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SUGAR PRODUCTION AND EXPORTS TREND ANALYSES, THE BASIS FOR INFORMED COMPETITIVE TRADE POLICIES: THE CASE OF SOUTH AFRICA WITHIN THE TRIPARTITE FREE TRADE AREA

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ABSTRACT

This article investigates the trends in South Africa`s sugar production and exports and determines the drift rate within the Tripartite Free Trade Area (TFTA) between 1996 and 2024. Trend analysis is crucial for informing policy to ensure that the competitiveness of the sugarcane industry is enhanced. To achieve this objective, it was, therefore, hypothesized that there were no trends in South Africa's sugar production and exports within the TFTA member states, there was no drift rate variation in South Africa's sugar exports within the TFTA member states and there was a significant positive correlation between South Africa's sugar production and exports between 1996 and 2024. Secondary data used in this study were obtained from the Economic Analysis and Agricultural Statistics Directorate of the Department of Agriculture, Land Reform and Rural Development (DALRRD) as well as the TradeMap database. Using time series data, the trend analysis results revealed that there were regular fluctuations in sugar production in South Africa during the period under review. Similar fluctuations were concurrently noted for the raw and refined sugar exports. It is important to note that factors of a seasonal nature generally explain such fluctuations, hence, it was concluded that seasonal variations accounted for these fluctuations in the sugar industry. The Johansen test model was employed to determine the drift rate and the results revealed a drift rate variation of 32% for raw sugar and 56% for refined sugar indicating potential for growth in South Africa's sugar exports. The Pearson correlation test results revealed that there was a positive correlation between sugar production and export in South Africa at the time. Further analysis using bivariate correlation analysis between sugar production and exports confirmed the results, clearly indicating a positive relationship. Improving productivity through appropriate government interventions can be expected to have a positive impact on sugar exports and South Africa's balance of payments.

Key words: drift rate, exports, Johansen test, production, South Africa, sugarcane, trend analysis

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INTRODUCTION

Although South Africa is one of Africa's major sugar-producing countries, it is certainly not the only African country to export sugar, particularly among the member states of the Tripartite Free Trade Agreement (TFTA). Sugar industries in the TFTA have recognized the need to collectively consider a special dispensation for sugar. South Africa exports more than 75 percent of its sugar production and generally ranks amongst the top ten sugar exporters globally. The importance of increasing this country's exports, to improve its balance of payments cannot be overemphasized. The heavy reliance on sugar exports by some developing nations highlights the extent of the pressure they must feel if there is a decline in sugar revenue [1].

The TFTA was signed among three regional economic communities (RECs)[1] to enable quota and duty-free trade in all regional products and eliminate quantitative restrictions on goods that meet the tripartite rules of origin. Africa's sugar consumption is on the rise, and the TFTA has the potential to open the market for South Africa's sugar products. The agreement will provide an opportunity for local top producers to tap into major markets within the Tripartite Free Trade Area, which will translate into more foreign earnings for the country, and a rise in the contribution of the agricultural sector as a whole to the gross domestic product (GDP).

Some researchers conducted a trend analysis of agricultural products. For example, Mutanga [2], did so concerning small-scale commercial sugarcane production in the post-resettlement area of Mkwasine in Zimbabwe, using hyper-temporal satellite imagery. The study made use of the normalized difference vegetation index (NDVI) derived from spot vegetation images as a proxy for a sugarcane growth and production model. Using the moving average computed in the R programming language, a time series analysis was done to monitor sugarcane production after the introduction of land reform in Mkwasine Estate. The findings showed a general decline in sugarcane production over the 11-year period of the study, with a few years of improved production.
Ahungwa [3], analysed time series data for the period 1960-2012 using trend analysis to assess the contribution of agriculture to the GDP of Nigeria. The results

[1] (a) The Common Market for Eastern and Southern Africa (COMESA) - Burundi, Union of Comoros, Democratic Republic of the Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Sudan, Swaziland, Seychelles, Uganda, Zambia and Zimbabwe
(b) The East African Community (EAC) - Burundi, Kenya, Rwanda, Tanzania and Uganda
(c) The Southern African Development Community (SADC) - Angola, Botswana, Democratic Republic of the Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe

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revealed that the share of agriculture to the total GDP showed a downward trend, despite maintaining a clear dominance over other sectors from 1960-1975. This finding confirms the importance of agriculture to the economies of developing countries. Such trend variations impose a challenge for all the stakeholders along the sugarcane value chain, ranging from input suppliers to farmers, millers, exporters, and consumers. As noted by Everingham [4], sugarcane industries comprised an integrated value chain encompassing the growing, harvesting, transporting, milling, and marketing sectors. Thus, whatever the constraints faced by a single link in the value chain, their effects are also felt by the rest of the players. For instance, if farmers experience low production rates, that will also affect the milling and export industries since they are entirely dependent on the farmers' output. The stakeholders at the end of the chain - the consumers, as the final link – will also be affected. In a similar vein, Lejarsa [5], points out that decisions taken at different levels can no longer be considered independently, since they may influence profitability throughout the supply chain.

The objective of the current study is threefold: (i) to identify trends in South Africa's sugar production and exports within the TFTA between 1996 and 2024; (ii) to determine the drift rate in South Africa's sugar exports within the TFTA between 1996 and 2024; and (iii) to investigate the correlation between South Africa's sugar production and exports between 1996 and 2024.

To achieve the aforementioned objectives, the following hypotheses were put forward for empirical verification:

a) There is a negative and insignificant trend for both sugar production and export within the TFTA between 1996 and 2024.

b) There is a negative average rate in South Africa's sugar exports within the TFTA between 1996 and 2024.

c) There is a negative relationship between total sugar production and total sugar exports.

The conceptual framework summarizing the main objective of this article is depicted in Figure 1:

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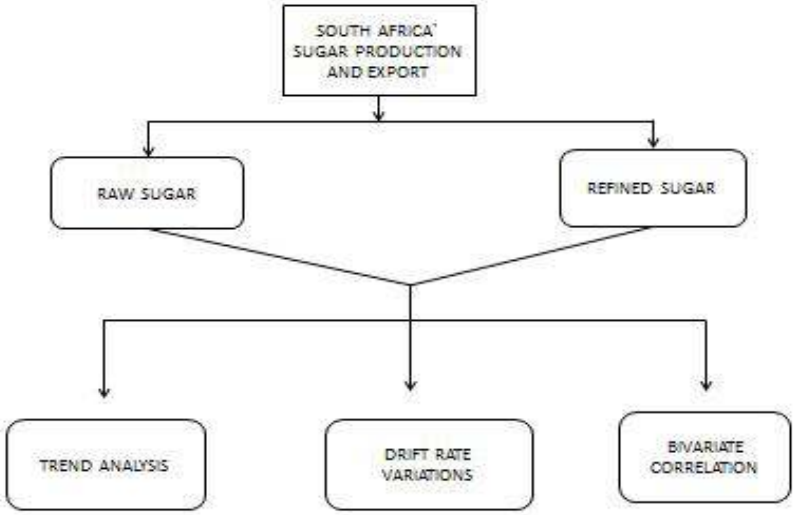

Figure 1: Conceptual framework (author's conceptualization)

This study examined trends in the production and export volumes of sugarcane (both raw and refined) over a set period. Such analysis is of great importance since it enables analysts to forecast the future supply of the product, particularly given the reality of climate change and other politically related issues that influence sugar production and exports. Assessing the variation, particularly in production trends, yields results or information that is also of great importance to policymakers. Awareness of such trends may assist them in reducing or even eliminating the risks associated with such variations.

MATERIALS AND METHODS

Data

This study focuses on the sugarcane industry, to analyse trends in terms of production and export volumes. Secondary data (time series) from 1996 to 2024, obtained from the Economic Analysis and Agricultural Statistics Directorate of the Department of Agriculture, Forestry and Fisheries (DAFF) and Trade Map, were used to address the study objectives.

Analysis

Guided by the research objectives, the researcher made use of a variety of research methods and techniques. Time-series data on South Africa's sugar production and exports between 1996 and 2024 were entered into an SPSS version 29.0 to determine trends. The trend analysis was used to identify any pattern or trend in sugarcane production and exports and assess whether they were trending down, up, or stationary. The Johansen test was used to determine the drift rate in South Africa's sugar exports within the TFTA between 1996 and

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2024. Named after Søren Johansen, this is a commonly used procedure for testing stochastic and cointegration relationships. Time series variables generally evolve stochastically and are frequently non-stationary in the analysis of stochastic drift. They are typically modelled as either trend stationary or different stationary.

A trend stationary process (y_t) is derived as follows:

$y_t = f(t)+e_t$

Where:
t = time (1=1996): base year
f = deterministic function
e_t = zero-long-run-mean stationary random variable
y_t= export of sugar at the time

In a time-series analysis, the independent variable is the period. A linear regression equation is used to calculate the trend of the dependent variable (y_t) as time passes. When time is used as the independent variable, however, several complications are introduced into the regression method. This is because the dependent variable will usually be subjected to several influences that are themselves affected by the unit used to measure time. In this case, the stochastic drift can be removed from the data by regressing y_t on t using a functional form coinciding with that of f and retaining the residuals.

In contrast to this, a unit root (difference stationary) process evolves as follows:

$y_t=y_{t-1}+c+u_t$

Where:
y_t = export of sugar at the time
u_t = zero-long-run-mean stationary random variable
c = non-stochastic drift parameter

In this case, the non-stationary variable can be removed from the data by differencing first, and the differenced variable will have a mean of c and no drift rate. A trend stationary process was selected, having been deemed most appropriate for this study.

The Johansen test clarifies what the assumptions are about the nature of the trend, at most a first-order polynomial in time. It helps one understand how the parameters of the reduced form are related to the coefficients of the matrix polynomial and shows how trending data affect inference and allows for a clear distinction between the data-generating process and the regression system used to construct the estimates [6].

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The model also has limitations, however. A noticeable feature of the regression system is the absence of a vector of linear time trends as repressor. A regression model without trends does not allow for stationary variables with non-zero trends and limits the possibility of testing stochastic cointegration. Implementing Johansen's method with the regression system is therefore flawed or of little practical relevance [6].

The Johansen test was selected as a suitable model for use in this study because the model can be applied to systems of variables that are trending and facilitates the interpretation of stochastic drift rate using coefficients.

RESULTS AND DISCUSSION

Trend analysis of South Africa's sugar production and exports within the tripartite area between 1996 and 2014

Figure 2 shows South Africa's sugarcane production in tons between 1996 and 2024. Indications are that overall production was good, consistently exceeding 15 000 tons per year although there were slight annual fluctuations. The highest production was recorded in 2001. Despite a decrease in production in some years which could be due to poor production practices, there was a significant increase between 1996 and 1999 and again from 2011 - 2014.

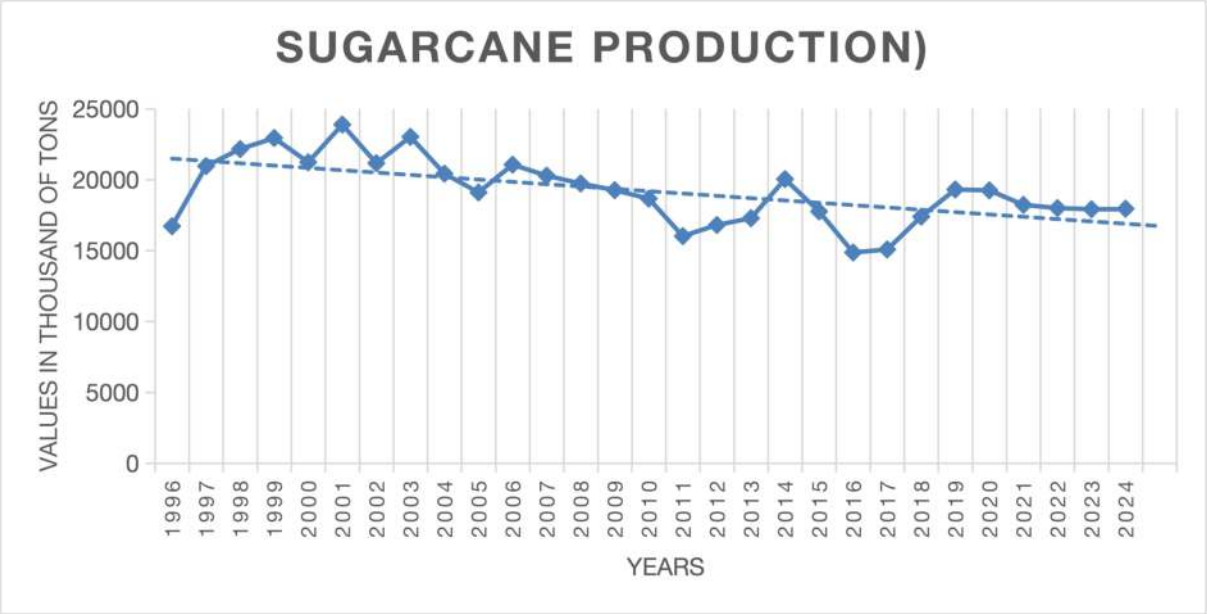

Figure 2: Sugarcane production in South Africa between 1996 and 2024
Source of data: Abstract of Agricultural Statistics (2024)

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Figure 3 shows South Africa's exports of raw and refined sugar to the Tripartite Free Trade Area member states between 1996 and 2024. It is clear from the graph that more raw sugar was exported in this period than refined sugar, with 2005 and 2012 being the only years when the Rand values of raw and refined sugar exports were equal. Several variables have been advanced in the literature to explain variations in export performance. Many researchers claim that a company's exporting experience or maturity plays a role in its performance when it comes to solving issues and exploiting export opportunities [7]. Based on a meta-analysis of 36 empirical research works on the correlation between export strategies for marketing and performance in terms of export, [8] point to several factors such as product design, branding, foreign market conditions, packaging, and pricing strategy as influencing the export performance of a given company or industry.

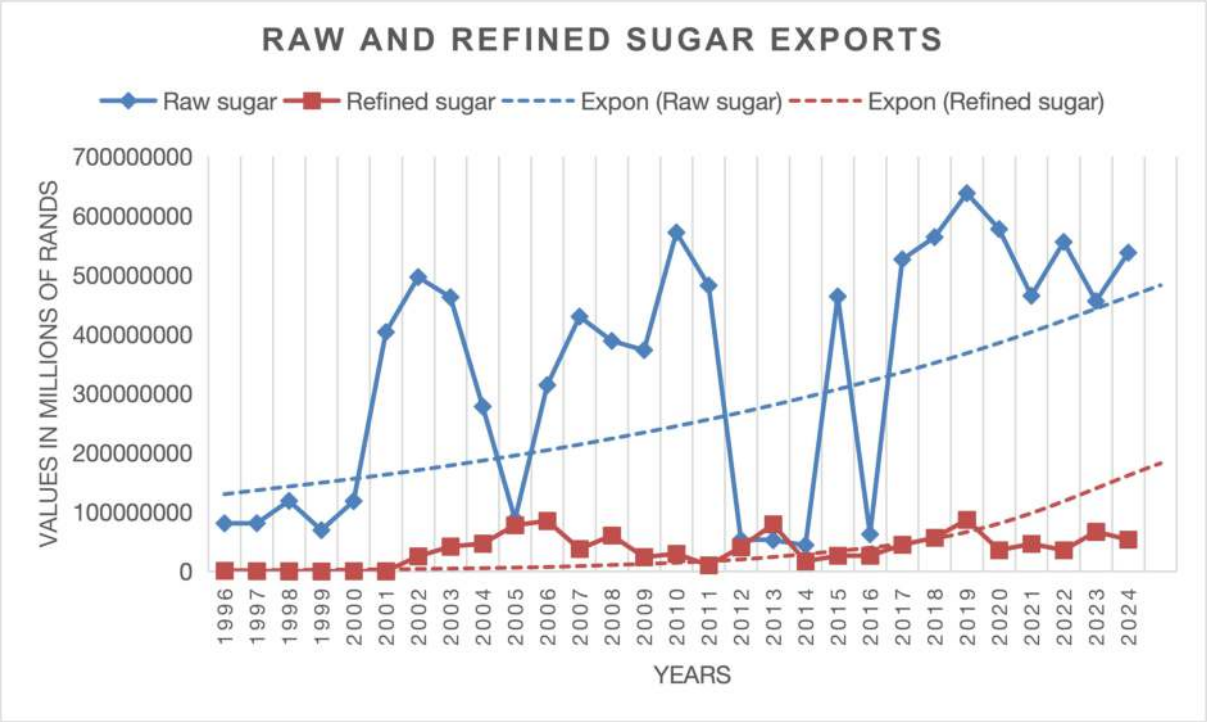

Figure 3: South Africa's raw and refined sugar exports to the TFTA (1996-2024)

Source: TradeMap (2014)

Analysis of drift rate in South Africa's sugar exports to TFTA between 1996 and 2014

The recorded drift rate variations and t-ratios for raw and refined sugar are presented in Table 1. The 56 percent drift rate in the case of refined sugar indicates a positive average change in refined sugar exports, while the 32 percent drift rate for raw sugar indicates a negative average change in raw sugar exports.

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However, the t-ratio of 2.686 for refined sugar is statistically significant (greater than 2) while the t-ratio of 0.553 for raw sugar is not.

Correlation analysis of South Africa's sugar production and TFTA exports between 1996 and 2014

Pearson correlation values range from -1 (representing a negative correlation) to +1 (representing a positive correlation). As shown in Table 2, the two-tailed significance is .004, which is less than 0.5. This means that the correlation can be considered significant, (that is, there is 95% confidence that the correlation between these two variables is not due to chance).

There is a strong positive correlation between total sugar production and total sugar exports, since r (29) = 63 (p=0.004), indicating that as production increased so did exports. Since the Pearson correlation value is .627 and is significant, it can be concluded that the data does not support the hypothesis that there is a negative correlation between sugar production and sugar exports in South Africa at the time. The results revealed a positive relationship. Given such a relationship between production and export, it therefore requires the sugar industry to increase production. One pathway to do that, as indicated by Mulherin [1], is through technological innovation.

Implications of the findings

Based on the findings of this study, it can be concluded that the South African sugar industry has the potential to maintain and even improve its competitive advantage within the TFTA. This implies that government intervention is sorely needed for sugarcane farmers to improve their productivity. The government can assist by providing training and providing access to production inputs. This will improve sugarcane production, which will ultimately improve sugarcane farmers' income. Earnings from sugarcane farming will combat poverty for most sugarcane farmers.

Competitive strategies need to be implemented to improve the competitive advantage of the domestic sugar industry. The critical aspects highlighted by the study as having a positive impact on competitiveness should receive special attention in order to sustain and enhance the performance of the industry through innovation.

CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

The results of the secondary data analysis indicate that there were regular fluctuations in sugarcane production in the period 1996-2024. Based on this, the researcher rejected hypothesis (1) that there were no trends in South Africa's sugar production and exports within the TFTA between 1996 and 2024. Not surprisingly, the same pattern was observed in raw and refined sugar exports

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during the period studied. Regular fluctuations are usually ascribed to factors of a seasonal nature, and it was concluded that seasonal variations explained the fluctuations in this case as well.

The Johansen test revealed a drift rate variation of 56 percent in refined sugar exports which is indicative of growth potential in sugar exports by South Africa. These results motivated the rejection of hypothesis (2) that there was no drift rate variation in South Africa's sugar exports within the TFTA between 1996 and 2024.

The results of the bivariate correlation between sugar production and exports in the periods 1996-2024 also clearly indicate a positive relationship between the production and export of sugar. The researcher, therefore, accepted hypothesis (3) that there was a positive correlation between South Africa's sugar production and exports between 1996 and 2024.

Based on the positive results of the bivariate correlation between sugar production and exports in the period 1996-2024, it can be assumed that increased production will lead to an increase in exports which will, in turn, contribute greatly to South Africa's GDP. Improving productivity through appropriate government interventions can be expected to have a positive impact on sugar exports and South Africa's balance of payments. This also means an improvement in the economic welfare of sugarcane farmers and other players in the value chain.

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Table 1: Model summary of drift rate in South African sugar exports (1996-2014)

	Average value	Significance	t-ration
Raw sugar	0.317	0.131	2.686
Refined sugar	0.557	0.012**	0.553

*, ** and *** represents significance at 10%, 5% and 1% probability levels, respectively
Source: Own calculations based on secondary data

Table 2: Bivariate correlation analysis of secondary data

		Total exports	Total production
Total exports	Pearson Correlation	1	.627
	Sig. (2-tailed)	.004	
	N	29	29
Total Production	Pearson Correlation	.627	1
	Sig. (2-tailed)	.004	
	N	29	29

Source: Own calculations based on secondary data

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