The main purpose of the study was to investigate the causal relationship between sugar exports and economic growth in the Kingdom of Eswatini using quarterly data covering the period from 2005 to 2017. Toda-Yamamoto Granger-causality approach has been estimated using the bivariate Vector Autoregression (VAR) model that requires information about the optimal lag length as well as the maximum order of integration of the variables in the system in order to avoid spurious causality. The unit root test results showed that the variables are integrated of order one, I(1) using the Augmented Dickey-Fuller test. The optimal lag length for the variables in the system were selected to be two. The Granger-causality test results showed that sugar exports do Granger-cause economic growth but economic growth does not Granger-cause sugar exports meaning that there is a unidirectional causality from sugar exports to economic growth in the Kingdom of Eswatini. The study concludes by acknowledging that the country needs to develop its sugar exports in order to improve its economic growth. Therefore, policy makers should develop strategies that increases sugar export share by domestic firms in order to create a stronger national export sector.

Keywords: Sugar Exports, Granger-causality, Economic Growth, Eswatini, Unit root.

INTRODUCTION

The sugar industry in the Kingdom of Eswatini consists of the sugarcane production an activity that is regarded to be agricultural as well as the sugar processing an action that is regarded as industrial nature. The sugar processing accounts for just about 60 percent of the overall agricultural production output in the Kingdom of Eswatini and it also contributes 35 percent towards the agricultural sector employment. The sugar industry also contributes approximately 18 percent towards the Gross Domestic Product (GDP) of Swaziland. An addition of about 11 percent to the national income employment. Furthermore, the industry acts as the main contributor towards the state revenue through taxes, community services plus trade in terms of sugar exports and sugar related imports of agricultural chemicals, processing, fuel, finance as well as transport (Swaziland Sugar Association, 2016). The Eswatini sugar major export market is the European Union (EU), United States (US) and the Southern African Customs Union (SACU) markets. The sales to the EU market before 2006 was through the ACP-EU Sugar Protocol (SP) preferential market access that allowed the Kingdom of Eswatini to supply EU with a sugar quota of 120 000 tons as well as supplying 30 000 tons of sugar under the Complementary Quantity (CQ) that was mainly meant to meet the EU port refiners. The quota system that came into effects through rules of the Common Agricultural Policy (CAP) on sugar in 1968, that gives a price support to the African, Caribbean and Pacific (ACP) and the Least Developed Countries (LDC) producers above the price set in the world market. The EU had reformed its market access from 2006 to 2017 where the supply of sugar was ad-libitum by various sugar producing countries through the Quota Free- Duty Free (QF-DF) access that came into effect of January 1, 2018.

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effect after the signing of the Economic Partnership Agreement (EPA) between the EU and the ACP plus the Least Developed countries (World Bank, 2017). The reforms in the EU market swayed the reference raw sugar price from 2006 to 2009 from the fixed minimum of €523 per ton to €404 per tons which accounted for 36 percent decrease. The projected reduction from 100 percent to 90 percent of the EU minimum guarantee price for October 2009 to September 2012 was expected but it did not occur due to the high world prices prevailing during this period (International Sugar Organization [ISO], 2012).

According to the ISO (2012), the raw sugar price in the global market has stretched up to the uppermost price happening 30 years ago to be 36 cents/lb by February 2011. Some of the explanations for such incidence in the international price scramble is being made by a number of factors. These includes the greater than before demand for biofuel; the increased in the price of oil that contributed in the increase agricultural inputs cost such as the one for energy as well as the cost for fertilizers; shocks in the short-term sugar supply because of the confrontational weather patterns conditions that was received by most of the key sugar manufacturers such as Brazil as well as India; the modifications in the trade policy for the short-range trade cases that involves imports barriers reduction on sugar plus sugar products, increased sugar exports restraint among countries. Given the starring role in which the sugar industry plays in the economy of Eswatini there is a need to understands its effects on the economic growth. Hence, the purpose of this paper is to investigate the relationship between sugar exports and economic growth in Eswatini using Toda-Yamamoto Granger-causality approach. The study contributes by filling the knowledge gap in literature as well as providing an evidence-based export promotion strategy to be adopted by Eswatini in order to stimulate economic growth with more emphasis on sugar exports.

LITERATURE REVIEW

The theory that drives the relationship between exports and growth was given by Solow (1956) as the neo-classical growth model that supports the export-led growth hypothesis. The exports are linked to advancement in technology, economies of scale and improvement in productivity that will further enhance the economic development (Helpman and Krugman, 1985). There are numerous empirical studies that have been conducted in the past decade pertaining the causal relationship between export and economic growth and the debate was mainly on export-led growth hypothesis that identifies exports as a driver of economic growth. Most of the empirical studies that are done to test the validity of the export-led hypothesis came out with mixed and controversial outcomes across countries and methodologies.

Hassan and Murtala (2016) employed augmented Toda-Yamamoto causality approach to test the export-led growth hypothesis in Malaysia using annual data from 1970-2012. The results from the granger causality analysis revealed bidirectional causality between exports and GDP. A study by Lam (2016) that was investing the export-GDP nexus in four countries that are under the ASEAN community (Philippines, Malaysia, Indonesia and Thailand). The results revealed that for Malaysia there is bidirectional causality between exports and GDP. There is unidirectional causality from economic growth to exports for the other three countries, Indonesia, Philippines and Thailand.

Ronit and Divya (2014) analysed the relationship between export growth and GDP growth in India. The methodology that was used by the study were the Vector Auto Regression (VAR) examination, granger causality test as well as the impulse response function. The study applied these examinations on an annual secondary data from 1969-2012. Using the VAR model, the results illustrated that the exports growth in India for the entire period that was reviewed positively contributed to the GDP growth. The Granger-causality revealed that in India during the period under study GDP growth was not led by growth of exports and hence that provided evidence against the export led growth hypothesis. Using the Impulse Response Functions the study showed that there were much higher responses of export through a change in GDP in India and hence that backed the theory of growth led exports.


Qazi and Houda (2011) applied the autoregressive distributed lag (ARDL) bounds testing approach on 1960-2008 data for Tunisia to explore the existence of long-run equilibrium among exports, imports and GDP. Their estimates indicate that there is bidirectional causality between exports and imports.

Ozturk and Acaravci (2010) utilised the Toda-Yamamoto Granger-causality test to show a unidirectional causal flow from exports to economic growth in Turkey. Soyigitoğlu (2010), analysed the period of 1990-2008 with Toda-Yamamoto causality test and claimed that manufacturing industrial export and economic growth occur through intermediate good and investment good import. emphasizes the bidirectional relationship between export and economic growth.
Jordaan and Eita (2010) also conducted Granger-causality test between export and economic growth for Botswana, using quarterly data for the period 1996 to 2007. The results show that there is bi-directional causality between export and economic growth. Elbeydi, Hamuda and Gazda (2010) examined a relationship between export and economic growth in Libya. Granger causality test was conducted on annual data for the period 1980 – 2007. The results revealed a long-run bidirectional causality between the exports and income growth and that export-led growth does exist in Libya.

Chimobi (2010) investigated a relationship between economic growth, investments and export using the Johansen cointegration and Granger causality tests in Nigeria. The annual time series used was for the period ranging between the years 1970 to 2005. Cointegration tests results found no long run relationship between the variables under study. Nevertheless, the Granger-causality was found to be bidirectional between Investment and Economic growth as well as between Investment and Export. The causality results between export and economic growth was statistically insignificant in Nigeria.

Based on the literature that was reviewed most of the studies were testing the causality between aggregate exports and economic growth, hence for this study the departure point is that of sugar exports is used as opposed to aggregates. There has been an explosion of research on the relationship between exports and economic growth, but the existing research efforts failed to provide clear evidence on the direction of causality between these two variables. The current study employed Toda-Yamamoto approach to test for causality between those two variables. This is how it departed from other studies. Toda-Yamamoto approach has been found to be superior to ordinary Granger- causality tests since it eliminates the need for pre-testing for cointegration and therefore avoids pre-test bias and is applicable for any arbitrary level of integration for the series used. Also, the Toda-Yamamoto approach is useful because it fits a standard vector autoregressive model in the levels of the variables (rather than the first differences, as the case with Granger causality tests) thereby minimising the risks associated with the possibility of wrongly identifying the order of integration of the series (Mavrotas and Kelly, 2001).

MATERIALS AND METHODS

Data type and sources

The data that was used to carry out the study were quarterly Gross Domestic Product and Eswatini sugar exports value for the period 2005 to 2017. The Gross domestic product data where sourced from the Central Bank of Eswatini in local currency and for the value of the sugar exports it was sourced from International Trade Centre database (http://www.intracen.org). The time series were transformed into natural log before it was used.

Model Specification

The main objective of this study was to investigate the relationship between sugar exports and economic growth in the Kingdom of Eswatini using Toda-Yamamoto Granger-causality approach. As stated, before the Toda-Yamamoto Granger-causality approach is superior compared to the other methods since the Toda-Yamamoto Granger-causality test can be applied to non-stationary series to provide valid estimations as long as the maximal order of the integration of the series is added into the model.

The Toda-Yamamoto Granger-causality test between the two variables of the study was estimated through the following bivariate Vector Autoregression [VAR] Model:

\[ Y_t = a_0 + \sum_{i=1}^{k+m} a_i Y_{t-i} + \sum_{j=1}^{K} b_j X_{t-j} + \mu_t \quad \text{.....Equation (1)} \]

\[ X_t = c_0 + \sum_{i=1}^{k+m} c_i X_{t-i} + \sum_{j=1}^{K} d_j Y_{t-j} + \nu_t \quad \text{.....Equation (2)} \]

Where Y is the GDP, X is the sugar exports, m is the maximal order of integration order of the variables in the system. In this study augmented Dickey-Fuller (ADF) unit root test that was proposed by Dickey and Fuller and Phillips Perron (PP) unit root test was used to test for the order of integration. The unit root test was performed for constant and trend. The lag length for the ADF test were selected using Schwarz information criterion while for the Phillips Perron test, they were selected through the Newey-West using Bartlett kernel. The optimum lag length (k) is always unknown and therefore has to be obtained in the process of the VAR in levels among the variables in the system by using different lag length criterion such as the Akaike information criterion (AIC), Schwarz information criterion (SC), final prediction error (FPE) and Hannan Quinn (HQ) information criterion. Then \( \mu_t \) and \( \nu_t \) are the error terms that are assumed to be white noise with zero mean, constant variance and not autocorrelation. Then the inferences on the Granger-causality was conducted by applying the Wald test on the model and linear restrict all the first lagged values on equation 1 and 2. Then the null hypothesis that can be drawn for the first equation X does not Granger-cause Y is represented as:

\[ H_0: \sum_{i=1}^{k} b_i = 0; H_1: \sum_{j=1}^{J} b_i \neq 0 \quad \text{...............Equation (3)} \]

And for the second equation the null hypothesis that Y does not Granger-cause X is represented as:

\[ H_0: \sum_{j=1}^{k} d_i = 0; H_1: \sum_{j=1}^{J} d_i \neq 0 \quad \text{...............Equation (4)} \]

The null hypothesis on the Wald test statistics has an asymptotic chi-square distribution and there are three
outcomes that can be achieved; Unidirectional causality will occur between two variables if either null hypothesis of equation (1) or (2) is rejected; Bidirectional causality exists if both null hypotheses are rejected; Independent causality exists under the null hypothesis of equation (1) nor (2) is rejected.

RESULTS AND DISCUSSIONS

The Granger-causality using Toda-Yamamoto approach requires information about the optimal lag length (k) as well as the maximum order of integration of the two variables in order to avoid spurious causality or spurious absence of causality. This study used both ADF and PP unit root test to determine the order of integration. The ADF and PP unit root test results are presented in Table 1 and Table 2. According to the results, both ADF and PP unit root test results indicates that the variables are non-stationary at their levels but stationary at their first differences, being integrated of order one, I(1). Therefore, the maximum order of integration for the variables in the system is one (d = 1).

Table 1: ADF unit root test

<table>
<thead>
<tr>
<th>Levels</th>
<th>Z(t)</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
</tr>
</thead>
</table>

Table 2: Phillips Perron unit root test

<table>
<thead>
<tr>
<th>Levels</th>
<th>Z(t)</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>LX</td>
<td>-1.754</td>
<td>-3.579</td>
<td>-2.929</td>
<td>-2.600</td>
</tr>
<tr>
<td>LY</td>
<td>-1.385</td>
<td>-3.579</td>
<td>-2.929</td>
<td>-2.600</td>
</tr>
</tbody>
</table>

Notes: ***/** / * indicates that the null hypotheses are rejected at 1%, 5% and 10% level of significant, respectively.

Source: Author, 2019

Table 3: Lag Length Selection

<table>
<thead>
<tr>
<th>Lag</th>
<th>AIC</th>
<th>SC</th>
<th>HQ</th>
<th>FPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-0.5308</td>
<td>-0.4521</td>
<td>-0.5012</td>
<td>0.0020</td>
</tr>
<tr>
<td>1</td>
<td>-3.5010</td>
<td>-3.2648</td>
<td>-3.4121</td>
<td>0.0001</td>
</tr>
<tr>
<td>2</td>
<td>-4.4458*</td>
<td>-4.0521*</td>
<td>-4.2977*</td>
<td>0.00004*</td>
</tr>
<tr>
<td>3</td>
<td>-4.3744</td>
<td>-3.8233</td>
<td>-4.1670</td>
<td>0.000043</td>
</tr>
<tr>
<td>4</td>
<td>-4.3103</td>
<td>-3.6018</td>
<td>-4.0434</td>
<td>0.000046</td>
</tr>
<tr>
<td>5</td>
<td>-4.3676</td>
<td>-3.5016</td>
<td>-4.0417</td>
<td>0.000044</td>
</tr>
</tbody>
</table>

Notes: * indicates lag order selection by the criterion.

Source: Author, 2019

As the optimal lag length was chosen by AIC, FPE, SC and HQ criterion in order to prove that our analysis are statistical viability VAR Residual Serial Correlation Lagrange Multiplier (LM) test was performed for testing the hypothesis of no residual serial correlation. The result on Table 4 for the VAR Residual serial correlation LM test confirms that at the lag order of 2 there is no existence of residual serial correlation in the VAR model. At this level, the VAR is found to be dynamically stable.

Table 4: VAR Residual Serial Correlation LM Test

<table>
<thead>
<tr>
<th>Lags</th>
<th>LM -Stat</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.403</td>
<td>0.034</td>
</tr>
<tr>
<td>2</td>
<td>9.369</td>
<td>0.052</td>
</tr>
<tr>
<td>3</td>
<td>2.535</td>
<td>0.635</td>
</tr>
<tr>
<td>4</td>
<td>2.235</td>
<td>0.602</td>
</tr>
</tbody>
</table>

Source: Author, 2019

Once the order of integration and the optimal lag selection was achieved, we then undertake the Toda-Yamamoto Granger-causality test, for VAR (3), (d =1 and k =2), we estimated the system equation 1 and 2 and then test the hypothesis of the estimates through MWALD test that follows the chi-square distribution with 3 degree of freedoms in accordance with the appropriate lag length and associated probability as presented in Table 5.

Table 5: Toda-Yamamoto test of Granger Causality

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>MWald</th>
<th>p-values Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>H0: X does not Granger-cause Y</td>
<td>6.47</td>
<td>0.091 Reject H0</td>
</tr>
<tr>
<td>H0: Y does not Granger-cause X</td>
<td>1.98</td>
<td>0.577 Accept H0</td>
</tr>
</tbody>
</table>

Source: Author, 2019

The results on the causality between sugar exports and economic growth in the Kingdom of Eswatini as presented in Table 5 reveals that we reject the null hypothesis and accept the alternative that sugar exports do Granger-cause economic growth in the Kingdom of Eswatini. The significance level of acceptance for this hypothesis is 10% level. On the other hand, testing whether economic growth does not Granger-cause sugar exports in the Kingdom of Eswatini, the results revealed that it was independent of each other. Thus, we can conclude that there is a
unidirectional causality from sugar exports to economic growth in the Kingdom of Eswatini. The results are consistent with the outcome from the studies that was carried by Hamdi (2013); Ozturk and Acaravci (2010) that also concluded that there is unidirectional another unidirectional causal flow from exports to economic growth in Morocco and Turkey respectively.

SUMMARY AND CONCLUSIONS

The main aim of this study was to investigate the relationship between sugar exports and economic growth in the Kingdom of Eswatini using Toda-Yamamoto Granger-causality approach, which is considered to be one of the superior Granger-causality tests since it eliminates the need for pre-testing for cointegration and therefore avoids pre-test bias and is applicable for any arbitrary level of integration for the series used. The data used in this study were quarterly for the period 2005 to 2017. The study applied a bivariate vector autoregressive (VAR) system that involves diagnoses test for the unit root, optimal lag selection before applying the Granger-causality test on the variables. The empirical results from the Toda-Yamamoto Granger-causality test indicates that there is a unidirectional causality from sugar exports to economic growth which suggests that changes in the sugar exports causes changes in the real GDP in the Kingdom of Eswatini for the mentioned time period. Hence the study concludes by acknowledging that for the country to develop they need to promote the development of its sugar exports. Therefore, policy makers should develop a new strategy that will be able to increase the sugar export share by domestic firms to create a stronger national export sector capable of generating significant spillovers to the rest of the economy, and thus to contribute to economic growth.

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