Testing the Export-Led Growth Hypothesis for Botswana: A Causality Analysis

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Abstract

This paper investigates the causal relationship 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. The two variables complement each other. This indicates that there is evidence in support of the export-led growth hypothesis as well as reverse causality. The results suggest that in order to achieve high economic growth, policies aimed at export expansion should be promoted. It is also necessary to devote resources on the non-export goods and services production in order to increase exports. The results suggest further, that Botswana can expand its limited domestic market by increasing exports.

Keywords: Africa, Botswana, Exports, Granger Causality, Growth

1. Introduction

One of the fundamental questions in economics is how a country can achieve high economic growth. An export-led growth hypothesis has been regarded as one of the answers to this fundamental question. An export-led growth strategy emphasises the role of export in promoting economic growth. It states that exports are very important for accelerating economic growth. Export of goods and services is an important source of foreign exchange reserves and can reduce balance of payments problems, and creates employment opportunities. Although the relationship between export and economic growth has been studied extensively, there is no consensus on whether economic growth causes export or whether export cause economic growth.

Many countries such as Botswana adopted a growth strategy that is led by exports. The export-led growth strategy of Botswana started during the colonial era (1885-1966) when the country was a British protectorate (see Sentsho, 2003). During that period, trade in Botswana was dominated by game meat, game skins and beef exports. According to Sentso (2003), the exports of beef continued to be the engine of economic growth until the early 1970s when Botswana discovered minerals (diamond, coal, copper, nickel). Together with beef, minerals are Botswana's traditional exports and are the engine of economic growth. These products constitute more than 80 percent of the exports in Botswana. Diamond is a key export product of Botswana, accounting for more than 70 percent of the country's export. Hence,

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Botswana is a mineral-dependent economy and the export-led growth strategy has been based on primary or mineral products (Wright, 1997).

According to Beaulier (2003), Botswana was the fastest growing country in the world during the period 1965 to 1995 with average growth rate of 7.7 and the country moved from being the third poorest nation in the world to become an upper middle income country. The IMF (2006) also noted that Botswana is still one of the fast growing economies. This high economic growth is attributed to export (dominated by diamonds). The export of primary products such as diamonds accelerated economic growth in the country. This tends to support the hypothesis that export was a key to economic growth in Botswana.

Table 1. Total exports and main export products

		Percent of Total export			
	Total export (Pula 000)	Diamond	Meat & Meat products	Copper nickel mate	Textiles
1996	8133358	70.4	2.5	5.5	2.4
1997	10390700	73.8	2.2	4.6	2.4
1998	8696922	69.5	3.4	5.0	3.5
1999	12227848	79.4	1.8	4.6	2.0
2000	14259879	82.6	1.8	5.8	1.7
2001	14658494	84.8	2.5	4.1	1.3
2002	16108744	82.1	1.7	4.4	1.8
2003	13910802	76.8	2.1	9.6	1.8
2004	16486553	75.4	1.5	9.6	3.4
2005	22480378	75.0	1.7	10.3	5.0
2006	26425919	73.5	1.8	15.0	3.5
2007	31702060	63.2	2.2	21.4	6.9
Average	16290138	75.5	2.1	8.3	3.0

Source: Bank of Botswana (2008): Annual Report

Table 2. Contribution of Minerals to GDP and to total government revenue and grants

Real GDP (Pula, million)		Percent of Real GDP						Government revenue (Pula, million)	Percent of Total Revenue and Grants		
		Agriculture	Mining	Manufacturing	Trade Hotels and Restaurants	Banks, insurance and business services	General government		Customs and Excise	Mineral Revenue	Non-mineral income taxes
1997/1998	14544	3.3	38.1	4.3	9.8	10.3	15.1	8281.3	14.3	56.5	6.5
1998/1999	15579	2.8	37.7	4.2	9.6	10.5	15	7677.6	16.4	41.5	9.6
1999/2000	16719	2.4	39.6	4.1	9.5	10.2	14.8	11963.1	16.1	55.9	6.5
2000/2001	18238	2.4	42.5	3.7	9.3	9.8	14.5	14115.1	15.5	59.3	6.6
2001/2002	18541	2.3	40.4	3.7	9.9	10.4	15.4	12708.9	13.6	55.0	9.8
2002/2003	20322	2.2	40.8	3.5	9.8	9.7	16.1	14318.3	11.0	52.4	12.8
2003/2004	20883	2.2	39.8	3.4	10.3	9.7	16.4	16197.3	13.9	50.4	12.8
2004/2005	22862	1.8	42.9	3.3	8.9	9.3	15.7	17956.6	18.0	48.3	11.6
2005/2006	23007	1.7	41.1	3.5	9.4	10.2	16.2	22266.6	17.6	49.6	13.5
2006/2007	24425	1.6	40.7	3.7	10.3	10.3	15.6	27397.7	24.1	47.9	11.2
Average	19512	2.3	40.4	3.74	9.68	10.04	15.48	15288.3	16.1	51.7	10.1

Source: Bank of Botswana (2008): Annual Report

The relationship between the main export products and GDP is presented in Table 1 and Table 2. Table 1 indicates that the main export products (meat, diamond, copper and nickel, textiles) accounted on average for 90 percent of the total export of Botswana during the period 1997 to 2007. Diamonds are the main components of exports, constituting on average 76 percent of total export during the period 1996 to 2007. The export led growth strategy is based on these commodities. It is important to note that mineral products (mainly diamonds, copper and nickel) are not only the main components of exports, but they also account for about 40 percent of Botswana's GDP as shown in Table 2. The agricultural sector accounts for less than 4 percent of the GDP. Manufacturing is also very small, accounting for less than 5 percent of the GDP. There is a general consensus that manufacturing is very important for economic growth and generation of the much-needed employment for any country. Table 2 indicates that the economy of Botswana is not diversified and depends mainly on the production and exports of mineral products, mainly diamonds. Mineral products (mainly diamonds) are also the main contributor to government revenue. As shown in Table 2, these mineral products accounted for more than 50 percent of total government revenue during the period 1997 to 2007. The economy of Botswana still depends mainly on diamonds for government revenue. Cowan and Petwe (1997) provided some explanations for the limited progress on economic diversification in Botswana. Among others, low levels of productivity, high utility costs, lack of long-term finance for industrial development and high costs of materials imported from outside the Southern African Customs Union (SACU).

The government of Botswana has noted the importance of diversification of the economy. According Cowan and Petwe (1997), economic and export diversification has been an important component of government economic policy since the fourth National Development Plan (NDP4). Although some progress has been made, the development of the non-mining sector remains very important for future economic growth and generation of the much-needed employment. As shown in Table 2, the economy is still dominated by traditional production and exports (mainly diamonds). The government of Botswana made some efforts to develop the manufacturing sector by boosting the textile sector and take advantage of access to the USA market under the African Growth and Opportunity Act (AGOA). Kim (2006) argued that this is not easy because of strong competition from other developing countries. The opening of the Hyundai Motor Company of Botswana was another notable effort by the government to develop the manufacturing sector, but was closed in 2002/2003. Kim (2006) stated that Botswana's proximity to South Africa may also be one of the reasons why there is little progress in developing the manufacturing sector. South Africa has a large domestic market and is considered to have strong competitive advantage over Botswana. According to Kim, it may be cheaper to import manufactured goods from South Africa than to produce them domestically. Reliance on the large diamond endowment might have diminished the need to coordinate labour demand and supply, and this can slow down the development of the manufacturing sector

and industrialisation. Kim argued that rich natural resources could lessen political incentives to pursue difficult policies that aim to build manufacturing export sector. It is important to note that explanation of the slow diversification of the economy of Botswana falls outside the scope of this paper.

Despite the low diversification of the economy, Botswana experienced rapid economic growth for more than 3 decades. This rapid growth is attributed to the abundance of mineral products (mainly diamonds). The rapid economic growth in Botswana is contrary to the view that rich resource-rich countries tend to grow less rapidly than scarce-resource countries. This is referred to as resources curse (Iimi, 2006). Botswana managed to transform diamond revenue into growth and development. Senthso (2003) stated that export revenue financed recurrent and development expenditure as well as the financial assistance program which was aimed at industrialisation. The country accumulated foreign exchange reserves of more than 30 months of import cover since 1993 (Senthso, 2003 and Bank of Botswana). According to Senthso, if exports from primary products are properly managed, they can lead to sustained economic growth. Contrary to many resource-rich countries, Botswana implemented good economic management and in years of economic boom when export revenue increased, surplus export revenues were converted into foreign exchange reserves. This prevented the economy from overheating. During the years of economic slowdown, when the export revenues are low, the government drew down on the foreign exchange reserves in order to finance expenditure for economic growth and development. Hence, the country experienced a high economic growth for decades.

The exchange rate policy of Botswana is also another factor that has enabled the country to experience high economic growth. At independence in 1966, Botswana did not even create a central bank to issue national currency. It used the South African rand before and after independence, as it was a member of the Rand Monetary Area (RMA). Membership of the RMA did not give Botswana monetary and exchange rate independence as these policies were conducted by the South African Reserve Bank. This resulted in Botswana's termination of its RMA membership in 1976 and established its own central bank and currency, the Pula (Harvey, 1996; Ahmed, 2006). This enabled Botswana to pursue independent monetary and exchange rate policies for promotion of exports, economic growth and development. A detailed discussion of the exchange rate policy falls outside the scope of this paper.

There is a wide range of empirical studies on the importance of exports in developing countries, however, studies on the causal relationship between exports and economic growth for Botswana is limited or scarce. Although it is generally believed that exports were key to Botswana's economic growth, it still to be established empirically whether exports leads economic growth or whether economic growth causes export. The purpose of this paper is to analyse the causality between exports and economic growth of Botswana and to evaluate the relationship of these variables for the period 1996 to 2007. Granger causality econometric techniques are applied to

test the hypothesis of an export-led growth strategy. It tests whether export Granger causes economic growth, or whether the causality runs from economic growth to exports, or if there is bi-directional causality between exports and economic growth. The results of this paper will help to evaluate the effectiveness of Botswana's strategy of growth led by exports. There are three main reasons for choosing Botswana as case study for the export-led growth hypothesis. First, Botswana experienced high economic growth rate for decades compared to other Sub-Saharan African countries. Second, exports are main components of GDP and there are limited studies on the causal relationship between export and economic growth. Third, export is universally accepted as a key for African countries to accelerate economic growth. The paper is organised as follows. Section 2 reviews the literature. Section 3 discusses the Granger causality analysis of export and economic growth, while Section 4 outlines the estimation technique and empirical methodology. The data and estimation results are presented in Section 5, while Section 6 concludes.

2. Literature Review

One of the fundamental economic questions is the issue of how a country can achieve economic growth. An export-led growth hypothesis which states that exports are a key to promoting economic growth provides one of the answers to this fundamental question. There is considerable literature that investigates the link and causation between exports and economic growth, but the conclusions still remain a subject of debate.

Exports are the most important source of foreign exchange, which can be used to ease pressure on the balance of payments and generate much-needed job opportunities. Abou-Stait (2005) states that an export-led growth strategy aims at providing producers with incentives to export their goods through various policies. The strategy also aims at increasing the capability of producing goods that can compete in the world market using advanced technology and make provision for foreign exchange needed to import capital goods. Exports can help the country to integrate into the world economy and help to reduce the impact of external shocks on the domestic economy. Exports allow domestic production to achieve a high level of economies of scale. Tsen (2006) stated that the experiences of East Asian economies provide good examples of the importance of the export sector to economic growth and development, and this stress the role of exports as an engine for economic growth.

The export-led growth hypothesis states that the growth of exports has an accelerating influence on the economy though the spillovers of technology and other externalities. According to Marin (1992), exports may have these stimulating influences because their industries (exports) are seen as key sectors to lead economic growth. Being exposed to international markets requires increased efficiency and encourages incentives for innovation of products. Exposure to international markets also implies increase in specialisation which allows economies of scale to be exploited. Marin (1992) argues that exports are regarded as economies of scale

which are external to the firms in the sectors that is not exporting, but internal to the entire economy. Increase in exports will add to human and physical capital stock in the country and this is beneficial to all firms in the economy. Hence, the export-led growth hypothesis postulates that an increase in exports will cause economy-wide gains in productivity and economic growth.

Although international trade theory did not say much on the relationship between trade and technical efficiency, the new trade theory regards the two variables as a central link (Helpman and Krugman, 1985). It must be noted that the effect of trade on technical efficiency is not without ambiguity in models of imperfect competition and increasing returns to scale. The effect of trade on technical efficiency depends on the type of competition on the domestic market. As Marin (1992) illustrated this point with the following example. Assume firms are producing with increasing returns to scale which emerges from the fact that there exist fixed costs for the development of products. Firms operate in monopolistic competition and produce goods that are differentiated where domestic price equals average costs. This means that firms are not making abnormal profits. If there is increasing returns to scale average costs decreases as firms increase output. In such a situation, increase in exports enables domestic firms to sell more goods at the original price. This in turn makes an increase in production and price profitable. Production activities which were small scale and not efficient will be increased and this will in turn increase productivity and economic growth. It is important to note that an increase in profitability increases the returns on the development of products and induces the entry of new firms in the market (see also Mankiw, 2007). When there is entry of new firms in the market producing a wide variety of products, the demand of the existing (incumbent) firms will be reduced. This forces them to reduce output. According to Marin (1992), the issue of whether output per firm and productivity increases or decreases depends on which of the forces dominates. A possible outcome is the existence of many firms producing many product varieties. In that case, increase in export can result in the entry of new firms producing at low levels of output. This may reverse the initial increase in productivity and economic growth caused by exports.

It is clear from this discussion that whether an increase in export will accelerate economic growth also depend on the market structure of the domestic market. If the domestic market is characterised by oligopolistic market structure, incumbent firms can lower sales and increase their profits because their profits are reduced when there is too much competition. They can also collude and maintain artificially high costs. The profits from the collusion could reverse the losses in productivity. Despite the fact that whether an increase in exports accelerates economic growth depends on the type of market structure in the domestic market, it is generally argued that export causes an increase in productivity and economic growth. However, the causal relationship between export and economic growth is ambiguous. The issue of whether exports accelerate economic growth can only be determined empirically.

Empirical research on the causal relationship between export and economic

growth is not conclusive. There are studies (Chow, 1987 for Argentina, Brazil, Hong Kong, Israel, Korea, Mexico, Singapore and Taiwan; Marin, 1992 for USA; Njikam, 2003 for Sudan, Cameroon, Ivory Coast, Ghana, Burkina Faso, Madagascar, Malawi, Zambia, Gabon and Democratic Republic of the Congo; Jordaan and Eita, 2007 for Namibia) which found that export drive economic growth. The studies suggest that policy makers need to promote export expansion policies with the aim of achieving high economic growth. Some studies provide evidence of causality running from economic growth to export. These studies are Oxley (1993) for Portugal; Ukpolo (1998) for South Africa. These studies indicate that export does not cause economic growth and suggest that policy makers do not need to promote export expansion policies with the aim of high economic growth. They should devote their resources on the production goods and services that are not for export and this will accelerate the growth of exports.

Other studies found a bi-directional causal relationship between export and economic growth. These are Shan and Sun (1999) for USA; Kwan and Cotsomitis (1991) for China. They indicate that export and economic growth complement each other. The causality runs from both directions. They suggest that policy makers should promote export expansion policies in order to achieve high economic growth. Similarly, they should also promote the production of non-export products in order to increase exports.

The last group of empirical studies found no evidence of causal relationship between export and economic growth. These are Ahmad and Kwan (1991) for 47 African countries; Hsiao (1987) for the then newly industrialised countries; Jin and Yu (1996) for USA. They suggest that export and economic growth are independent of each other.

3. Export and Economic growth: A granger causality Analysis

According to Granger (1969), a variable (in this case export) is said to Granger cause another variable (GDP) if past and present values of export help to predict GDP. A simple Granger causality test involving two variables, exports and GDP is written as:

$$X_t = \sum_{j=1}^{p} \alpha_j X_{t-j} + \sum_{j=1}^{p} \phi_j Y_{t-j} + u_t \tag{1}$$

$$Y_t = \sum_{j=1}^{p} \delta_j X_{t-j} + \sum_{j=1}^{p} \psi_j Y_{t-j} + v_t \tag{2}$$

where X and Y and p are export GDP and lag order. Two null hypotheses to be tested are:

$H_1 : \delta_j = 0, \; j = 1......p,$ export does not Granger cause GDP.

$H_2 : \phi_j = 0, \; j = 1......p,$ GDP does not Granger cause exports.

If the Wald F-statistic does not reject all the hypotheses, it means that export does not Granger cause GDP and GDP also does not Granger cause exports. It suggests that the two variables are independent of each other. If the first hypothesis is rejected, it indicates that exports Granger causes GDP. Rejection of the second hypothesis means that the causality runs from GDP to exports. If the Wald F statistics rejects all hypotheses, there is bi-directional causality between exports and GDP.

The traditional Granger causality test uses the simple F-test statistics to test for causal relationship between variables. However, the use of a simple traditional Granger causality has been identified by several studies (such as Engle and Granger, 1987; Toda and Yamamoto, 1995; Zapata and Rambaldi, 1997; Tsen, 2006; Ahmad and Harnhirun, 1996; Shan and Tian, 1998) as not sufficient if variables are I(1) and cointegrated. If time series included in the analysis are I(1) and cointegrated, the traditional Granger causality test should not be used, and proper statistical inference can be obtained by analysing the causality relationship on the basis of the error correction model (ECM). Many economic time-series are I(1), and when they are cointegrated, the simple F-test statistic does not have a standard distribution. If the variables are I(1) and cointegrated, the causal relationship between export and economic growth should be tested using the ECM as:

$$\Delta X_{t-1} = \sum_{j=1}^{p} \alpha_j \Delta X_{t-j} + \sum_{j=1}^{p} \phi_j \Delta Y_{t-j} + \gamma_1 \varepsilon_{1t-1} + u_t \tag{3}$$

$$\Delta Y_{t-1} = \sum_{j=1}^{p} \delta_j \Delta X_{t-j} + \sum_{j=1}^{p} \psi_j \Delta Y_{t-j} + \gamma_2 \varepsilon_{2t-1} + v_t \tag{4}$$

where ε_{1t-1} and ε_{2t-2} are the lagged values of the error term from the following cointegration equations.

4. Estimation Technique and Empirical Methodology

The first step in the empirical estimation is the univariate characteristics which show whether the variables are stationary or non-stationary. This paper uses the Augmented Dickey-Fuller (ADF) statistic to test the stationarity or non-stationarity of the variables and their order of integration. If the variables are I(1), the next step is to test whether they are cointegrated. This is done by using the Johansen (1988; 1995) full information maximum likelihood. If the variables are stationary, the system could be modelled using variables in levels and a simple F-statistic will be sufficient to test the causal relationship between export and economic growth.

5. Data and Estimation Results

5.1 Data
The study uses quarterly data and the estimation covers the period 1996.1 to 2007.4.

The data were sourced from various issues of the Annual Report of the Bank of Botswana. The variables used are GDP for economic growth, and export of goods and services. Informal investigation of GDP and exports in Figure 1 suggests that the variables are moving together and this may suggest that there is long term economic equilibrium relationship between the two variables.

Figure 1. GDP and Exports
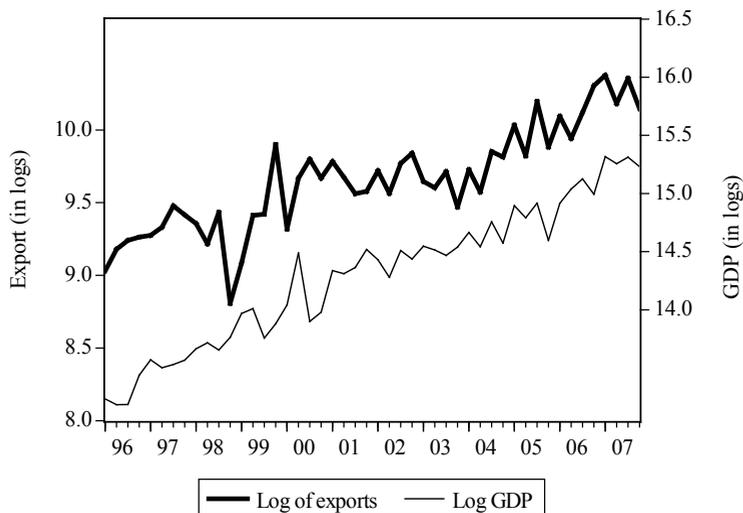
Source: Data for the graph obtained from Bank of Botswana's Annual Reports

The first step in estimation is the univariate characteristics of the data. The univariate characteristics of the data test for stationarity of the variables used in the estimation. The unit root test results are presented in Table 3.

Table 3. Unit root test

Variable	Model Specification	ADF statistic	Joint test (F-statistic)	Conclusion
LnGDP	Intercept and trend	-6.216***		I(0) no unit root
lnExport	Intercept and trend	-5.580***		I(0) no unit root

*/**/*** significant at 10%/5%/1% level

The results of Table 3 show that all variables are stationary in levels. Since all variables are stationary in levels, the estimation is done using variables in levels and there is no need for the error correction model. The causal relationship between export and economic growth is done using a simple F-statistic since all variables are I(0).

The long-run results for the two equations as specified in Equations (1) and (2) are:

$$\mathrm{h}\,Y = -7.255 \; + \; 1.107\,\mathrm{h}\,X$$
$$(-3.449) \quad (9.080)$$

$$(5)$$

$$\mathrm{h}\,X = 6.646 + 0.904\,\mathrm{h}\,Y$$
$$(2.763) \quad (7.042)$$

Equation (5) shows that export has a positive relationship with export, and GDP is also associated with an increase in export. The next step is to test for the direction of causality between export and economic growth. The results of Granger causality test using VAR in levels are presented in Table 4.

Table 4. Granger causality test results

H$_0$	Wald test/χ^2	Conclusion
Export does not Granger cause GDP	28.731 (0.000)	Reject the hypothesis. There is causality from export to GDP
GDP does not Granger cause export	8.859 (0.012)	Reject the null hypothesis. There is causality from GDP to export.

Note: Probabilities are in parentheses

Table 4 indicates that the hypothesis that export does not Granger causes GDP is rejected. The hypothesis that GDP does not Granger causes export is also rejected. These results provide evidence of bi-directional causality between export and GDP. Exports and GDP in Botswana complement each other. These results are consistent with other empirical studies. Bi-directional causality between export and economic growth in Botswana is not surprising because of the main export products are also the main contributor to GDP and government revenue. Hence, these results are not surprising. These results provide evidence in support of the export-led growth hypothesis and as well as the existence of reverse causality. The results suggest that there is a need to promote export expansion policies in order to achieve high economic growth. Similarly, there is also a need to devote resources on the production of non-export goods in order to increase exports.

5.2 Impulse Responses
Impulse responses were introduced by Sims (1980) and show the response of GDP to shocks in exports. It also shows the response of export to shocks in GDP. The impulse response in Figure 2. Figure 2 shows that GDP responds positively to shocks in export. Export also responds positively to shocks in GDP.

Figure 2. Impulse response of GDP and export
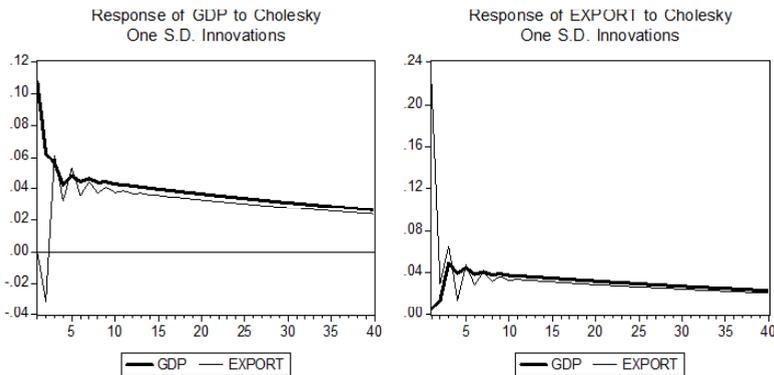
6. Conclusion

This paper examined the causal relationship between export and economic growth in Botswana using quarterly data for the period 1996 to 2007. Granger causality was applied to test the causal relationship between GDP and economic growth. Since the variables used in the estimation are I(0), a VAR in level is the appropriate modelling method.

The results show that there is evidence of bi-directional causality between export and economic growth in Botswana. Export causes economic growth and economic growth also causes exports. The results are favourably comparable to those obtained in the literature (such as Shan and Sun, 1999; Kwan and Kotomitis, 1990). Policy makers in Botswana should continue to promote and implement policies aimed at expanding export in order to accelerate economic growth and development. They should also devote resources to the production of goods and services that are not for export in order to increase exports. The results suggest further that Botswana can expand its limited domestic market by exporting more in order to increase economic growth, and export in Botswana can be promoted by increasing economic growth.

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