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Research Paper

AN ECONOMETRIC ANALYSIS OF INCREASED TRADE ACTIVITIES ON NAMIBIA`S ECONOMY

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ABSTRACT
A boost in trade revenue, economic diversification, increased Foreign Direct Investment (FDI), and improved regional integration are some of the reasons the African Continental Free Trade Area (AfCFTA) was established. Amid these positive reasons, there are also concerns about the negative impact of the free trade agreement. Namibia, with a relatively small population and small market share in terms of trade participation within the continent, is less likely to benefit from the AfCFTA. The aims of this study were to explore the relationship between trade flows and Gross Domestic Product (GDP) in Namibia, and to forecast the impact of increased international trade on Namibia`s economy. A robust econometric analysis test was applied to analyse the time series secondary data of real GDP, total trade, export, and import from 1990-2018. The findings showed no causal relationship between the dependent variable GDP and the independent variables; total trade, export, and import. However, increased participation in international trade will benefit the Namibian economy in the long term. Hence, the study finds it beneficial for Namibia to participate in the AfCFTA as a means towards increased trading activities.
Keywords: Africa Continental Free Trade Agreement, Economic growth, International trade, Regional Integration

INTRODUCTION
The African Continental Free Trade Area (AfCFTA) was launched with the agreement of 54 out of 55 member countries of the African Union (Kuwonu, 2021). This agreement is expected to increase regional integration, increase economic activities within the African continent, and provide economies of scale in production capacity. According to a report from World Bank (2020) it is estimated that AfCFTA could boost revenue within the continent to about $450 billion by 2035. In conjunction with increased trade activities, the AfCFTA is expected to increase competitiveness among member countries, therefore stimulating an increase in Foreign Direct Investment (World Bank, 2020a). In the 1990s, Foreign Direct Investment (FDI) was considered the largest single source of external finance for developing economies. The relationship between FDI and economic growth in host countries remains one of the most important issues in international business and economic literature (Lee, Fariza & Sharipova, 2015).

Upon AfCFTA ratification by most member states of the African Union (AU), there were major concerns and national debates on the benefit of the agreement to member countries. Major concerns were raised around lower tariff revenues, and stiff competition within the local market, especially among emerging industries in countries with relatively smaller trade shares in the African market (Nwankwo & Ajibo, 2020; Saygili, Peters, & Knebel, 2019). In line with trade time variation, the debate on a favourable approach to trade is based on the policy of free trade or protectionism. The policy of AfCFTA is based on the concept of free trade to increase trade activities and lead to a positive impact on economic growth.
In the context of Namibia, envisioned to achieve an industrialised and sustainable economic development by 2030, as stipulated in the vision 2030 goals, led the country to pursue increased trading activities (National Planning Commission, 2004). Reports by (African Development Bank, 2020) estimated Namibia`s Real GDP to grow at 2.4% in 2021 compared to 1.9% in 2020.

However, considering Namibia`s population, estimated at 2.58 million (United Nations data, 2021), makes the country less attractive in terms of market access to international trade. About trading activities within the continent, Namibia has a relatively smaller market share in comparison with other African countries. In terms of Namibia`s total trade with African countries; South Africa, Botswana, Zambia, and the Democratic Republic of Congo are regarded as the major trading partners. This translates to a level of trade focus and dependency with these Southern African countries (NSA, 2019). Namibia`s export market is also limited and heavily dependent on the mining sector (Sherbourne, 2016). Hence, the ratification of the free trade area implies Namibia`s commitment to increasing trading activities in Africa and fostering economic growth within the key sectors.

Towards economic development, international trade is highly regarded as an engine for growth (Eravwoke & Imide, 2013). Hence, considering Namibia`s scant trade activity in the international market, this study provides an econometric analysis on the impact of increased trade activities on the Namibian economy. Furthermore, the study conducted an econometric analysis forecast of the impact of increased trade activities on the Namibian economy. The analysis of this study was based on the interplay of key trade variables such as export, import, total trade, and the Gross Domestic Product (GDP).

METHODS

This study adopted a quantitative methodology with an interest in the interplay of four variables; Gross Domestic Product (GDP), Export, Import, and Total trade (export plus import). The study used time series data set from 1990–2018. The secondary data used in this study were extracted from the United Nations Conference on Trade and Development Statistics (UNCTAD Statistics). The study adopted rigorous econometric analysis to explore the relationship between trade flows and GDP and also to forecast the impact of increased international trade activities on Namibia`s economy. The following econometric analysis was conducted: Firstly, the Augmented-Dickey Fuller (ADF) test was used to test for unit root presence in the dataset. Secondly, a Johansen Co-integration test was used to check for the long-run association of the variables. A Vector Error Correction Model (VECM) was used to determine the variables` speed of adjustment while a Granger-causality test was used to determine the causality effects between the variables. Lastly, a variance decomposition analysis was utilized to assess the future impact of increased international trade activities on the Namibian economy.

Based on the empirical literature, theoretical economic knowledge, and the driving objective of the study, the following variables are included in the econometric model for purposes of estimation: Real gross domestic product (RGDP), which serves as the dependent variable, while total trade which comprises of the total import and export within the period is used as the explanatory variable. In consideration of this, the model to be estimated can be written in its general form as:

RGDP is the market value of all goods and services produced in a country in a given period, which is adjusted for changes in prices. EXPORT (EXP) refers to the total goods exported from a country in a given period and IMPORT (IMP) refers to the total goods imported into the borders of a country. The TOTAL TRADE (TT) is simply the combination of export and import of a country in a given period.

$$RGDP_t = (EXPORT_t, IMPORT_t) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

In specific terms, the equation (1) can be rewritten as:

$$LnRGDP_t = b_0 + b_1 LnEXPORT_t + b_2 LnIMPORT_t + U \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Equation (2) can be re-written as:

$$LnRGDP_t = b_0 + b_1 LnTOTALTRADE_t + U \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where:

$b_0 = numerical\ constant$

$b_1\ and\ b_2 = coefficients\ of\ the\ regressors\ (independent\ variables)$

$RGDP_t = regress\ and,$

$EXPORT_t IMPORT_t\ and\ TOTALTRADE_t = independent\ variables$

t = time period

Ln = natural logarithm and

U= disturbance term

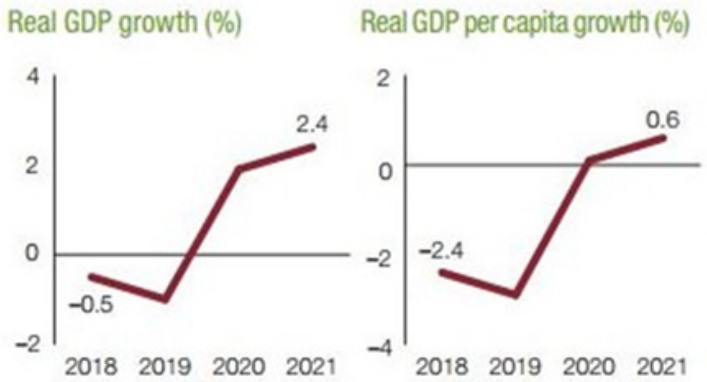

Figure 1: Namibia`s Real GDP growth and Real GDP per capita Projections

Source: (African Development Bank, 2020)

RESULTS AND DISCUSSIONS

The study made use of cointegration procedures involving the following: Unit root tests, cointegration tests, error correction modelling, diagnostic tests, Granger-causality tests, and forecast error variance decomposition analysis. Unit root tests are performed to check for the presence of unit roots or

stationarity in the time series datasets used in the study. The use of non-stationarity time series data in the estimation process would potentially produce spurious results, hence the technical necessity of these tests. The study employed the Augmented Dickey-Fuller (ADF) procedures for this purpose due to its simplicity and popularity. The reasons to test for stationarity are as follows:

The stationarity or otherwise of a series can strongly influence its behaviour and properties -e.g. persistence of shocks will be infinite for non-stationary series. Spurious regressions if two variables are trending over time, a regression of one on the other could have a high R^2 even if the two are unrelated. If the variables in the regression model are not stationary, then it can be proved that the standard assumptions for asymptotic analysis will not be valid. In other words, the usual "t-ratios" will not follow a t-distribution, so we cannot validly undertake hypothesis tests about the regression parameters. In line with the analysis procedures, cointegration implies the existence of long-run relationships among the variables used in a time series econometric model. Several procedures are recommended in the literature to test for co-integrating relationships. The rule is that the presence of, at least, one co-integrating vector or relation in a model implies the existence of long-run relationships among the variables used in the estimation process.

Unit Root Test

To cross-check the series of data and observe the nature of the variables total trade and Real GDP, the logarithm was taken (ltt and lrgdp) respectively. The results show (Figure 2) that both graphs are trending upwards, indicating that both variables are non-stationary. Similarly, the rule of thumb suggests that if R^2 is greater than the Durbin Watson Statistics, it is evidence of performing a spurious regression. The R^2 was given as 0.880203 which is greater than the Durbin Watson Statistics of 0.220396

Durbin-Watson Result

The Durbin-Watson stat given as 0.220396 is a clear indication that the regression is spurious and it is so because both series (ltt and lrgdp) are non – stationary. A disadvantage of a spurious regression is that the outcome of the results cannot be used for predicting and forecasting hypothesis testing. Hence, there is a need to subject the variables to an Augmented-Dicky Fuller (ADF) test as unit root testing.

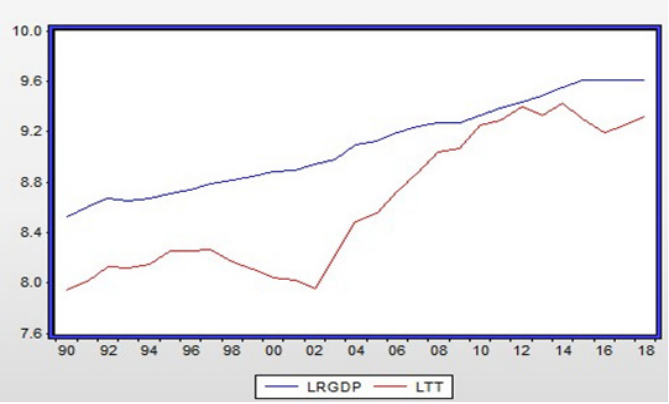

Figure 2: Stationarity Test for Total Trade and Real GDP

In the ADF test, a P-value of less than 0.05 indicates that there is no unit root. Similarly, the calculated Dickey-Fuller (DF) T-statistics was compared with a tabulated critical value which reflects no unit root. Thus, this implies the attainment of a stationarity status level. The results of the ADF test in levels and first differencing are shown in Table 1 below.

Assessing the result from Table 1, the series are integrated of order 1 (that is, stationary after the first difference). In other words, all variables were significant only after the first differencing. Hence, stationarity level status was achieved for all. The next step requires a test for co-integration.

Co-integration Test

The co-integration test is necessary to provide a long-run relationship among all the variables. That is; the long-run equilibrium to which an economic system converges over time. The assumption of a co-integration test is based on a long-run relationship in the model although the series are drifting apart or trending upward or downward. There are two prominent co-integration tests for I (1) series. They are Engle-Granger co-integration test and the Johansen co-integration test. This study adopted the Johansen co-integration test.

Table 1: Augmented Dickey-Fuller (ADF) in Levels and First Difference

Variables	Levels ADF Stat	First Differencing ADF Stat	Remarks
LnRGDP	-0.320968	-4.217820	I(1)
LnTT	-0.622760	-3.516276	I(1)
LnEXP	-0.710406	-4.036606	I(1)
LnIMP	-0.641899	-3.295124	I(1)

Table 2: Johansen Co-integration Test

H_0	H_1	Max – Eigen Statistic	95% Critical value
r = 0	r = 1	36.77585	47.85613
r < = 1	r = 2	19.19221	29.79707
r < = 2	r = 3	5.155392	15.49471
r < = 3	r = 4	0.010153	3.841466

As shown in Table 2, the variables under investigation are co-integrated. That is, they exhibit a long-run relationship. This implies that the series are related and can be combined in a linear model. In a situation of shocks in the short run, which may affect the movement of the individual series, they would converge with time (that is in the long run). Hence, the study conducted estimation of short-run and long-run models for the variables using Vector autoregression (VAR) and Vector Error Correction Model (VECM) respectively.

Vector Auto Regression Test

Since the model was stationary after its first difference I (1), it is imperative to construct a VAR model. Similarly, if the variables are co-integrated, it is necessary to construct both short-run (VAR) and long-run (VEC) models. It is also important that VAR is specified in levels; hence, VAR in difference would be miss-specified. All the variables in the VAR systems are endogenous, thus, the dependent variable is a function of its lagged values of other variables in the model. This is replicated in the equation below:

After analyzing the unrestricted VAR, 13.8 percent of the equation was significant (86.2 % insignificant); hence, the need to test for the redundancy of each variable. The result showed that each variable was relevant to the model. The study proceeded in estimating the Vector Error Correction Model (VECM) and conducting the Granger-causality test.

Vector Error Correction Model and Granger-causality Test

Estimating the cointegration and Error Correction Term (ECT), the result showed that a 1 percent increase in export will lead to an 18.77% decrease in economic growth. Though this is quite surprising considering the policies in support of export promotion as a result of increasing Namibia`s export. Similarly, a 1 percent change in imports will result in a 26.76 percent decrease in economic growth. Since Namibia`s currency is pegged to the South African Rand and in the same vein, South Africa is the major trading partner with Namibia, the exchange rate may have a significant effect on the export and import of goods and services. However, when the researchers considered total trade, a 1 percent increase in (TT) will lead to a 46.23% increase in real GDP. This shows significant support for the ideology of increased trade will lead to an increase in economic growth. In Table 3 below, the result of the long-run causal relationship among the variables is explained.

$$LnRGDP_t = a + \sum_{i=1}^{k} \beta_i lnRGDP_{t-1} + \sum_{j=1}^{k} \theta_j lnEXP_{t-j} + \sum_{m=1}^{k} \varphi_m\, lnIMP_{t-m} + \sum_{n=1}^{k} \omega_n\, lnTT_{t-n} + \mu_{1t}$$

$$LnEXP_t = \sigma + \sum_{i=1}^{k} \beta_i lnRGDP_{t-1} + \sum_{j=1}^{k} \theta_j lnEXP_{t-j} + \sum_{m=1}^{k} \varphi_m\, lnIMP_{t-m} + \sum_{n=1}^{k} \omega_n\, lnTT_{t-n} + \mu_{2t}$$

$$LnIMP_t = \partial + \sum_{i=1}^{k} \beta_i lnRGDP_{t-1} + \sum_{j=1}^{k} \theta_j lnEXP_{t-j} + \sum_{m=1}^{k} \varphi_m\, lnIMP_{t-m} + \sum_{n=1}^{k} \omega_n\, lnTT_{t-n} + \mu_{3t}$$

$$LnTT_t = \delta + \sum_{i=1}^{k} \beta_i lnRGDP_{t-1} + \sum_{j=1}^{k} \theta_j lnEXP_{t-j} + \sum_{m=1}^{k} \varphi_m\, lnIMP_{t-m} + \sum_{n=1}^{k} \omega_n\, lnTT_{t-n} + \mu_{4t}$$

Table 3: Pairwise Granger-causality Test

Null hypothesis	Observation	Prob.
LnEXP does not Granger Cause LnRGDP	27	0.7212
LnRGDP does not Granger Cause LnEXP	27	0.1486
LnIMP does not Granger Cause LnRGDP	27	0.3425
LnRGDP does not Granger Cause LnIMP	27	0.2577
LnTT does not Granger Cause LnRGDP	27	0.4485
LnRGDP does not Granger Cause LnTT	27	0.1957
LnIMP does not Granger Cause LnEXP	27	0.9691
LnEXP does not Granger Cause LnIMP	27	0.1173
LnTT does not Granger Cause LnEXP	27	0.9772
LnEXP does not Granger Cause LnTT	27	0.5594
LnTT does not Granger Cause LnIMP	27	0.1040
LnIMP does not Granger Cause LnTT	27	0.4939

Considering the information in Table 3, none of the variable pairs demonstrated any form of a causal relationship between themselves.

Variance Decomposition Test

The VAR system is also commonly used for forecasting systems of inter-related time series and for analyzing the dynamic impact of random disturbances on the systems of variables. The four-variable VAR model can be written as follows:

$$ln\boldsymbol{y}_t = a_i + \sum_{i=1}^{k} a_{1i} ln\boldsymbol{y}_{t-1} + \sum_{i=1}^{k} b_{1i} ln\boldsymbol{w}_{t-1} + \sum_{i=1}^{k} d_{1i} ln\boldsymbol{x}_{t-1} + \sum_{i=1}^{k} g_{1i} ln\boldsymbol{z}_{t-1} + e_{1t}$$

$$ln\boldsymbol{w}_t = a_2 + \sum_{i=1}^{k} a_{2i} ln\boldsymbol{y}_{t-1} + \sum_{i=1}^{k} b_{2i} ln\boldsymbol{w}_{t-1} + \sum_{i=1}^{k} d_{2i} ln\boldsymbol{x}_{t-1} + \sum_{i=1}^{k} g_{2i} ln\boldsymbol{z}_{t-1} + e_{2t}$$

$$ln\boldsymbol{x}_t = a_3 + \sum_{i=1}^{k} a_{3i} ln\boldsymbol{y}_{t-1} + \sum_{i=1}^{k} b_{3i} ln\boldsymbol{w}_{t-1} + \sum_{i=1}^{k} d_{3i} ln\boldsymbol{x}_{t-1} + \sum_{i=1}^{k} g_{3i} ln\boldsymbol{z}_{t-1} + e_{3t}$$

$$ln\boldsymbol{z}_t = a_4 + \sum_{i=1}^{k} a_{4i} ln\boldsymbol{y}_{t-1} + \sum_{i=1}^{k} b_{4i} ln\boldsymbol{w}_{t-1} + \sum_{i=1}^{k} d_{4i} ln\boldsymbol{x}_{t-1} + \sum_{i=1}^{k} g_{4i} ln\boldsymbol{z}_{t-1} + e_{4t}$$

The following parameters are to be estimated: aij, bij, dij, and gij after obtaining the VAR system for the variance decomposition.

The variance decomposition of the forecast error gives the percentage of unexpected variation in each variable that is produced by shocks from other variables. It indicates the relative impact that a variable has on another. It also enables the assessment of the economic significance of this impact as a percentage of the forecast error for a variable sum to one (that is 100 percent). The orthogonalization procedure of the VAR system decomposes the forecast error variance. Lastly, the component that measures the fraction in a variable is explained by shocks in other variables. The following steps were taken to obtain the variance decomposition of each variable from the VAR model.

Firstly, the second objective of this research is to forecast the impact of increased international trade on Namibia`s economy. This objective was achieved by forecasting for 10 years the significance and impact of each variable (that is log of Economic growth, Export, Import, and Total trade) through variance decomposition. The second step requires the performance of a unit root test for stationarity, which was earlier achieved. All variables were stationary after the first difference. The third step requires the determination of an optimal lag for each variable and the construction of an unrestricted VAR. Fourthly, several diagnostics tests such as serial correlation, stability, and heteroscedasticity for robust analysis of the variables. Finally, variance decomposition was performed and the result is shown in Table 4 below:

Table 4: Forecast Error Variance Decomposition Result

Period	LnRGDP	LnEXP	Ln IMP	LnTT
1	100.0000	0.000000	0.000000	0.000000
2	96.15061	1.863603	1.793509	0.192274
3	84.27749	5.669966	2.949808	7.102739
4	72.79965	8.312714	2.341159	16.54648
5	68.21666	8.823002	1.936892	21.02345
6	67.57536	8.021324	1.891655	22.51166
7	67.72700	7.121991	1.848120	23.30288
8	67.12990	6.696888	1.726019	24.44719
9	65.68051	6.704913	1.576855	26.03772
10	63.95203	6.970383	1.437846	27.63974

Table 4 presents forecast error variance decompositions for each variable in the model over a 10-period forecast horizon. The results depict that consistently, economic growth itself accounted for most of the changes or innovations that occurred concerning economic growth for the entire period under consideration. That is LnRGDP is strongly endogenous. The results show that in the first period, the fluctuations in economic growth are 100 percent purely driven or explained by economic growth itself. In the short run (that is 1 – 5 years) it is forecasted that only total trade and to some extent export depict a strongly exogenous impact on the dependent variable RGDP. However, in the long run (10 years period forecast) only total trade of 27.6% is projected to have the least exogenous impact on the dependent variable RGDP. This implies that an increase in total trade will benefit the Namibian economy in the short run and the long run.

CONCLUSIONS

The findings of this study show that there is no causal relationship between trade flows (export, import, and total trade) and the gross domestic product in Namibia. However, in the short and long term, the economy is expected to benefit from increased participation in international trade. Thus, this justifies the ratification of Namibia to participate in the AfCFTA. Economic stimulation through an increase in total trade in Namibia supports the ratification of AfCFTA.

The concerns raised for some Namibia`s manufacturing industry, and the likelihood of lower tariffs revenue in the short run are justified with the findings showing the low impact of export leading to a significant increase in the Gross Domestic Product (RGDP). However, there are potential benefits from trade openness, and increased trade activities, forecasting into the future. Hence, Namibia should pursue an export promotion approach to strengthen the manufacturing industry amid increasing trading activities within the continent. Similarly, it is expected that the AfCFTA will promote regional integration, and improve the regional value chain and the Global Value Chain (GVC). Thus, Namibia must be ready to take advantage of increased trade activities due

to the country`s competitive edge in geographical location and modest infrastructure for export promotion within the region. As a means to promote economic diversification towards sustainability and development, the AfCFTA will also contribute to the Namibian tourism sector.

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