

## Testing the Long-run Relationship between Export and Economic Growth: Evidence from Namibia

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### **Abstract**

*This study investigates the export-economic growth relationship for Namibia. The study was motivated by the contradicting results in the literature of the export and economic growth relationship despite the wide theoretical consensus among researchers that “export expansion is the engine of economic growth.” Namibia was chosen as a case study since the Namibian government also put some weights on export promotion as one of its growth strategies. The study models the relationship through the augmented neoclassical production function framework. The Johansen co-integration test, the vector-error correction model (VECM) and the Granger causality tests were employed to test for the nature of the relationship. The Granger causality test indicates a uni-directional causation from export to economic growth. This allows us to confirm the validity of the export-led growth hypothesis in the case of Namibia. The findings also suggest that economic growth is dependent on export performance in a way. Therefore Namibia can enhance its economic growth by improving upon the competitiveness of its exported items.*

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**Key words:** Economic growth, export, co-integration, error correction model, Namibia, time-series data, labour and capital, export-led growth hypothesis.

**JEL Classification:** F430, F140, F10, C4, F100, C100, C120, C130, C870 and O490

## 1. Introduction

Over the years, numerous articles and studies have been written and published regarding the relationship between export and economic growth. This is particularly true, if one considers the past two decades or so. Indeed, while some empirical studies find supporting evidence for export-led growth, studies such as Taban and Aktar (2008) cast doubt on the universality of the direction of causation. Despite the differences in the opinion of scholars regarding the direction of causation, there seems to be a consensus in the literature that export expansion could potentially lead to a higher rate of economic growth. Indeed, export expansion is viewed as a major source of foreign exchange reserves, which can be used to ease the pressure on the balance of payment and create employment opportunities (Jordaan and Eita, 2007:2). This perceived connection between export and economic growth is also attributed to the positive externalities that are often associated with exports. These positive externalities *inter alia* include benefits from the reallocation of resources, economies of scale and various labour effects. Studies such as Ogbokor (2005), Jordaan and Eita (2007), and Sinocha-Lopete (2006) demonstrate that economies with favourable export growth enjoy higher rates of economic growth. Additionally, these authors maintained that export expansion further leads to efficient allocation of resources and hence many countries today, especially those belonging to the Southern Hemisphere are adopting export-led growth industrialization strategies as against the import-substitution strategies.

The success story of South Korea, Hong Kong, Singapore, Taiwan, Malaysia, Indonesia, Mexico and Brazil has also given additional credence to the adoption of export-led growth strategies. For Namibia, long-run studies dealing with the relationship between trade and economic growth are rather few. In light of this the study will attempt to establish a long-run relationship between export and economic growth for Namibia using an annual time-series macroeconomic data running from the period 1972 to 2010. The main question that this paper attempts to answer is: can export expansion be a reasonable economic growth strategy for Namibia? Namibia has put some efforts to stimulate economic growth through an export strategy – the Export Processing Zone (EPZ) that was established in 1995. It is against this background that this paper adopts the Johansen (1988) co-integration procedures to establish if exports expansion leads to economic growth. Put differently, the paper aims to test the following hypotheses in the context of Namibia:

H<sub>0</sub>: Export-led growth hypothesis is not valid for Namibia

H<sub>1</sub>: Export-led growth hypothesis is valid for Namibia

H<sub>0</sub>: Growth-led hypothesis is not valid for Namibia

H<sub>1</sub>: Growth-led hypothesis is valid for Namibia

The rest of the paper is organised in the following way. Section 2 reviews literature on the relationship between export and economic growth, while Section 3 presents the methodology of the research. Section 4 deals with data sources and definitions of variables. Section 5 discusses the results of the research. The final section addresses the policy implication arising from the research as well as the concluding remarks.

## 2. Literature Review

Lots of studies have been done over the years in respect of the connection between trade, especially foreign trade and economic growth. While a number of such studies do reinforce the existence of a positive connection between foreign trade and economic growth for most modern economies, others seem to present conflicting results. Some of the reviewed literatures are discussed below.

Ogbokor (2001) investigated the macroeconomic impact of oil exports on the economy of Nigeria. Utilizing the popular OLS technique, he observed that export is undeniably a critical source of growth for the Nigerian economy. He also found that a 10% increase in oil exports would lead to a 5.2% jump in economic growth. He concluded that export-oriented strategies should be given a more practical support by the relevant authorities. Although, Ogbokor's results concur with the theoretical presumptions that export growth fuels economic growth, the use of co-integration procedures would have most likely produced more robust and superior results given the nature of macroeconomic variables used.

Another study on Nigeria was carried out by Akerele (2001) who relied on quantitative techniques to identify sources of instability in export earnings for the Nigerian economy for the period 1980-1997. He observed that political as well as economic factors provide sources of instability in Nigeria's export earnings. The influence of political factors is not surprising, since the period of the study coincided with the imposition of various sanctions on Nigeria for failure to adopt western-style democracy. Ogbokor's and Akere's studies together imply that if Nigeria is to use export as a tool to foster economic growth, then they first have to smooth out other instabilities that may have negative impact on export.

During the same period, an export-economic growth relationship was investigated by Abu-Bader (2001) who used data for 9 Middle East and North Africa (MENA) countries (Egypt, Israel, Morocco, Sudan, Tunisia, Turkey, Algeria, Iran and Jordan) covering the period 1966-

1996. Abu-Bader considered two cases: in case one, Abu-Bader used total export to represent the export variable, while in case two he used export in the manufacturing sector only. Abu-Bader tested for causality using the modified Granger causality for all countries where co-integration was detected (Israel, Tunisia and Turkey), and Granger causality test in a VAR model for countries (Egypt, Morocco, Sudan, Algeria, Iran and Jordan) where no co-integration was detected. When total export is used, the results support the growth-led export hypothesis in Iran, Israel and Turkey, and export-led growth hypothesis in Sudan. The results show no causal relationship in the case of Egypt, Jordan and Morocco. However, when only manufactured export is used, the results showed bi-directional causality for Morocco, Tunisia and Turkey, validity of export-led growth hypothesis for Israel and no causality for the other remaining countries. What we can observe from Abu-Bader's findings is that the results are sensitive to the variables and the method employed, as they differ when total export is used and when only manufactured export is used. The author opines that usually, when economists justify the export-led growth proposition, in most cases they point to the positive impact of promoting export in the manufacturing sector to generate a significant effect on economic growth. Accordingly, export of the manufacturing sector is regarded as an appropriate proxy for the export variable when modelling the export-led growth relationship.

Ogbokor (2005) analysed the export-economic growth relationship in Zimbabwe. Using time series data running from 1991 to 2003, he also confirmed the existence of the export-led growth model in Zimbabwe. He further suggested fundamental economic cum political changes in order to address the various quagmires that are currently facing its economy.

Temiz and Gökmen (2010) examine the relationship between economic growth and export growth for Turkey using annual data for the period running from 1950 to 2009. Using the modified Granger causality test, the results support the growth-led export hypothesis. Taban and Aktar (2008) also examined the export-led growth hypothesis for Turkey, but using quarterly data for the period 1980Q1 to 2007Q2. By relying on the modified Granger causality test, the results indicate a bi-directional causal relationship between exports and real GDP. They concluded that export-led growth policies in Turkey will contribute to economic growth and economic growth will also contribute to growth in exports. These results imply that there is bi-directional causality between the two variables under discussion.

Investigating the export-led growth hypothesis for Botswana covering the period 1995Q1 to 2005Q4, Jordaan and Eita (2007) used the modified Granger causality test and GDP minus

exports as proxy for economic growth. Their results show a bi-directional relationship between exports and economic growth. Like Aktar and Taban concluded for Turkey, Jordaan and Eita also reached the conclusion that Botswana can promote higher export growth by encouraging higher economic growth and vice versa.

Maneschiöld (2008) investigated the export-led growth hypothesis for Argentina, Brazil and Mexico for the period, 1993 to 2006. The co-integration test results indicate that a long-run relationship between GDP growth and export only exists for Argentina and Mexico, but not Brazil. The modified Granger causality test reveals a bi-directional causation between GDP growth and export for Argentina. Though no long-run relation was detected for Brazil, the short-run causality test indicates a uni-directional causation from export to GDP, thereby validating the export-led growth hypothesis in Brazil. However, despite the results of the Granger causality test the export-GDP nexus by its very nature is a long-run relation, therefore Maneschiöld only concludes a partial export-led growth hypothesis in Brazil. For Mexico, the Granger causality test reveals a uni-directional causation from exports to GDP.

Investigating the export-led growth hypothesis of the Southern African countries (Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe) for the period 1980-2002, Sinoha-Lopete uses two bi-variate vector autoregressive (VAR) models: a VAR model with and without exogenous variables. The modified Granger causality test shows that neither the export-led growth nor the growth-led export hypotheses are valid for Mozambique, South Africa, Zambia and Zimbabwe. However, both bi-variate models produced results in favour of the growth-led export hypothesis for Malawi and Namibia, and export-led growth hypothesis for Lesotho, Botswana and Swaziland. The results imply that the latter countries could pursue export-led growth strategies to enhance their economic growth.

While Sinoha-Lopete did not find evidence of either of the two hypotheses for South Africa, Ziramba (2011), using quarterly data from 1960Q1 to 2008Q3 to analyse the relationship between export and economic growth in South Africa, finds evidence of both the export-led growth hypothesis and the growth-led export hypothesis. In contrast to Sinoha-Lopete who used total export of goods and services to represent the export variable in his analysis, Ziramba decomposed total export into merchandise export, net gold export, export of goods and services and income receipts. Using the modified Granger causality test, the results for the relationship between economic growth and merchandise export support the export-led growth hypothesis. Regarding the relationship between economic growth and income receipts, as well as economic growth and the export of goods and services; the results show evidence in support of the growth-led export

hypothesis. The results do not show causality relationship between economic growth and net gold export. The findings imply that only export promotion that increase merchandise export will enhance economic growth in South Africa.

Ogbokor (2011) with the use of double-log transformations equations estimated the relationship between foreign trade and economic growth for Namibia with data running from 1990 to 2008. He observed that exports and foreign direct investment are good predictors of economic growth in the case of Namibia. Export-economic growth relationship in Namibia was also studied by Jordaan and Eita (2007). Using Granger causality test procedures, they found evidence of export-led economic growth.

In summary, all the literature reviewed did provide explanations in some ways concerning the issue under investigation. Another important inference drawn from the reviewed literature is that results are sensitive to the variables used. For example, the findings and the approach used by Ziramba (2011) and Abu-Bader (2001) to analyse the relationship between export and economic growth indicate that the choice of variables played a crucial role in the results obtained. The general conclusion that can be drawn from their findings is that one may find a direct relationship from export to economic growth. However, such findings do not necessarily mean that export promotion in all the export sub-sectors is the most appropriate strategy to enhance economic growth. There may be some export sub-sectors, where causality runs from economic growth to export. Therefore, caution is required when a policy recommendation is made based on the findings. Accordingly, where data allows, it is advisable to use export of different sectors to establish how each sector's export relates with GDP. It is against the above background that this study aims to use different variables and different approaches from that of Jordaan and Eita (2007) and Ogbokor (2011) to analyse the case for Namibia.

### **3. Research Methodology**

One of the basic principles in long-run empirical studies is to first check for the stationarity or non-stationarity of the variables that will be used. If the variables are non-stationary, their order of integration is subsequently tested. This study uses three unit root tests: the Dickey Fuller GLS (DF-GLS), Phillips-Peron (PP) and the Kwiatkowski-Philips-Schmidt-Shin (KPSS) tests to test for the stationarity of the variables. A consensus among the three tests yield a more reliable results compared to when only one test is used. However, since these tests do not suffer to the same extent from the sample bias, the DF-GLS and the KPSS are the most reliable. The null hypothesis for the first two (DF-GLS and PP) tests is that a variable has a unit root so that if the

null hypothesis is rejected, a conclusion that a variable is stationary will be reached. The null hypothesis for the KPSS is that a variable is stationary, thus if the null hypothesis is rejected, a conclusion that a variable is not stationary will be reached.

After the stationarity of the variables is assessed, the next step is to look at the order of integration. If the variables are found to be integrated of order one i.e. I(1), the next step is to test for the existence of a co-integrating relationship between them. The two common tests for co-integration are the Engle and Granger (1987) two-steps procedure and the Johansen (1988) maximum likelihood procedure. The Engle-Granger test has been criticised by a number of studies in that, it being a two-steps procedure, implies that the errors in the first step are carried over to the second step (Enders, 2010). Moreover, the method only allows for one co-integrating equation. However, if there are more than two variables there may be a possibility for more than one co-integrating equations.

In contrast to the Engle and Granger two-steps procedure, the Johansen procedure allows for multiple co-integrating equations. The method also "...corrects for autocorrelation and endogeneity parametrically through using the vector-error correction mechanism (VECM) specification" (Jordaan and Eita, 2007). This study follows the Johansen procedure to test for co-integration. To carry out the Johansen test, we first formulate an unrestricted vector autoregression (VAR) model:

$$z_t = A_1 z_{t-1} + A_2 z_{t-2} + \dots + A_p z_{t-p} + \varepsilon_t \quad (1)$$

Where:  $z_t$  is an  $(n \times 1)$  vector containing all the  $n$  variables in the VAR (i.e. all variables in the augmented production function above) and  $\varepsilon_t$  is an independently and identically distributed  $n$ -dimensional vector with zero mean and variance matrix  $\Sigma_\varepsilon$ .

Transforming the level series in equation (1) into changes in  $x_t$  by adding and subtracting  $A_p z_{t-p+1}$  in period one,  $(A_{p-1} + A_p)z_{t+2}$  in period two and continuing the process, equation (1) derives into a more usable VAR form equation (Enders, 2010):

$$\Delta z_t = \sum_{i=1}^{p-1} \pi_i \Delta z_{t-i} + \pi z_{t-1} + \varepsilon_t \quad (2)$$

Where:  $\pi = -(I - \sum_{i=1}^p A_i)$  and  
 $\pi_i = -\sum_{j=i+1}^p A_j$

In equation (2),  $\pi$  is the rank of a matrix and it represents the number of co-integrating vectors. If  $\pi = 0$ , it means that there are no co-integrating vectors and that equation (2) is the usual VAR model in first difference (Enders,2010). However, if  $1 < \text{rank}(\pi) < n$ , there are  $r$  co-integrating vectors and a Vector Error-Correction Model (VECM) can be estimated. Therefore if variables are co-integrated, vector  $\pi$  is now defined as a product of two matrices,  $\alpha$  and  $\beta'$ , i.e.  $\pi = \alpha\beta'$ . Where  $\beta$  is the matrix of the co-integrating vectors and  $\alpha$  is the matrix of the speed of adjustment parameters (Enders, 2010). According to Engle and Granger (1987), the idea of a VECM is that a proportion of disequilibrium in period  $t$  is corrected in period  $t + 1$  so that variables return back to equilibrium.

Since the aim of the study is to discern the relationship between economic growth and export, two VECM models will be estimated and expressed as follows:

$$\Delta Y_t = \mu_{10} + \sum_{j=1}^r \alpha_{1j} \varepsilon_{t-1,j} + \sum_{i=1}^p \gamma_{11,i} \Delta Y_{t-i} + \sum_{i=1}^p \gamma_{12,i} \Delta X_{t-i} + \sum_{i=1}^p \gamma_{13,i} \Delta K_{t-i} + \sum_{i=1}^p \gamma_{14,i} \Delta L_{t-i} + \xi_{1t} \quad (3)$$

$$\Delta X_t = \mu_{20} + \sum_{j=1}^r \alpha_{2j} \varepsilon_{t-1,j} + \sum_{i=1}^p \gamma_{21,i} \Delta Y_{t-i} + \sum_{i=1}^p \gamma_{22,i} \Delta X_{t-i} + \sum_{i=1}^p \gamma_{23,i} \Delta K_{t-i} + \sum_{i=1}^p \gamma_{24,i} \Delta L_{t-i} + \xi_{2t} \quad (4)$$

Where,  $\Delta$  denotes the first difference operator,  $\varepsilon_{t-1,j}$  is the lagged error-correction term obtained from co-integrating equation  $j$ ,  $\xi_{1t}$  and  $\xi_{2t}$  are serially uncorrelated error terms.  $\alpha_{1j}$  and  $\alpha_{2j}$  denote the speed of adjustment of the variables  $Y$  and  $X$ , respectively, to the  $j$ -th long-run equilibrium and all other variables are defined as before. A unique advantage of the VECM as compared to other methods such as the Engle-Granger methodology is that, it treats each variable (simultaneously) in the system as potentially endogenous and relates each variable to its own past values and to past values of all other variables.

A VECM provides an additional channel through which causality can be tested in the Granger causality sense. Though there are some of the empirical studies that use the standard Granger causality test to test for the relationship between export and economic growth, Engle and Granger (1987), Abu-Bader (2001) and Jordaan and Eita (2007) warn that this method is not sufficient if variables are I(1) and co-integrated. The Standard Granger uses the F-test, however, given that many economic time series data are I(1), if they are co-integrated the F-statistics does not have a



standard distribution. Thus, Jordaan and Eita (2007) argue that “if variables are I(1) and co-integrated, the Granger causality should be done in error-correction model.” Abu-Bader (2001) also argues that a standard Granger causality test might produce invalid causal information since it does not include an error-correction term. If variables are co-integrated and an error-correction term is excluded from the model, there is a high possibility that causation may not be detected when it exists.

This study tests for causality using a VECM. However, if no co-integration is detected causality will be estimated from a VAR in first difference. Using a VECM, if we fail to reject the null hypothesis that  $\alpha_{1j}$  (the error-correction term of the export variable) and  $\gamma_{12}$  in equation (3) are equal to zero, a conclusion that  $x_t$  does not Granger cause  $y_t$  will be reached. Similarly, if we fail to reject the null hypothesis that  $\alpha_{2j}$  (the error-correction term of the GDP variable) and  $\gamma_{22}$  in equation (4) are equal to zero, a conclusion that  $y_t$  does not Granger cause  $x_t$  will be reached. Lack of causality from both sides indicates that the two variables are interdependent. The establishment of the direction of causation has implications for economic policy strategies. For example, if causation runs from export to GDP growth then implementation of the export promotion strategy will be the appropriate strategy for a country's economy to grow. However, if causation runs from GDP growth to export then some degree of development may be a prerequisite for a country to increase its export and, therefore, economic growth policies are necessary to expand export (Temiz and Gökmen, 2010). If there is a bi-directional causation, it would imply that both export and growth strategies may be appropriate as long as they reinforce each other.

A VECM allows for the estimation of the weak exogeneity test and impulse-response functions. A weak exogeneity test is conducted to identify the variables that respond to deviations from the long-run equilibrium relationship. If a variable does not respond to the deviation from long-run equilibrium relationship, it is said to be weakly exogenous (Enders, 2010). The null hypothesis for the weak exogeneity test is that a variable in question is weakly exogenous while the alternative hypothesis is that the variable is endogenous. If the null hypothesis is rejected, it means that the variable plays some role in bringing the normalised variable to the long-run equilibrium.

Impulse-response functions on the other hand trace the effects of a one-time shock to one of the innovations on current and future values of the endogenous variable. The impulse response function allows us to establish the length of time it takes for the effects of shocks to die out. The

relative importance of shocks can also be analysed through variance decomposition. The variance decomposition analysis tells us the proportion of the variation in the variable that is due from its own shocks and the variation that is due to the shocks in other variables (Enders, 2010).

The variance decomposition also allows us to determine whether or not our normalisation in the VECM is appropriate. For example, a normalised variable should explain less than 50% of its own variation, otherwise the variable in question is exogenous and this implies that our normalisation were not appropriate.

#### **4. Data Sources and Definition of Variables**

##### **4.1 Data Sources**

The study relied upon the use of annual data for Namibia which covers the period 1972 to 2010. The following constitute the major sources of data for our study: National Planning Commission (NPC), Ministry of Labour (MoL), Bank of Namibia (BoN), World Bank (WB) Statistics, and International Labour Organisation (ILO) Statistical bulletins.

##### **4.2 Definition of Variables**

The variables used in the study are: real GDP, real fixed capital stock, real export of goods and services, real import of goods and real export of goods and services and total employment (labour). All other variables with an exception of labour were rebased to 2004 constant prices. While most studies in the literature use total export to establish the nature of the export-economic growth relationship, Riezman *et al* (1996, *cf.* Shan and Sun, 1998:360) point out that if import are excluded from the model (i.e. import not added back to GDP minus export) the results may be misleading because import affects both GDP and export. Therefore, omitting the import variable can result in spurious rejection or a spurious detection of the export-led growth (Shan and Sun, 1998:360). This study acknowledges the latter and includes import in the analysis so that export is defined as net export and not total export, and GDP is defined as GDP minus export plus import. By definition, GDP minus export plus import gives GDE (Gross Domestic Expenditure). Therefore, it is GDE that is used as a proxy for economic growth. This proxy is used to increase the viability of the results (see Shan and Shun, 1998).

Furthermore, to establish the extent to which economic growth (GDE) depends on export given the usual production inputs (capital and labour) the study considered the use of GDE to labour ratio, capital to labour ratio and export to labour ratio. Therefore the variables used in the analysis below are defined as follows:

*GDE ratio* = Real GDE divided by labour (Y/L)

*Capital ratio* = Real fixed capital stock divided by labour (K/L)

*Export ratio* = Net export of goods and services divided by labour (X/L)

The use of ratios is a standard practice, especially with the empirical analysis of the economic growth theories (see for example Sørensen and Whitta-Jacobsen, 2005 for different growth theories). According to Onafowora and Owoye (1998) and Salvatore and Hatcher (1991), economic development and the economic growth in particular, are more associated with changes in real *per capita* income than real aggregate GDE overtime. Accordingly, the use of ratios is more preferred than aggregates.

## 5. Econometric Results

### 5.1 Univariate characteristic of variables

The unit root tests (Table 1) produced mixed results. However, the majority of the tests show that variables are integrated of order one, I(1). Therefore the next step is to test if variables are cointegrated using the Johansen procedure.

**Table 1: Unit root tests**

Variables	PP test stats in levels	PP test stats in 1 <sup>st</sup> difference	Decision
GDE ratio	2.288	3.236	Null hypothesis rejected and variable is found to be stationary in first difference, therefore variable is I(1)
Capital ratio	-1.7375	-4.267	Null hypothesis rejected and variable is found to be stationary in first difference, therefore variable is I(1)
export ratio	-2.386	-8.623	Null hypothesis rejected and variable is found to be stationary in first difference, therefore variable is I(1)
Variables	KPSS test stats in levels	KPSS test stats in 1 <sup>st</sup> difference	Decision
<b>GDE ratio</b>	0.810	0.2588	Null hypothesis rejected and variable is found to be stationary in first difference, therefore variable is I(1)
Capital ratio	0.331	-----	Fail to reject the null hypothesis, therefore variable is stationary in levels, I(0)
Export ratio	0.501	0.293	Null hypothesis rejected and variable is found to be stationary in first difference, therefore variable is I(1)
Variables	DF-GLS test stats in levels	DF-GLS test stats in 1 <sup>st</sup> difference	Decision
GDE ratio	-2.034	-3.937	Null hypothesis rejected and variable is

			found to be stationary in first difference, therefore variable is I(1)
Capital ratio	-1.427	-2.497	Null hypothesis rejected and variable is found to be stationary in first difference, therefore variable is I(1)
Export ratio	-2.258	-----	Fail to reject the null hypothesis, therefore variable is stationary in levels, I(0)

**Note:** Tests performed and evaluated at 5 percent significance level. All tests include intercept only

The number of lags to include in a VAR was determined using information criteria. The information criteria indicated that two lags in levels are sufficient. The Trace test results are presented in Table 2 below. The results indicate that the null hypothesis of no cointegration ( $r=0$ ) is rejected at 1% significance level. This indicates that there is one cointegration relationship between GDE, capital and export ratios, therefore a VECM can be estimated.

**Table 2: Johansen cointegration (Trace) test**

Null hypothesis	Alternative hypothesis	Test statistic	0.05 critical value	Probability <sup>b</sup>
$r=0$	$r=1$	47.0195 <sup>a</sup>	42.9153	0.0184
$r=1$	$r=2$	22.5078	25.8721	0.1240
$r=2$	$r=3$	5.8377	12.5180	0.4812

**Note:** Trend assumption: intercept and trend in cointegrating equation and no trend in VAR.

<sup>a</sup> denotes rejection of the null hypothesis at 5% significance level.

<sup>b</sup> MacKinnon-Haug-Michelis (1999) P-values

### 5.2 Vector Error correction model (VECM)

The two hypotheses from the literature, export-led growth hypothesis and growth-led export hypothesis, imply that we can normalise on either on export or GDE to establish their relationship. Table 3 below presents the VECM results when normalisation is done on GDE. The results show that all the coefficients in the cointegrating equation have positive signs as expected. However, the coefficient of capital is statistically insignificant. The statistically insignificant capital coefficient is somewhat odd and contrary to *a priori* expectation because it means that capital does not play any role in explaining changes in GDE. Eita (2009) analysed the source of economic growth in Namibia and his findings show that capital contributed very little to economic growth over the period 1990-2005. Eita's results show that capital contribution amounted to 0.40% between 1990 and 2005 compared to 2.74% between 1971 and 1989. The decline in capital contribution could also add to the interpretation of the insignificant capital ratio in Table 3 below. Furthermore, the evolution of the capital to labour ratio for the period under

consideration was plotted (results not reported) and it showed that capital ratio decreased significantly since late 1982 and only started picking up around 2006. Given the nature of the employment level in Namibia (employment is fairly stable and did not show any significant increase over the same period), it implies that capital stock has not been increasing.

The export coefficient on the other hand is statistically significant and implies that GDE increases by about 0.8 percentage points for every one percentage point increase in export. The error-correction term for both GDE and export have the right signs as expected and are statistically significant. This indicates that GDE and export adjust to deviations from the long-run equilibrium, while capital does not. The Adjusted coefficient of determination ( $R^2$ ), though not relatively high, they coincide with small values of standard errors, suggesting that the model fit the data well and can be used for policy analysis. The probability of the LM-test is very high indicating that the model does not suffer from serial correlation.

**Table 3: VECM results – Normalising on GDE**

	<i>COINTEGRATING EQUATION</i>	
	<b>Coefficients</b>	<b>t-statistic</b>
<b>GDP ratio</b>	1.000	-----
<b>Capital ratio</b>	-0.0568	-0.6488
<b>Export ratio</b>	-0.8298	-2.5537
<b>Trend</b>	-0.00189	-7.8982
<b>Constant</b>	-0.0046	-----

**Error Correction**

	<b>D(GDE)</b>	<b>D(capital)</b>	<b>D(export)</b>
Coefficients	-0.3175 [-4.8365]	0.0061 [0.0536]	0.2461 [2.6007]
Adjusted $R^2$	0.443	0.166	0.3500
Standard error	0.0004	0.0008	0.0011
Autocorr LM(1) prob	0.9383		
Autocorr LM(2) prob	0.779		

**Note:** 1. In square brackets are the t-values.

Dummies included:

2. Dummy1, Dum = -1 in 1999 and Dum = 1 in 2000, capturing capital flight over these years.
3. Dummy90, Dum = 1 in 1990 for Namibia's independence.
4. Dummy92, Dum = 1 in 1992 for drought in 1992.

When normalisation is done on export (Table 4 below), GDE is statistically significant and capital is still statistically insignificant. The GDE coefficient, -1.2051, means that when GDE increases by one percentage point, export increases by about 1.2 percentage points. A statistically insignificant capital coefficient when export is the dependent variable was expected on *a priori* grounds because an increase (decrease) in capital stock would imply increase (decrease) in production output, but does not necessarily mean that export will increase (decrease). The relationship between capital and export is rather indirect.

**Table 4: VECM results – Normalising on export**

<i>COINTEGRATING EQUATION</i>		
	Coefficients	t-statistics
Export ratio	1.000	-----
GDE ratio	-1.2051	-2.7500
Capital ratio	0.0684	0.6509
Trend	0.0228	4.497
Constant	0.0053	-----

**Error Correction**

	D(GDE)	D(export)	D(capital)
Coefficients	-0.2042 [-2.6007]	0.2635 [4.8365]	-0.0050 [-0.053]
Adjusted R <sup>2</sup>	0.166	0.443	0.3500
Standard error	0.0051	0.0004	0.0062
Autocorr LM(1) prob	0.9383		
Autocorr LM(2) prob	0.779		

**Note:** the same dummies as in Table 4 above were included.

The error-correction terms for both export and GDE ratios are also statistically significant while that of capital is not. These error-correction results imply that, deviations of export from its long-run equilibriums are corrected through adjustments in export itself and GDE, but not capital. The impulse response functions performed (results not reported) also indicate that capital does not respond to shocks while GDE and export do.

**5.3 Exogeneity/endogeneity of the variables.**

The weak exogeneity test was performed to establish which of the variables are endogenous and which of the variables are exogenous. Table 5 below indicates that the null hypothesis of

weakly exogenous is rejected for the GDE ratio at the 1% significance level as indicated by a relatively small chi-square probability. However, the null hypothesis of weakly exogenous is not rejected for capital ratio at all conventional levels, while that of the export ratio is only rejected at the 10% significant level. These results show more evidence in support of the so called export-led growth hypothesis than the growth-led export hypothesis because the results show that the GDE is more endogenous than the export.

**Table 5: Weak exogeneity test**

	GDE ratio	Capital ratio	Export ratio
Chi-square	10.7137	0.0025	3.7477
probability	0.0011	0.9601	0.0529

The variance decomposition analysis performed (Table 6) also support the weak exogeneity test results. It indicates that capital and export are more exogenous since they explain a larger percentage of their own variation. Capital explains about 98.7% of its own variation while export explains about 81.2% of its own variation. GDE only explains about 17.4% of its own variation and 82.6% of its variation is explained by capital and export, therefore indicating that GDE is more endogenous and that the export-led growth hypothesis is more valid in Namibia than the growth-led export hypothesis.

**Table 6: Variance decomposition**

	Explanatory Variables			
		GDE ratio	Capital ratio	Export ratio
Variance decomposition of	GDE ratio	17.41	44.32	38.27
	Capital ratio	0.34	98.73	0.93
	Export ratio	11.19	7.62	81.19

**Note:** 1. Choleski ordering: capital, export, GDE.

2. Variance decomposition includes 15 horizons.

Though the weak exogeneity test and the variance decomposition analysis show more evidence in support of the export-led growth hypothesis than the growth-led export hypothesis, a more rigorous test that tests for the direction of causation was performed and is explored below.

#### **5.4 Granger causality test: what is the nature of causation?**

According to Granger (1988), the presence of cointegration relationship between variables as observed above implies that there should be causality in at least one direction. Therefore a VEC

Granger causality test was performed to establish the direction of causation and the results are presented in Table 7 below. The null hypothesis of no Granger causality from export to economic growth is rejected at 10% significance level, while that of no Granger causality from economic growth to export cannot be rejected at all conventional levels. Like the weak exogeneity and the variance decomposition results above, the Granger causality test indicates that Namibia's economic growth is mainly driven by exports. These results imply that Namibia can increase its economic growth through promoting export.

**Table 7: VEC Granger Causality/Block Exogeneity Wald test**

Null hypothesis	Chi-square	df	Probability
Export does not Granger cause economic growth	3.2537	1	0.0713
Economic growth does not Granger cause export	0.8512	1	0.3562

## 6. Conclusion and Policy Implications

The driving objective of this study has been to investigate the nature of the relationship between export and economic growth in the context of Namibia. The literature reviewed has shown that the main question in the export-economic growth issue is causality, whether causality runs from export to economic growth or *vice versa* or whether there is bi-directional causality. Using annual data for the period running from 1972 to 2010 the study explores the nature and the direction of the relationship in Namibia. The Vector-Error correction model (VECM), weak exogeneity test, variance decomposition and the Granger causality test results affirm a uni-directional causation from export to economic growth, therefore concluding an export-led growth hypothesis in Namibia. These results concur with that of Jordaan and Eita (2007). The findings imply that Namibia, through various measures to increase export, can enhance its economic growth and therefore consequently reduce its higher unemployment and poverty level.

Although the results may be intuitively appealing, it is important to note that the validity of the export-led growth hypothesis suggested by data should not be taken to mean that an expansion in the whole export sector would induce economic growth. As mentioned earlier in the paper, the export-led growth issue is noted to be appropriately modelled when manufactured export is used to represent the export variable in the regressions compared to when aggregate export in the economy is used. The export-economic growth relationship would be much clearer if the analysis also considered the various components making-up the export sector in order to establish whether or not individually, the data still support the export-led growth hypothesis. We relied upon highly aggregative data as a result of this challenge. Nevertheless, we do hope that the conclusion arising



from this article will serve as food for thought and also provoke other researchers to carry out further investigation on the issue under consideration.

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