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Effect of Foreign Exchange Rate on Maritime Sector Performance in Enhancing Economic Growth in Kenya

Sudi Amani Mwasinago [α], Dr. Richard Siele [σ] & Dr. Thomas Agak [ρ]

Abstract- Maritime transport remains backbone of globalized trade and manufacturing supply chain, as more than 80% of world merchandise trade by volume is carried by sea. Maritime transport in Kenya takes care of 90% of Kenya's international trade by volume. The objective of this study was to establish effect of labor productivity on maritime sector performance in enhancing economic growth in Kenya. Target population was Kenya Ports Authority and Kenya Ferry Services while Kenya Maritime Authority coordinated implementation of policies relating to maritime affairs. The study was guided by the Solow growth model and the production theory. The study adopted explanatory research design employing panel data using data on annual basis over the period 2000-2019. Simple Linear Regression and GMM Models were utilized. Using STATA 13.0 and applying Simple Regression model, results indicated that coefficient of foreign exchange rate was 3.5694 which was positive and significant at 5% level, $p = 0.000 < 0.05$, implying every one percent increase in coefficient of foreign exchange rate, output increased by 3.5694%. Applying GMM, results indicated that coefficient of foreign exchange rate was positive and significant at 5% level of significance, $p = 0.000 < 0.05$ implying that for every increase in 1% of foreign exchange rate, output production increased by 3.2744%. On comparing results using Simple Regression and GMM models, effect and direction were the same with slight differences in quantity of coefficient of foreign exchange. Policy makers could consider improving on policies which could strengthen foreign exchange rate in order to increase output in maritime sector in Kenya.

Keywords: maritime, labor productivity, generalized method of moments, Kenya.

I. Introduction

A competitive maritime sector is important to global economic growth, since international trade is underpinned by waterborne transport. Maritime activity has a key role to play in the alleviation of extreme poverty and hunger as it already provides an important source of income and employment for many developing countries, such as the supply of seagoing personnel and ship recycling, ship-owning and operating, shipbuilding and repair and port services, among others.

Waterborne transport has historically underpinned international trade and contributed to global economic growth. Waterborne transport is facilitated by ports, which provide a fundamental role in linking navigable water and surface transport. As is the case for most transport services, demand for port services is a derived demand that depends ultimately on the demand for freight at a destination and the demand for travel by passengers. Ports are therefore only one component in a chain of services that deliver the outcome of the movement of people and goods (OECD, 2011).

The neoclassical growth theory, Solow-Swan Model, is grounded on production functions with strict neoclassical assumptions including constant returns to scale, diminishing returns to inputs and the perfect competition assumption. Only two factors, capital and labor, were considered in the production function. According to this model economic growth performance of a country was influenced by exogenous factors, namely, technology and population growth (Solow 1956).

According to Solow (1956) time was the only variable that affected the level of productivity. More specifically, he used the following aggregate production function:

$$Y = A_t F(K, L)$$

Where Y is the level of aggregate output, K is the level of the capital stock, L is the size of the labor force, A is total factor productivity and t is time. The most important prediction of the neoclassical theory was that the poor countries would eventually converge to the per capita income levels of the rich countries. But in reality the gap between the rich and some poor countries in the world has increased (Acemoğlu (2008).

This theory ordinarily presents the producers as successful optimizers by maximizing production, minimizing cost, and maximizing profits. Econometric techniques build on the basis to estimate production/ cost/profit function parameters using regression techniques where deviations of observed choices from optimal ones were modeled as statistical noise (Furková, 2013). Therefore, econometric estimation techniques should allow for the fact that deviations of observed choices from optimal ones are due to two factors: by either failure to optimize i.e., inefficiency or due to random shocks.

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Global growth in maritime trade is closely correlated with changes in real GDP as a 1% change in real GDP corresponds to a 1.1% change in in maritime trade (UNCTAD, 2017). Maritime transport services are directly driven by global economic growth and the need to carry goods internationally, and thus they are subject to developments in the global economy. In other words, global economic growth directly influences international trade, which, in turn, directly affects transport services and therefore the world's seaborne trade volumes. As demand for both maritime transport services and logistics services derives from global economic growth and the need to carry out international trade, the global shipping industry and maritime transport activities could not escape from performance of the global GDP and international trade volumes (Song & Panayides, 2015).

World tourism has always been enhanced by the maritime transport industry. In 2005, an estimated 10.5% of total world tourism expenditure was directly related to maritime transport (The Philippine Environmental Governance, 2006). The tourism sector of the maritime transport industry also helps in generating revenue to a nation. Cruise shipping is an area with huge potential, targeting high end tourists. Industry experts say that 400 cruise tourists are equivalent to 4000 tourist by air. Kenya Ships Agents Association estimates that 40 cruise ships calling at the port could translate to US$ 20 million (Sh2 billion) and there is a positive development with the Kenya Ports Authority (KPA) currently developing a cruise (Marete, 2018).

The importance of the maritime transport to the Kenya economy is seen in the following contribution: Transportation, Facilitation of Trade and commerce, Revenue generation, tourism, Promotion of Tourism, Development of related economic activities, Employment and job opportunities, Enhancement of industrial growth and development and Institutional development.

Kenya's territorial waters cover 230,000 square kilometers and a distance of 200 nautical miles offshore and 10,700 square kilometers of inland waters, thus the country's maritime sector has a huge potential to turnaround the economy. However, in 2015 for example, the maritime domain contributed only $1.83 billion to the GDP. Fisheries account for only about 0.5 per cent of the Gross Domestic Product and generate employment for around two million Kenyans through fishing, boat building, equipment repair, fish processing, and other ancillary activities.

The Government of Kenya has undertaken several initiatives to streamline the public sector to improve service delivery to its citizens. As a result, the public sector reform program (PSRP) was introduced in Kenya in 1991 after International donors supporting Kenya's development strategies tied aid to implementation of policy and sectorial reforms (PTPR, 2013). These efforts however, have still not yielded much result. The Government, through Sessional Paper No. 10 of 1965 on African Socialism and its Application to Planning in Kenya, resolved to establish state corporations in the Maritime industry like Kenya Ports Authority, Kenya Maritime Authority and Kenya Ferry services with a view to: accelerating economic growth and social development, redress regional economic imbalances, increase Kenyan citizen's participation in the economy, promote indigenous entrepreneurship, and promote foreign investments through joint ventures.

Maritime transport remains the backbone of globalized trade and the manufacturing supply chain, as more than 80 percent of world merchandise trade by volume is carried by sea (UNCTAD, 2019). One subject that has been hotly debated among maritime economists is the way in which shipping and ports facilitate trade (Song & Panayides, 2015). The economic impact of an industry, even though often measured by the level of economic activity of that industry, in the form of value added to GDP and employment generation, is not only restricted to these economic activities but also include the impact of these industry on other aspects of the economy. Studies on the importance of maritime sector has divided this industry contribution into several economic impact.

Maritime sector remains the backbone of globalized trade and the manufacturing supply chain, as more than 80 percent of world merchandise trade by volume is carried by sea (UNCTAD, 2019). Maritime sector in Kenya takes care of 92 percent of Kenya's international trade by volume, which is expected to grow as the country seeks to implement the early crude oil exportation project. However, State corporations in the maritime sector in Kenya have been experiencing redundancies, cost cutting, closure of operations and challenges to the quality of their services. They have become more complex to manage because of the demands of the dynamic business environment. They are finding it difficult to meet the challenge of customer demands as well as complicated service technologies and production processes (Awuondo *et al*, 2013).

Competitiveness of the Mombasa port was ranked number 114 among the world's best 120 best ports that handle container cargo. The latest ranking now puts the Mombasa Port at position 6 in Africa behind other best performing Ports in Africa including Tangier Med Port in Morocco which handled 3.3 million TEUs, Durban (South Africa) did 2.6 million TEUs and Lagos Nigeria that made it into the list for the first time clocking 1.5 million TEUs in 2017. Africa's other best performing Ports are Alexandria and Port Said both in Egypt. (PMAESA, 2017).

Kenya Vision 2030, the country's development blueprint, has set ambitious targets of transforming Kenya into a newly industrialized, globally competitive, middle-income country. The long-term agenda, which is

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being implemented through successive five-year medium-term plans, has three pillars: an economic pillar that aims to achieve GDP growth of 10 percent per annum; a social and environmental pillar that aims to build a society enjoying equitable social development in a clean and secure environment; and a political pillar that aims to build a people-centered, results-oriented, accountable democratic political system (Word bank, 2019).

The costs of international transport services are a crucial determinant of a developing country's export competitiveness. Shipping costs often represent a more binding constraint to greater participation in international trade than tariffs and other trade barriers. Across economies, a doubling of shipping costs is associated with slower annual growth of more than one-half of a percentage point. Transport costs determine the potential access to foreign markets, which, in turn, explains up to 70 percent of variations in countries' gross domestic product (GDP) per capita (World bank, 2019).

Kenya depends quite heavily on external trade for sustaining her economy and also for her economic growth and development. Despite the extensive hinterland the port commands, and the recent commencement of SGR Freight services in 2018, its overall performance remains significantly below international standards. Kenya Ports Authority, a Maritime State corporation which manages Mombasa port, is underperforming in terms of turn-around time despite the heavy infrastructural inputs as depicted in table 1.1.

Table 1.1: Average Turn-around Time

Port	Waiting Time
Mombasa	62.4 hours
Namibia	18 hours
Djibouti	3 hours

Source: Kenya Ports Authority (2020)

As depicted in table 1.1, the port of Mombasa has one of the longest ship waiting time with turnaround time of an average of 2.6 days compared to Djibouti's 3 hours, Namibia 18 hours and Durban 16 hours. While this can lead to underperforming of volumes of handling of cargo and consequently reduce the value of contribution to the national gross domestic, the other fundamental issue is to establish whether the delay is as a result of monopoly structure of maritime sector.

II. Materials and Methods

The research design of this study was explanatory which used panel data to analyze effect of labor productivity on Maritime sector performance in enhancing economic growth in Kenya. In order to analyze the effect of labor on maritime performance in Kenya, this research utilized Simple Regression Analysis and Dynamic Stochastic General Equilibrium (DSGE) employing Generalized Method of Moments (GMM) modeling.

Using simple regression analysis was used to estimated regression equation is, R2 was found, which simply the square of correlation coefficient. This measure was also called the coefficient of determination of a regression equation and it took value between 0 and 1(both values inclusive). It would indicate the explanatory power of the regression model. The test for the significance of R2 would be carried out using the F statistics. The Simple Regression Model was employed in analysis of determinant of maritime output which were labor productivity in maritime sector in Kenya as depicted by equation 2.1.

$$Y_t = \beta_0 + \phi_1 Y_{(t-1)} + \beta_2 Lbr_t + \varepsilon_t \quad \text{.....2.1}$$

Where $Y_t, Y_{(t-1)}, \beta_2 Lbr_t, \varepsilon_t$ represents output, lagged output, labor productivity and the random error term respectively.

In GMM, a population moment condition is that a vector of observed variables, v_t, and unknown parameter vector θ with true value θ_0 which satisfy a $kx1$ element vector of conditions:

$$E[f(v_t, \theta)] = 0 \text{ for all } t \text{ .....2.2}$$

The method of moment estimator θ_T^* is used to solve the analogous sample moment conditions given as:

$$g_T(\theta_T^*) = T^{-1} \sum f(v_t, \theta_T^*) = 0 \text{ .....2.3}$$

Where T is the size of the sample.

Therefore, under the usual regularity conditions, $\theta_T^* \xrightarrow{T} \theta_0$, where θ_0 is the solution for equation 2.3, in which there are k unknowns and k equations leading to unique solution. Suppose that f is a $qx1$ vector and $q > k$ meaning there are k unknowns and q equations implying that there is no unique solution.

GMM picks a value for θ such that it approaches closest to satisfy equation 2.3. The closeness can be defined by the following criterion function:

$$Q_T(\theta) = [T^{-1} \sum f(v_t, \theta)] W_T [T^{-1} \sum f(v_t, \theta)] = g_T(\theta)' W_T g_T(\theta) \text{ .....2.4}$$

Where W_T is the weighting matrix, converges to a positive definite matrix W as T grows large.

The GMM estimator depends on the weight matrix $Q_{GMM}(W_T)$ which becomes the GMM estimator of θ_0 (true value) given as $\hat{\theta}$ can be obtained by finding

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argument of the minimum (argmin) of equation 2.4 as follows:

$$Q_{GMM}(W_T) = \hat{\theta} = \arg\min Q_T(\theta) \ldots\ldots 2.5$$

The Generalized Method of Moments (GMM) of estimation of DSGE model was employed in analysis of determinants of maritime output which were labor productivity in maritime sector in Kenya as depicted by equation 2.6.

$$Y_t = \beta_0 + \beta_2 Lbr_t + \varepsilon_t \ldots\ldots\ldots\ldots 2.6$$

Where $Y_t, Lbr_t, \varepsilon_t$ represents output, labor productivity and error term.

Secondary data on port of Mombasa between 2000 and 2019 was sourced from KPA, KFS and various economic surveys among other sources for the analyses. After data collection, analysis was carried out using Stata 13.0 software. Various diagnostic tests were carried out. Inferential statistics were used to understand relationships between different variables.

III. Results

This section presents the results and discussions of the examination of the effects of labor productivity on performance of maritime sector using the GMM approach and simple regression model.

a) Simple Regression Estimation of Parameters

The result for the Simple Regression estimation is shown in table 3.1.

Table 3.1: Simple Regression Results

ln Output (*lnOPT*)	Coeff.	Std. Error	Z- Value	P > |Z|	[95% Conf. Inter.	
ln Foreign Exchange Rate (*lnFOREX*)	3.5694	0.6688	5.34	0.000	2.2129	4.9258
Intercept	-15.4600	3.0878	-5.01	0.000	-21.7224	-9.1976

Source: Author (2020)

The results showed that the intercept coefficient was negative and significantly ($p = 0.000 < 0.05$) determined the output in the maritime sector in Kenya during the period under study. From the above regression equation it was revealed that holding labor productivity to a constant zero; the intercept coefficient indicated that output produced in maritime sector in Kenya 5,178,365 DWT.

With the use of bootstrap which is used to obtain improved estimates and confidence intervals in statistics, the results indicated the range in which the parameter coefficients are normal based on the 95 percentage confidence interval. This implied that the coefficient of *lnFOREX* 3.5694 was within the normal-based 95 percentage confidence interval of 2.2129-4.9258.

In general, transformed models where the dependent variable and independent variables are transformed, a coefficient represent elasticity. The results in this study, the coefficient of foreign exchange rate, 3.5694 was positive and significant at 5% level, $p = 0.000 < 0.05$. This implied that every one percent increase in labor productivity, output increased by about 3.5694%.

b) GMM Estimation of Parameters

The results for the system GMM estimation is shown in table 3.2.

Table 3.2: System GMM Estimation

	GMM			Ivregress_GMM			Arellano-Bond		
	Betas	SE	P	Betas	SE	P	Betas	SE	P
_cons				-6.7142	1.3410	0.000	-13.7809	2.0519	0.000
Indept. Variables									
ln ForeignExhange Rate (lnFOREX)				3.5684	0.6688	0.000	2.9817	0.4146	0.000
Instrumental Variables									
β_0	-14.8527	1.5385	0.000						
β_1	3.2744	0.3346	0.000						
Model Diagnostics									
R-squared				0.9927					
Wald chi2				318.90			458.76		
Sig.				0.000			0.000		

Source: Author (2020)

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From the findings, the results showed that the coefficient of foreign exchange rate was positive and significant at 5 percent level of significance, $p = 0.000 < 0.05$. This implied that for every increase in one percent of foreign exchange rate (β_1), output production increased by 3.2744 percent in the maritime sector in Kenya.

IV. Conclusion

In achieving the objective of this study, which was to establish the effect of foreign exchange rate on maritime sector performance in enhancing economic growth in Kenya, Simple Linear regression and GMM models were utilized. Simple Regression and GMM Models indicated that coefficient of labor productivity was 3.5694 and 3.2744 respectively and were positive and significant at 5% level of significance, $p = 0.000 < 0.05$. This implies that using simple regression every 1 percent increase in coefficient of foreign exchange rate, output increased by 3.5694%. Applying GMM, the results implies that every increase in 1% of foreign exchange rate, output production increased by 3.2744%. The study thus revealed that foreign exchange rate is a critical determinant in the performance of the maritime sector because foreign exchange rate had a direct bearing on the performance of the maritime sector. The results established that foreign exchange rate significantly and positively influenced maritime performance and thus a vital component in enhancing economic growth. The study concluded that foreign exchange rate has a very strong effect on performance of maritime sector in Kenya thus a critical driver of economic growth.

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