the period between 1980 and 2012. It focuses on domestic factors that affect production and participation of firms in the manufacturing sector. It also looks at the effects of absorptive capacity of key trading partners on performance of these exports. The Principal Component Analysis (PCA) is used to compute the composite infrastructure index based on transport, communication and energy indicators. The long run relationships were estimated and the error correction model was used to estimate the short run dynamic relationships of manufactured exports and the selected factors.

Empirical results indicate that infrastructure development, human development, real exchange rate and output of the manufacturing sector are important in explaining the performance of manufactured exports. The study recommends increased infrastructural investment by both the national and county governments as a way of boosting production in the manufacturing sector. Equally important is investment in human development, which encompasses improving standards of education, upgrading skills, ensuring higher health standards, and reducing poverty. The study also recommends increased investment in the manufacturing sector in order to increase output and exports from the sector.

Abbreviations and Acronyms

ADF	Augmented Dickey-Fuller
AGOA	African Growth Opportunity Act
ARDL	Auto-Regressive Distributed Lag
COMESA	Common Market for Eastern and Southern Africa
EAC	East African Community
ERS	Economic Recovery Strategy for Wealth and Employment Creation
FTA	Free Trade Agreement
GDP	Gross Domestic Product
GoK	Government of Kenya
MNCs	Multinational Corporations
MTP II	Medium Term Plan II
NICs	Newly Industrialized Countries
PCA	Principal Component Analysis
PRSP	Poverty Reduction Strategy Paper
PP	Phillips and Perron
RPED	Regional Programme for Enterprise Development
SAPs	Structural Adjustment Programmes
UNCTAD	United Nations Conference on Trade and Development
WDI	World Development Indicators

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1. Introduction

1.1 Background

In the global market, exports of primary commodities are more prone to price fluctuations compared to other types of exports. This has been supported by Prebisch-Singer hypothesis cited by Todaro and Smith (2012) who argued that primary commodities have low income elasticity of demand, and yield low income compared to manufactured exports. In fact, developing countries, Kenya included, have poor trade balance because they rely mainly on primary commodities. Moreover, Hausman, Hwang and Rodrik (2005) emphasize on the need for export diversification, which involves a shift from primary commodity exports to more sophisticated manufactured exports for developing countries to experience a desirable growth for economies.

The success story of the East Asian tigers,[1] whose development is virtually synonymous with export of manufactured products, has elicited interest among developing countries. The East Asian countries steadily transformed from producing primary products and low technology manufactures such as textiles in the 1970s and 1980s to produce high technology manufactured products such as electronics in 2000s. According to UNCTAD (2013a), East Asian countries have gradually increased the share of manufactured exports in total merchandise exports; for instance, in 2012, Malaysia, Singapore and South Korea had 61.6, 69.1 and 84.5 per cent shares, respectively. Subsequently, these economies have grown rapidly with tremendous high employment rates and per capita income.

Comparably, Africa still lags behind in exports of manufactured goods as the export basket is dominated by primary commodities with the exception of only a few countries such as South Africa, Tunisia, Morocco and Botswana. Trade among African countries shows that a large share of exports are manufactures, compared to trade with the Asian and European countries. More details indicate that the East African Community (EAC) has the highest share of intra-bloc trade in manufactured goods (58.23% between 2007 and 2011). This shows that the manufacturing sector is likely to benefit more with the increasing intra-African trade (UNCTAD, 2009 and 2012), thus creating unprecedented opportunities for economic growth. However, according to World Bank *et al.* (2013), Africa is constrained by poor infrastructure development, thus affecting both manufacturing sector investment and exports performance.

In the Kenyan context, agricultural products are the dominant exports, although there have been efforts to widen the export basket by including

[1] The Asian tigers include Hong Kong, South Korea, Singapore and Taiwan.

horticultural and manufactured products. According to the Government of Kenya (2010), the production of manufactured goods has been compounded by several challenges. Poor infrastructure development is a major constraint in production and movement of these products, and it is also a disincentive for investors in the sector. Alongside this is the use of poor technologies by the small and medium enterprises (SMEs), which form 80 per cent of the manufacturing sector. Additionally, there is a problem with access to affordable credit, denying the firms in the industry the opportunity to expand businesses and do value addition of their products.

1.2   Overview of Kenya's Exports

The Kenyan economy has been growing gradually over the decades, such that in 2012 it grew at 4.6 per cent from 4.4 per cent in 2011. On the other hand, the value of exports has been rising but its contribution to Gross Domestic Product (GDP) has been growing slowly.

For instance, in 2012, total exports contributed 27 per cent to GDP from 21 per cent in 2000, while manufactured exports had negligible growth over this time period. Comparably, imports have been rising faster than total exports, especially after 1995 and even more rapidly after 2005 (Figure 1.1). Between 2008 and 2012, exports grew at 48 per cent, while imports grew at 78.3 per cent in the same

Figure 1.1: A comparison of Kenya's GDP with the external sector from 1980-2012
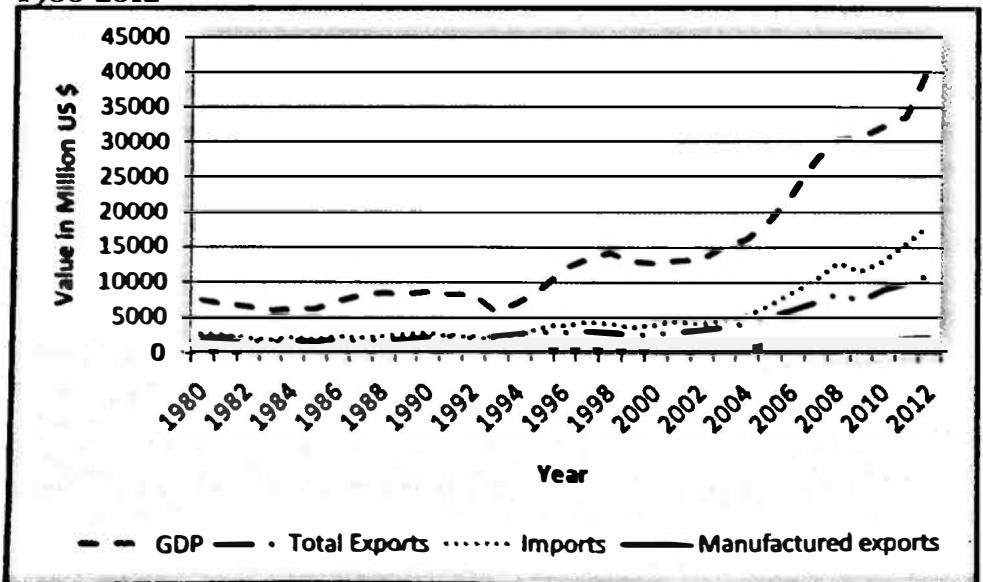
*Data Source: World Bank (2010), World Development Indicators*

period, which is almost double the growth of exports. This reveals that more is spent on imports than what the country receives from total exports.

Kenya's exports are dominated by agricultural products such as tea, coffee, and horticultural products whose main market is the European Union (EU), and Egypt for tea (Figure 1.2). Exports of basic materials and fuels have been rising slowly, and lagging behind other exports. Exports of manufactured goods have increased over time but the value of its earnings is below those of agricultural exports. The main manufactured exports are chemicals, medicaments, construction materials, storage and transport equipment, cement, cigarettes and petroleum products. The Common Market for Eastern and Southern Africa (COMESA) provides a large market for these exports. Apart from this region, Kenya has benefited from preferential access to the United States though AGOA for textiles and apparel exports.

1.3 Policy Developments for the Manufacturing Sector Exports in Kenya

In an effort to encourage exports from the manufacturing sector, the government adopted import- substitution strategies in the 1960s with an intention of protecting local industries from external competition and enabling them to dominate the domestic market while building potential to compete at a later stage. Although these strategies increased domestic market share for local industries, there was no motivation to export, thus unexploited capacity in the sector. During this period,

Figure 1.2: Principal commodity exports (1999 to 2012)
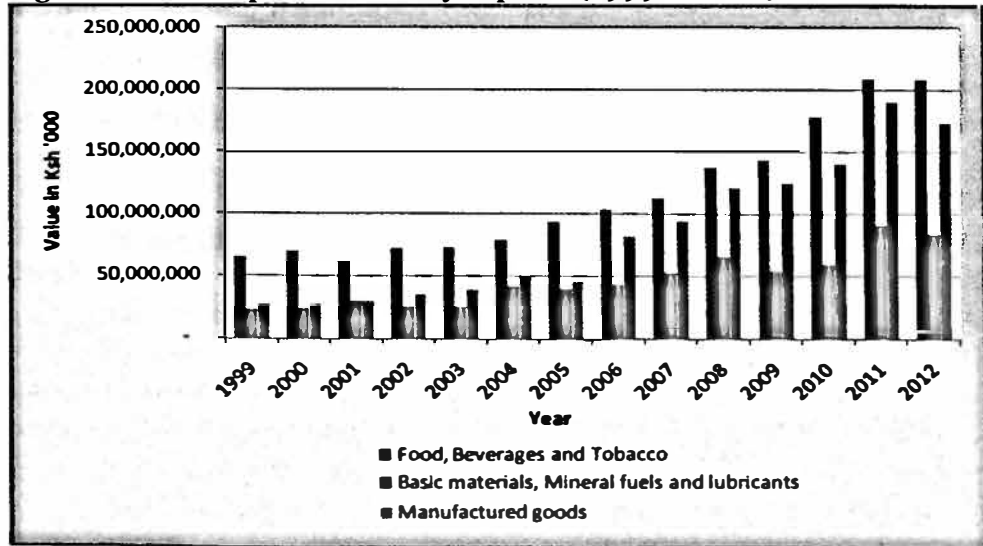
Data Source: KNBS (Various), Statistical Abstracts

few firms ventured into the external market, leading to a reduction of exports. The situation was made worse in the 1970s during the foreign exchange crisis in Kenya (Bigsten *et al.,* 2010).

In the 1980s, the government adopted Structural Adjustment Programmes (SAPs) that involved adjustments to more open policies, shifting from the inward looking strategies. Among these changes were the introduction of Manufacturing under Bond (MUB) and Export Processing Zones (EPZ), establishing corporations in the trade sector, and decontrol of prices (Government of Kenya, 2012). The aim of establishing MUB and EPZs was to encourage manufacturing of labour-intensive products for export. However, these strategies did not stimulate production of export products as it was expected, but they have gone through improvements with an expectation that they will play a better role in increasing exports of manufactured goods. Again, due to other impediments such as import controls and exchange rate controls during this period, the growth of the industrial sector was affected.

Further advancements took place through trade liberalization, which the government adopted gradually as a way of opening up the economy. With this came the signing of regional trade agreements such as Free Trade Agreement (FTA), for example the EAC and COMESA. Alongside this were a number of bilateral trade arrangements signed to increase trade with other countries. This was accompanied with several macroeconomic reforms and other trade liberalization measures, which contributed to increased performance of the manufacturing sector.

Several other strategies have been adopted with the main objective of raising manufactured exports and other exports. The Government of Kenya (2001 and 2003) focused on improving the investment climate through infrastructure and human capital investment. This marked the start of key investments in transport and energy sectors. The Economic Recovery Strategy (Government of Kenya, 2003) for Wealth Creation and Employment proposed major strategies for raising export performance by increasing national competitiveness. Some of the key strategies targeting the manufacturing sector included reduction of production cost, promoting use of modern production methods and technologies, and building a competitive human resource rich in skills. According to the Government of Kenya (2007), the manufacturing sector is envisioned to be one of the main contributors to the economy, accounting for more than 10 per cent. As part of efforts towards achieving this trade policy, the Government of Kenya (2010) has identified key areas of focus such as increasing value addition, enhancing linkages between industries, and facilitating small and medium enterprises (SMEs) in the sector in order to raise the quality of their products. The National Trade Policy also aims at boosting exports from the manufacturing sector from the current 7

per cent to 15 per cent. The manufacturing sector is also expected to create more employment and play a major role in poverty reduction.

To achieve this, both the first and the second medium term plan have identified key projects and programmes, some of which include upgrading SMEs through establishment of requisite infrastructure such as SME parks and Special Economic Zones, implementing National Electronic Single Window System to allow for exchange of trade and transport documents, encouraging investments in export-related value chains, establishing credit guarantee schemes, among other programmes and projects meant to increase trade with other countries, and raise production of quality export products.

1.4   Problem Statement

The foregoing discussions portray the structure of Kenya's export basket, which is dominated by primary commodities and raw materials. These products are highly susceptible to price volatility in the world market negatively, affecting trade balance. As a way of addressing this problem, the Government of Kenya (2010) prioritized the need to diversify both exports to include manufactured products and services. However, manufactured exports are still growing slowly, accounting for only 35 per cent of total merchandise in 2012, with low technology products dominating the basket. Again, Kenya's market share in the EAC, the main destination of manufactured products, has not been growing at the desired level. For instance, in 2012, it stood at 7 per cent against a target of 15 per cent (Government of Kenya, 2013). The low share of manufactured exports in Kenya's export basket might pose a challenge to the growth of other sectors, for example the agricultural sector. Without a robust manufacturing sector, it will be difficult to reduce unemployment in the country and meet the aspired economic growth.

Further, the current surge of manufactured exports to Africa by Asian countries particularly India and China is posing a threat to Kenya's manufactured exports as it is to other developing countries. This is a challenge because high cost of production and poor technologies reduce the competitiveness in the region. On the other hand, there is increased demand for commodity imports by these two countries. Although this may appear appealing due to increase in demand for commodity exports, it may shift focus from efforts to raise manufactured exports (Alemayehu and Meskel, 2008).

Besides, the sector also faces infrastructural challenges affecting production and raising transaction costs. This adversely affects the quantity and quality of products from the sector and their competitiveness in the domestic and external markets. Further, according to Government of Kenya (2013), Foreign Direct

Investment (FDI) to the sector has been dwindling, signifying low technology transfer to the sector. Apart from these impediments, firms in the manufacturing sector face financial challenges, limiting the small businesses in the sector from growing into medium and large businesses.

1.5   Objective

The objective of this study is to determine the factors that influence the performance of Kenya's manufactured exports.

1.6   Policy Relevance of the Study

Raising performance of manufactured exports is important for Kenya because of the sector's contribution to economic growth and employment creation (Government of Kenya, 2007 and 2013). The exports sector is the primary engine of economic growth. Specifically, high export growth comes with more foreign earnings and improvement of the Balance of Payment (BoP), which are needed for a stable macroeconomic environment. For this to be achieved, promoting exports of commodity products is not adequate, but efforts should be geared towards boosting export of manufactured goods.

The success of manufactured exports' performance is a reflection of an efficient industrial sector that is well linked with other sectors of the economy, such as agriculture and the services sector. This creates multiple effects, thus boosting the performance of these sectors. It is also expected that this will create more employment opportunities in the sector so as to address unemployment. In this regard, therefore, it is essential to understand the factors that influence the performance of these exports at a macro level. Consequently, it is anticipated that this will help in formation of appropriate policies that will increase the supply of competitive products to the expanding regional market and beyond.

2. Literature Review

2.1 Theoretical Literature

The Ricardian trade theory emphasizes comparative advantage as the main determinant of what a country exports. Based on this theory, countries specialize in exporting products of their comparative advantage, and import goods that require inputs that the country is not endowed with. In this case, many developing countries export agricultural products since they have abundance of land and cheap labour, but they can also export low technology manufactures favoured by abundant low skilled labour (Todaro and Smith, 2012). The Ricardian theory also posits technological abundance and labour productivity as sources of comparative advantage, determining the type of products the country exports. In extending this theory, Kowalski (2011) contends that comparative advantage of a country can be enhanced through accumulation of physical and human capital, financial support and institutional factors. He explains that a combination of factors raises productivity in the industrial sector.

The new trade theory by Helpman and Krugman (1985), and Grossman and Helpman (1991), gives prominence to exporting varieties in order to increase gains from trade, thus the idea of diversifying from traditional exports to manufactures and other value added products and services. Additionally, this theory points out the importance of increased investment, knowledge, and technology for higher productivity and transformation of trade patterns.

The relationship between the type of goods exported and earnings accrued was explained by Prebisch-Singer hypothesis (Todaro and Smith, 2012), which argues that trade in primary commodities can result in declining commodity terms of trade because these products have low income elasticity of demand and yield low income compared to manufactures. The hypothesis thus suggests diversification to manufactured products to reduce such effects. Export of manufactured products is associated with better earnings compared to raw materials and low technology products. In a similar vein, value addition of exported products fetches more for a country, translating to more earnings.

2.2 Empirical Literature

2.2.1 Lessons from industrialized countries

Sharing from the experiences of the Newly Industrialized Countries (NICs) and other emerging economies of East Asia, one of the factors that led to the proliferation of the manufacturing sector is investment in quality human capital. In South Korea, it involved a three-tire strategy through promotion of technical education,

and rigorous training of workers in private sector firms with the aim of ensuring that each worker is equipped with at least one skill and is learning by doing. In addition, the governments established well equipped research laboratories and employed many engineers and other scientists, while also creating a linkage between research and training institutions and industry players. This produced a pool of skilled workers creating spillover effects within the industrial sector and production of quality products for export (Ito and Krueger, 1995).

Of interest to note also is the huge government support to the private sector firms through provision of affordable credit. The Government of South Korea went to an extent of borrowing foreign loans to support this sector by lending loans to them and investing in infrastructure to meet the needs of the growing industrial sector. Loans lent to these firms rose to a substantive level of 59 per cent of total commercial loans between 1959 and 1982 (Ito and Krueger, 1995). What emerged was a strong industrial sector with rich spillovers to other sectors of the economy, and production of both medium and high technology products that were consumed in the domestic market and exported to other countries.

As for Singapore, though a small country in population and size, its focus in value addition in manufacturing and services was incredibly high, boosting the country to become a high income economy. This was achieved through a combination of various measures by the government, such as creating a stable macroeconomic condition and good business environment, and providing efficient transport facilities in order to attract investments from Multinational Corporations (MNCs). There was also emphasis on investment in education, and research and development (R&D) to raise technological innovations. Over time, the country moved from production and export of labour-intensive goods such as soap, oil, and chemicals to high value-added industrials in the 1990s and 2000s. Besides, there was increased value addition in the services sector, which accelerated its relevance in the economy by raising efficiency (Iwulska, 2012).

2.2.2 Empirical studies

Determinants of export performance have been explored extensively in literature by applying a range of empirical methods with focus on various types of export products. Fuggaza (2004) studied the determinants of export performance by looking at the supply and demand constraints. He points out the importance of access to foreign market, and domestic factors in determining the potential of a country to export. Using bilateral trade data of 84 countries, the author applied gravity trade model and found that strengthening supply capacity of exporting firms enhances their production.

Demand for exports is influenced by the income of a country's trading partner. Bardaka and Athanasoglou (2010) estimated the demand for Greece's manufactured exports and found that GDP of the trading partner determines exports to a large extent. Were *et al.* (2002) examined the influence of macroeconomic factors on supply of exports (tea, coffee and 'other exports')[2] in Kenya. Using time series data of 1972-1999, the study estimated a single equation model and examined both short run and long run relationships of the series by estimating the long-run elasticities and the Error Correction Model (ECM). This study found that real foreign income of four key trading partners significantly affects 'other exports', but not tea and coffee in the long run. Further, the findings of this study indicate that depreciation of real exchange rate leads to a rise in 'other exports' both in the short and run.

Infrastructure development has been cited as an important determinant of export performance. Bigsten *et al.* (2010) highlights transaction cost as a main constraint facing the manufacturing sector in Kenya. This study contends that high transaction costs due to poor infrastructural facilities affects the ability of manufacturing firms to produce competitively. The study recommends high investment in modern and efficient infrastructure. Other studies such as Fugazza (2004) found that transport infrastructure affected trade performance and, although it differed from one season to another, high transport cost has negative effects on export performance. Duranto *et al.* (2013) also observed that differences in highways between cities affect the weight and value of trade, since they reduce distances between cities.

On the linkage between investment in technology and raising the quality of exports, Kiriyama (2012) found that Foreign Direct Investment (FDI) brings with it competition to the local industries and channels important technologies to the host country. Pravakar (2006) found that as a result of spillover effects to other sectors, FDI raised exports not only from firms owned by foreigners, but also local firms. He argues for proper channelling of FDI to export-oriented sectors as well as creating linkages with local firms to enhance transfer of technology for production of quality products.

Human development influences industrial production and export performance. UNDP (2013) defines human development as enlarging people's choices and capabilities to participate in meaningful economic activities. This encompasses improving standards of living, enabling people to live healthier lives, and raising education and skills levels. With higher levels of human development, labour productivity goes up, translating to better industrial performance (Ranis *et al.*,

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[2] All Kenyan exports in the study period except for tea and coffee. This includes manufactured goods, horticultural products, services and other agricultural commodities.

2000). Some studies found that investing in skills development is important since it facilitates generation of new knowledge, absorption of foreign technologies and their adaptation in the local environment. A highly skilled labour in this case is suitable in taking advantage of new developments in the scientific environment (Anderton, 1999 and Aghion and Howitt, 2004. This was also supported by Busse and Groizard (2008) as cited in Biwott *et al.* (2013) who indicated the important linkage between technology, skills and knowledge. The level of skills used in industrial production also determines the quality of the products. Lall (2000) contends that skills development can contribute to gradual progress from production of low-tech manufactures to high technology manufactures which, as Hausman et al. (2005) argues, yields better earnings.

Edwards and Alves (2006) investigated South Africa's export performance in particular determinants of manufactured export supply. They applied auto-regressive distributed lag (ARDL) in estimating the supply and demand of these exports. They found that real effective exchange rate, infrastructure cost, tariff rates and labour cost were important factors in determining export supply. Further, this study found that export growth was not mainly affected by export demand, but supply factors constrained it. Otieno (2008) looked at the determinants of Kenya's beef export supply by estimating the export supply equation. He examined how beef export supply is affected by beef production in the country, livestock development expenditure as a ratio of GDP, and disease incidence. His findings point to the importance of increasing development expenditure in beef sector and domestic beef production.

Another strand of literature has widely studied the impact of real exchange rate on exports. Sarikaya (2004) found that exchange rate is a determinant of the current account, but mainly through imports. He found that depreciation of Turkish Lira reduced the volume of imports, but it did not have any significant effect on exports. He concluded that public and private factors could be exploited to increase productivity, resulting to increase in exports. However, Hatab *et al.* (2010) found real bilateral exchange rate significant in explaining Egyptian agricultural exports, in that depreciation led to increase in exports. Other authors such as Edwards and Garlick (2008) and Fugazza (2004) also found real exchange rate depreciation as a stimulant for export growth.

A good business environment is essential for raising the productivity of exporting firms. This involves availing finances to firms dealing with exports. Filmer and Fox (2014) argued that financial constraint is a problem that is hindering export-oriented firms in Africa from raising their capacity. The financial services offered are expensive and limited, reducing access by potential firms and hindering those who are already in the industry from growing. Similarly, they found that

a good business environment also entails good governance that can ease entry and expansion of export-oriented firms. Bigsten *et al.* (2010) also found access in Kenya, particularly by small firms, to be a constraint to expanding businesses.

Recent studies carried out on manufactured exports in Kenya include Abala (2012), who explored export propensity and intensity in Kenya's manufacturing sector using firm level data from the Regional Programme for Enterprise Development (RPED) survey conducted in 1993, 1994 and 1995; the Kenya Manufacturing Enterprise Survey (KMES) of 2000; and Kenya Manufacturing Sector data of 2002/2003. Using a control function approach, he found that increasing total factor productivity raises exports propensity, recommending the need for more FDI and modernization of manufacturing capital. Farole and Mukim (2013) takes an elaborate approach by looking at the factors that influence the competitiveness of the manufacturing sector in Kenya, particularly exports from the sector. They analyze export performance using trade outcome analysis combined with first hand data from stakeholders in the sector. This study found significance of the business environment in determining export competitiveness from the sector. In departure from these studies, and as a way of adding on to literature, the current study empirically looks at macro-level factors that influence the performance of Kenya's manufactured exports.

2.3 Overview of Literature

Extensive research has been done on the factors determining export performance using various approaches. These methodologies range from gravity models, error correction model, auto-regressive distributed lag and control functional approach. The choice of these approaches depends on availability of data and the objectives of the study. This study adopts the approach taken by Otieno (2008) and Were *et al.* (2002) to examine the factors that affect the supply of manufactured exports by estimating the long run and the short run dynamics using the error correction model, although this will depend on whether some of the variables are co-integrated or not.

The literature reviewed reveals some of the determinants of export performance, including infrastructure development, financial support, human capital, real exchange rate, income of key trading partners, and the level of Foreign Direct Investment (FDI). Instead of using a single indicator on infrastructure development, a composite index will be calculated using the Principal Component Analysis (PCA). Additionally, Human Development Index will be used as a proxy for human capital.
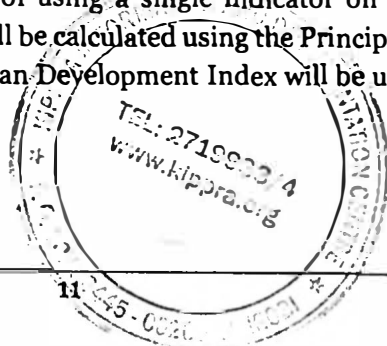
3. Methodology

3.1 Conceptual Framework

This study looks at export performance of manufactured exports, which is largely defined as the growth of exports in terms of income received from sales of these products to other countries (Farole and Mukim, 2013). Export performance could be attributed to the strategies used to increase domestic production of goods by focusing not only on quantity, but also on raising quality in order to increase the competitiveness of these products in the external market. In this context, domestic supply factors shape the environment within which firms in the manufacturing sector produce, hence defining their production capacity and ability to compete successfully in the external market (Fuggaza, 2004). This could translate to outcomes such as better export performance as a result of higher income from exports or reduced incomes from the same. These domestic supply factors include infrastructural facilities, production capacity of the manufacturing sector, technological capacity, human capital, and access to credit facilities. Attracting foreign investors in the sector could leverage technological capacity, hence encouraging production of high quality products. Other factors that are known to influence the performance of exports are the income of key trading partners, and relative price of these exports (Were *et al.*, 2002).

Besides, export performance could also be looked at in terms of better market access, which revolves around tariff and non-tariff barriers as well as trade agreements with other countries. The policy environment and institutional factors could facilitate or constrain the performance of the manufacturing sector. Apart from these factors, external and internal shocks could affect the performance of exports at any given time. However, these issues are beyond the scope of this study.

3.2 Empirical Model Specification

For a small country such as Kenya, which is a price taker in the market for its manufactured exports, the simultaneous equation of both demand and supply will not be estimated, but estimation of a single equation is sufficient. In this case, this study takes the single equation approach to estimate supply elasticities of manufactured exports as used by Gunawardana and Karn (1998) as cited in Otieno (2008) and Were *et al.* (2002). As noted earlier, additional explanatory variables such as real foreign income and real exchange rate will be incorporated. Therefore, the following manufactured export supply function is estimated:

$$X^s_t = f(I, O, H, F, C, Y, R, E) \dots\dots\dots(1)$$

Where X_{st} is the value of manufactured exports supplied, I is the infrastructure index, O is output of the manufacturing sector, H is the Human Development Index, F is net inflow of Foreign Direct Investment as a percentage of GDP, C is credit to the manufacturing sector, Y is average income of key trading partners of manufactured exports (Uganda, Tanzania, Sudan and Rwanda), R is real exchange rate, and E is the dummy for signing of the East African Community (EAC). The supply model is estimated as:

$$lnmfex_t = \beta_0 + \beta_1 iindex_t + \beta_2 lnoutput_t + \beta_3 hdi_t + \beta_4 lnfdi_t + \beta_5 lnytpr_t + \beta_6 lncred_t - \beta_7 lnrer_t + \beta_8 eac_t + \mu_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(2)$$

Where:

lnmfex	= logarithm of manufactured export
iindex	= infrastructure development index
lnouput	= logarithm of manufacturing sector out put
hdi	= human development index
lnfdi	= logarithm of foreign direct investment
lnytrp	= logarithm of income of key trading partners
lncred	= logarithm of credit to the manufacturing sector
lnrer	= logarithm of real exchange rate
eac	= operation of the East Africa Community

β_0 is the constant term β_1, $\beta2$, β_3, β_4, β_5, β_6, β_7 and $\beta_8 > 0$ are the elasticities of dependent variable relative to each of the independent variables with *a priori* expected values. μ_i is the error term, and t is the time factor. Except for indices, all variables are expressed in logarithm form to allow for estimated parameters to be interpreted as elasticities.

3.3   Diagnostic Tests

3.3.1   Unit root test

To test for stationarity of variables, this study uses Augmented Dickey-Fuller (ADF) and Phillips and Perron (PP) since they are the two mostly used methods. The null hypothesis tested by both PP and ADF is of a non-stationary time series. If the series is found to be non-stationary at level form, it is differenced d times to make it stationary. If it becomes stationary after differencing it once, then it is integrated of order one, that is I (1).

3.3.2   Cointegration tests

Going further, if some variables are found to be stationary at first difference *I(1)* but their linear combination is stationary, *I(0),* then they are said to be co-integrated. In other words, a combination of such variables will be having a long run relationship. Johansen test will be used to determine the number of co-integrated equations. The estimated parameters of the co-integrated regression will be interpreted as long-run parameters. If the *I(1)* variables are found to be co-integrated, the error correction model will be estimated.

3.3.3   Error correction model (ECM)

The residual of the long run equation will be taken as the equilibrium error, in the sense that it will be used to relate the short run behaviour to the long run. The one period-lagged value of the error correction term gives the rate at which a shock in the long run is adjusted in the short run. The general-to-specific approach by Hendry (1987) as quoted by Thomas (1997) is used in selection of variables for the model.

3.4   Measurement of Variables and Expected Signs

The dependent variable for this study is the value of manufactured exports in US$ current prices. The independent variables of the study are described as follows:

Infrastructure index: This study selected infrastructure indicators from the energy, transport and telecommunication sub-sectors to construct a composite infrastructure index (IINDEX). The selected indicators are explained as follows:

(i)   **Energy sub-sector:** Two indicators are selected from this sub-sector. Total domestic consumption of electricity is given by total demand of electricity in million kilowatts per hour. This is used as a proxy for the country's capacity to generate electricity. Consumption of oil is measured using per capita consumption in terms of kilogrammes of oil equivalent in thousand tonnes of oil equivalent.

(ii)   **Transport sub-sector:** In this sub-sector, two indicators are chosen. The quality of road transport is proxied by the percentage of paved roads in the country (km). The third measure for transport infrastructure in terms of stock is the railway lines available for train services (km).

(iii) **Telecommunication sub-sector:** The two indicators selected from this sub-sector are the total mobile cellular subscriptions per 100 people and telephone lines per 100 people. They are added together to give a proxy for the stock of telecommunication services in the country.

A composite index was calculated using the Principal Component Analysis-PCA (see appendix). Development of infrastructure in terms of stock and quality is expected to raise production in the industrial sector and reduce transaction costs associated with transportation of goods, which then leads to increase in export of manufactured products.

Human development index: This is a composite index measured using three components: education (measured using years of schooling); standards of living (measured by per capita income); and longevity of life (measured by life expectancy at birth). This index is a measure of human development in the country. Promoting human development is about enlarging people's choices and capabilities to participate in meaningful economic activities (UNDP, 2013). The implication here is that higher human development is associated with desirable industrial production that will translate to better export performance.

Real Exchange Rate: This measures the real worth of a foreign currency in terms of a given domestic currency. It measures the competitiveness of a country's exports. In this case, real exchange rate is computed as follows:

$RER=ep^*/p$

where e is the nominal exchange rate of the shilling per foreign currency (US\$), p^* denotes foreign price index (US\$) and p is the domestic price index (consumer price index). Depreciation in real exchange rate makes exports cheaper, increasing demand for domestic goods in the external market, while raising profitability of exporters. This is turn simulates more supplies for exports.

Foreign direct investment: FDI if channelled well can contribute to higher levels of manufactured exports through its contribution to capital formation and transfer of modern technologies. For lack of FDI data disaggregated at sector level, this study uses total net inflows of FDI as a percentage of GDP.

Credit to the manufacturing sector: In addition, provision of support incentives such as credit to firms in the sector is essential, since it enables them to expand their business and raise production. Provision of affordable credit to the manufacturing sector is expected to increase production and exports from the sector.

Table 3.1: Data sources and expected signs

	Variable	Variable used as a proxy	Source	Expected sign
1.	Manufactured exports (mfex)	Value of manufactured exports in US$ at current prices	World Development Indicators	Dependent Variable
2.	Infrastructure Index (IIndex): calculated using the Principal Component Analysis (discussed in Appendix 4)	(a) Transport sub-sector: Road transport: Total paved roads as a % of total roads (km)	Statistical Abstract (various issues)	+
		Rail transport: Total rail lines (km)	Statistical Abstract (various)	
		(b) Energy: Electricity domestic demand	Economic Survey (various issues)	
		Petroleum: Per capita consumption (kilogrammes of oil equivalent in thousand tonnes of oil)	Economic Survey (various issues)	
		(c) Telecommunication: Total number of mobile cellular subscription (per 100 people)	World Development Indicators	
		Total number of telephone lines per 100 people	World Development Indicators	
3.	Inward foreign direct investment (FDI) inflows	Net inflows of foreign direct investment (% of GDP)	UNCTAD	+
4.	Output of the manufacturing sector	Value (Ksh million) of manufacturing output	Economic Survey (various issues)	+
5.	Human capital development	Human Development Index (HDI)	Human Development reports	+
6.	Income of main trading partners (ytrp)	Average real GDP of four countries from COMESA and EAC	World Development Indicators	+
7.	Credit to the manufacturing sector	Credit to the manufacturing sector in millions	Economic Survey (various issues) Indicators	+
8.	Real Exchange rate (RER)	US$	Penn world tables	
9.	EAC regional integration	1 from 2004 when EAC customs union was signed, 0 otherwise	EAC website	+

Output of the manufacturing sector: An improvement in the manufacturing sector output is expected to raise the volume of exports of manufactures. However, this is dependent on several factors of production that are available for the sector.

Income of trading partners: Income of the four major trading partners in manufactured exports is incorporated as a key variable in export of manufactures. This study takes the average of the GDP per capita for Uganda, Sudan, Rwanda and Tanzania as a proxy for income of key trading partners in manufactured exports. A rise in income of these countries in terms of GDP is expected to go along with an increase in demand for their imports.

East African Community (EAC): The signing of a customs union between the three East African Community members[3] in 2004 led to consolidation among members and enhancement of trade. A dummy variable for this community is constructed to capture its impact on trade of manufactured exports. It is expected that after the agreement was signed, there was increased volume of trade in manufactured products. A summary of data is given in Table 3.1.

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[3] Kenya, Uganda and Tanzania.

4. Empirical Results

4.1 Summary Statistics

The study uses time series data for the period 1980 to 2012 to analyze the factors that determine the performance of manufactured exports in Kenya. Summary statistics of the data used is given in Appendix 2. The Correlation Matrix (Appendix 3) shows correlation among the explanatory variables. It is notable that logarithm of income of key trading partners (lnytrp) is highly correlated with infrastructure index (Iindex), Human Development Index (hdi), and the dummy variable on EAC. The human development index (hdi) is also correlated with the infrastructure index (iindex)

4.2 Unit Root Test for Data

The Augmented Dickey- Fuller (ADF) test and Phillips Perron (PP) test were used to test stationarity of the time series data. Trends were included in the tests for data, which showed some trend. Unit root test results (Table 4.1) indicate that logarithm of foreign direct investment (lnfdi) and logarithm of credit to the manufacturing sector (lncred) are stationary at level form. All the other variables are stationary after first differencing, and are integrated of order one, that is I(1).

Although these variables, I(1), might each be moving in a different manner in the short run, they could be converging together in the long-run. In other words, the respective variables could be co-integrated. However, a logical step to take is to test for existence of this phenomenon. Johansen test for co-integration is preferred against the alternative test by Engle-Granger two-stage procedure for

Table 4.1: Unit root test results

Series	ADF	PP	Order of Integration I(d)
lnmfex	-2.864135***	-7.069761***	I(1)
iindex	-5.368080***	-5.736889***	I(1)
lnoutput	-4.104527***	-4.068293***	I(1)
lnrer	-6.210783***	-6.234000***	I(1)
lnfdi	-1.552602	-7.210442* **	I(0)
hdi	-9.294490***	-9.51445 ***	I(1)
lncred	-2.887460*	2.806749*	I(0)
lnytrp	-3.18751	-3.095263**	I(1)

The null hypothesis of unit root using ADF and PP is rejected at the following levels of significance: ***, **, * representing 1%, 5% and 10 %, respectively.

Table 4 2· Johansen test co-integration results

Trace test				Max-Eigen value test	
	Hypothesized number of co-integrating equations (CE)			Hypothesized number of co-integrating equations (CE)	
	None	At most 1	At most 2	None	At most 1
Eigen value	0.850041	0.59783	0.549532	0.850041	0.59783
Trace statistic	134.2401	75.42094	47.18364	58.81919	28.23731
0.05 critical value	95.75366	69.81889	47.85613	40.07757	33.87687
Probability	0.0000	0.0167	0.0578	0.0001	0.2028
Number of CE	2 CE at 0.05 %			1 CE at 0.05 %	

Note: The test assumes a linear deterministic trend.

the main reason that the later test is applied on residuals of the co-integrating equation instead of the true disequilibrium errors (Thomas, 1997).

Results of Johansen multivariate test (Table 4.2) indicate the presence of co-integrating equations. Using the two widely applied trace and max-eigen tests, trace test shows that there are at least two co-integrating equations, while the max- eigen value test indicates there is at least one co-integrating equation, both at 5 per cent level of significance. This gives indication of a long-run relationship among these variables. A logical step to take is to generate the long-run equations and interpret coefficients. Variables that are highly correlated with other variables were dropped from the long-run equation.

The long-run relationship between manufactured exports and selected cointegrating variables is given in Table 4.3. The results in this model give the lowest Akaike Information Criterion (AIC), which is 0.5892. It is also apparent that all coefficients have the expected signs. The infrastructure index and output of the manufacturing sector are important variables in improving the performance of manufactured exports in the long-run.

The coefficient of infrastructure index is positive and significant at 1 per cent level of significance. This indicates that improvement in infrastructure development by one unit in the previous year leads to 66 per cent increase in manufactured exports. It therefore implies that infrastructure development in both stock and quality has a robust relationship with the performance of manufactured exports in Kenya.

Table 4.3: Long run relationship

Variable	Coefficient	t-statistic	
C	9.620640	3.179924***	
IINDEX(-1)	0.665264	4.267448***	
HDI(-1)	2.681298	0.496916	
LNRER(-2)	0.383419	0.845354	
LNOUTPUT	0.823372	3.616843***	
EAC	0.139450	0.564385	
R-squared	0.916343	Mean dependent var	19.90285
Adjusted R-squared	0.899611	S.D. dependent var	0.940888
S.E. of regression	0.298113	Akaike info. criterion	0.589296
F-statistic	54.76767	Durbin-Watson stat	1.035425
Prob(F-statistic)	0.000000		

***, ** and * represent 1%, 5% and 10 % levels of significance respectively

Further, the results indicate that total output of the manufacturing sector is important in explaining the supply of manufactured exports. This is credible since the quantity of output from this sector determines the quantity exported. In this case, increasing output from this sector would lead to approximately 82 per cent rise in performance of manufactured exports. It therefore means that investments that go into raising output would raise the performance of manufactured exports.

4.3   Error Correction Model Results

The results of the error correction model are displayed in Table 4.5. The co-integrated variables were differenced, but variables that were stationary were used in their level form. The general-to-specific approach by Hendry (1987) as quoted by Thomas (1997) was used to select the variables for the model. The results indicate that performance of manufactured exports in the short-run is significantly influenced by the magnitude of exports of the same products, real exchange rate and human development, all in the previous two years.

The Error Correction Term has the expected negative sign (-) and it is statistically significant at 5 per cent. The magnitude of the error term (-0.314137) indicates that the speed of adjustment to equilibrium of supply of manufactured exports in Kenya is 31 per cent in each time period. This is fairly good since it shows that instabilities in this sector would be corrected within a period of around three to four years.

Table 4.5: Error correction model

Variable	Coefficient	t-Statistic	
C	-0.252348		-1.484612
D(LNMFEX(-2))	0.525053**		2.652292
D(LNYTRP)	2.852391		1.483917
D(LNYTRP(-2))	1.072366		0.640368
D(LNRER(-1))	0.640430		1.053038
D(LNRER(-2))	0.874133*		1.839624
D(IINDEX(-1))	0.131818		0.545933
D(HDI(-1))	3.916465		1.130033
D(HDI(-2))	6.266895*		1.788386
D(LNOUTPUT)	0.367186		1.040039
FDI	0.040910		0.479574
CRED(-1)	0.004616		0.953680
ERROR(-1)	-0.314137*		-1.870591
R-squared	0.658509	Mean dependent var	0.092457
Adjusted R-squared	0.417456	S.D. dependent var	0.265271
S.E. of regression	0.202467	Akaike info criterion	-0.057795
Sum squared resid.	0.696881	Schwarz criterion	0.549391
Log likelihood	13.86692	F-statistic	2.731806
Durbin-Watson stat	2.442599	Prob (F-statistic)	0.028815

*** p-value < 0.01, ** p-value<0.05, * p-value< 0.1. The values in brackets are the t-values.

The coefficient of the value of manufactured exports lagged for two years is important in explaining manufactured exports in the current year. The results suggest that holding other things constant, an increase in manufactured exports in the past two years would spur more exports of the same products by 0.52 per cent.

The coefficient of real exchange rate lagged for two years is positive and significant in the short-run as expected. Therefore, depreciation of real exchange rate would encourage export of manufactured goods. It is evident that manufactured exports respond to price effect after a period of two years.

Similarly, improvements in human development may also not result to better performance of manufactured exports immediately as indicated by its coefficient lagged for one year, which is insignificant. However, the coefficient lagged for two periods is significant, indicating the importance of human development in raising exports in the manufacturing sector. From this, it is clear that building people's

capacity to be knowledgeable, healthy and to live long would contribute to a better performing industrial sector.

Income of key trading partners in manufactured goods indicates a positive relationship with supply of manufactured exports, but it is not significant. It can be deduced that, in the short run, an increase in income of trading partners may not simultaneously lead to an increase in exports in the short-run, since more resources may be required to increase output commensurate with rising demand.

Further, results show that the coefficient of FDI is not important in explaining the performance of manufactured exports. In this case, it can be deduced that FDI channelled to the sector has been minimal to bring any significant difference in production and exports from the sector.

Similarly, the coefficient of manufactured output is positive, but insignificant, which could imply that increasing output in the short-run may not necessarily imply that there will be an increase in manufactured exports. In this case, the domestic market is a major consumer of locally manufactured products. That notwithstanding, other strategies such as raising the quality of exports could increase export competitiveness from the sector.

Although the coefficient of infrastructure index is positive, it is not significant in the short run. This could mean that changes in infrastructure development in the short-run may not yield immediate increase in exports from the sector. Credit provision to firms in the manufacturing sector is not significant in explaining the performance of manufactured exports. Perhaps the amount of credit provided to this sector has been negligibly low and inaccessible to many.

5. Conclusion and Policy Recommendations

5.1 Conclusion

Increasing performance of manufactured exports in Kenya is a key policy issue with direct impact on trade balance and overall economic performance. Previous studies have focused on firm level analysis of manufactured exports, ignoring sector-wide issues that could be affecting the performance of these exports. It is in recognition of this that this study attempted to take a macro-level analysis of factors that determine the performance of exports from the manufacturing sector from 1980 to 2012.

The study found that infrastructure development has a significant role in improving the performance of manufactured exports in the long-run. Thus, efforts to increase investment in energy, communications and transport infrastructure would go a long way towards improving the performance of these exports. In addition, the study showed that output of the manufacturing sector is important in explaining the performance of exports from this sector, particularly in the long-run, such that investments that lead to increased production in the sector translate to better performance of exports from the sector. However, while increasing output is important, the quality of these products should be im proved in order to raise their competitiveness and value.

It is also evident that improvement in human development has a positive relationship with manufactured exports. This implies that it is imperative to raise the productivity of the labour force by equipping them with the necessary skills, providing requisite healthcare, and good standards of living. Apart from this, price effect as shown by real exchange rate has significant influence on the performance of these exports, leading us to conclude that stability of the exchange rate would encourage exports.

The Error Correction Model (ECM) indicates that the performance of manufactured exports in Kenya adjusts to equilibrium at a speed of 31 per cent at each period whenever it is destabilized by some kind of shock. This shows that the sector would take nearly four years to stabilize once it deviates from the long-run equilibrium.

The rejection of other factors such as credit allocated to firms in the manufacturing sector and FDI to the sector could indicate the negligible amount of funds invested in the sector to bring out any visible changes in the performance of exports of manufactured products. Even as foreign firms continue to invest their resources in the local market, much of these investments are directed to other sectors of the economy, such as the services industry.

5.2   Policy Recommendations

The following are pertinent policy recommendations drawn from this study:

1.   Since infrastructure development is an important supply factor for manufactured goods, the government should make deliberate efforts to upgrade existing transport networks, both train services and roads, to increase connectivity and reduce the transactions cost of local products. There is hope that the construction of the standard gauge railway system connecting Mombasa and Kampala will ease the road network of congestion and reduce the cost of transport to the EAC member countries. It is also important for the government to provide modern transport services in major towns and cities, since this would attract investors in the manufacturing sector. Energy supply should also be upgraded to meet the increasing demand of the sector and reduce frequent power outages that have resulted into huge losses in the manufacturing sector. In a complementary way, it would be important to enhance provision of these infrastructural facilities in localized zones such as Special Economic Zones (EPZs) in order to increase proximity and efficiency in production. Investment in good infrastructure would enable existing firms in the sector to participate in the global value chains.

2.   There is need to increase investment in human development, which encompasses increasing education standards, health status, and standards of living of the Kenyan population. This will translate into a more productive workforce for the manufacturing sector, in tandem with what the Government of Kenya (2012) recognizes as a key instrument in revitalizing the industrial sector. Even as the government invests in education, more emphasis should be put on building the capacity of students on skills required to participate in production of high quality products for exports. It could also involve training those who are already in the sector, particularly SMEs. One way of achieving this is by identifying the skills need of the SMEs sector, and benchmarking with highly industrialized countries on quality training in order to meet this need. This will raise production of high quality products in the sector.

3.   Investment in the manufacturing sector by foreign firms is important to boost exports from this sector. It is, therefore, important to create an attractive policy and political environment and address failures in the market to encourage these investors. Proper linkages should also be established between foreign firms and local industries in order to facilitate

flow of technology. It is expected that this will enhance technological capacity of local firms in order to compete effectively in the market.

4.   In a global market, where there is increased participation in global value chains, there is need to identify areas of comparative advantage for increased investment, particularly in the aforementioned, in order to boost outputs and exports from the sector.

5.3   Suggestions for Data Collection and Further Research

There is need for stakeholders in the manufacturing sector to establish a comprehensive database capturing data related to the sector. Carrying out survey on all firms in the sector would provide important information about the sector. It is also important to encourage disaggregation of data according to sectors, for instance FDI inflow into manufacturing sector (for firms engaged in domestic and exports production), and research and development (R&D) expenditure allocated to the manufacturing sector. Of interest to study in future is the export performance of various manufacturing firms to inform targeted policy actions. Another area is on the participation of SMEs in exporting their products and factors that affect their performance. Additionally, it could be important to study the level of involvement of local firms in the global value chains, which entails transition into exports of tasks instead of final products.

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Appendix 6: Component eigen vectors

Variable	Eigen vectors
Paved roads	0.5182
Rail lines	-0.2422
Oil consumption	-0.2958
Electricity consumed	0.5735
Telephone and mobile subscription	0.5062