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Trade and Economic Growth: Theories and Evidence from the Southern African Development Community

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ABSTRACT

This paper empirically tests the hypothesis that trade can act as an engine of growth using panel data for the Southern African Development Community (SADC), a regional integration agreement (RIA) organization, the central objective of whose formation was the need to accelerate, foster, and encourage the region's growth. Our results indicate that during the period covered by this study (2005-2017), export expansion stimulated growth, more openness to trade reduced it, and that the formation of SADC had not yet brought about any effects on growth perhaps because of lack of full establishment of the primary instruments for achieving its central objective. These results lead to three conclusions. Firstly, trade through export expansion seems to be a better solution for SADC for achieving the central objective of its formation. Secondly, more openness to trade seems to jeopardize growth. Finally, the formation of SADC has not yet brought about the expected gains from a RIA. In this context, we recommend that policymakers should consider adopting measures aimed at supporting increased trade through promoting export expansion, achieving strong absorption of negative chocks that usually result from trade, and exploring the possibility of establishing all the planned primary instruments for achieving SADC's central objective.

Keywords: International trade; Regional integration agreements; Free trade area; Customs union; Prebish-Singer hypothesis;

JEL Classification Codes: F15; F36; F43; O43; O47.

1. INTRODUCTION

The main position that free traders take is that international trade can act as a stimulus for economic growth and development in less developed countries (LDCs). For example, Minford et al. (1995) maintain that in the 19th century, international trade strongly contributed to the transformation of Canada, Australia, New Zealand, Sweden, and Denmark from underdeveloped countries to developed countries, and in the second half of the 20th century it acted as an engine of growth and development for the so-called newly industrialized countries (South Korea, Taiwan, Hong Kong, and Singapore).

However, some economists point out that in practice the impact of trade on economic growth is indeterminate over a wide range of aspects. For instance, The United Nations Economic Commission for Latin America and the Caribbean (UNECLA, 1950) argues that in LDCs the foreign sector is doomed to lag behind domestic growth partly due to insufficient demand for their primary products from industrial countries, and partly because of the necessity of LDCs to buy capital goods from the industrialized countries. Our paper points out that external trade can stimulate growth when foreign demand is favorable, domestic supply is reliable, products are competitive, and outward-oriented trade policies are adopted. Conversely, trade can inhibit growth when foreign demand is erratic, domestic supply is unreliable, products are not competitive, and the trade policies are inappropriate.

The Southern African Development Community (SADC), currently has 16 member countries;[1] it was established by the Windhoek Treaty of 1992 as a successor to the Southern African Development Co-ordination Conference. SADC became operational as a regional integration agreement (RIA) organization with the ending of apartheid in the Republic of South Africa in 1993. Evans (1997) states that according to the Windhoek Treaty, a major reason for forming SADC was the overriding need to accelerate, foster, and encourage the economic and social development of its member countries to improve the standard of living of their people.

In the view of the founding countries of SADC,[2] the expansion of trade through the formation of a RIA was expected to bring about rapid economic development of its member countries. However, SADC existence and work has been hampered by a host of factors including political instability and lack of political will among the leaders of its member countries. Thus, most of the expected gains from the RIA in terms of rapid expansion of intra-union trade, growth of total trade, and accelerated economic development have not yet materialized.

In this context and given the existing economic situation in SADC countries there is a need to undertake additional research to answer some fundamental research questions: (i) has the expansion of trade through the formation of a RIA organization in Southern Africa been

[1] SADC countries include Angola, Botswana, Comoros Island, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Tanzania, Zambia, and Zimbabwe.

[2] The founding SADC countries are Angola, Botswana, Eswatini, Lesotho, Malawi, Mozambique, Tanzania, Zambia, and Zimbabwe.

acting as a stimulus for economic growth and development in SADC? and (ii) has the formation of SADC brought about improvements in the performance of member countries' economies?

To answer these research questions, we investigated how far trade has contributed to economic growth and also whether the creation of SADC has brought about the expected gains from the RIA (in terms of both rapid expansion of intra-union trade and growth of total trade) in SADC by empirically investigating the validity of the hypotheses of a positive relationship between economic growth and selected trade variables. We take SADC as a case study and uses data for this RIA organization for the period between 2005 and 2017. The choice of this period for study is determined by data availability.

Many empirical studies have been done on the trade variables' responses to economic growth and also on the effects of the formation of a RIA on intra-union trade and total trade in LDCs, but there are very few studies specifically on the SADC economy. To our knowledge, very few prominent economists have attempted to empirically test the hypotheses mentioned earlier using data from SADC. Hence, our study is one of the few works that empirically discusses the relations between economic growth and selected trade variables in SADC. Thus, this paper seeks to fill this gap in knowledge on the research topic in question.

However, the results of some studies on related subjects show that international trade has two conflicting effects: on the one hand, it generates an expansion in output, and on the other hand, it has a negative effect on growth. For instance, Dollar (1992) addressed the question of whether outward-oriented economies grow more rapidly. He examined sources of growth in 95 developing economies over the period 1976-1985, and estimated a simple model in which per capita GDP growth over that period was a function of the investment rate, real exchange rate variability, and the index of real exchange rate distortion.[3] His results showed that growth was positively associated with the investment rate and negatively associated with distortions and variability in the real exchange rate.

Given the indetermination of the impact of international trade on economic growth, there is a need to know the real effects of both international trade and the formation of a RIA on the SADC countries' economies. This will be new knowledge and an addition to literature on international trade; this study brings both these to the fore along with its use of an econometric method. The method allows us to test the validity not only of the model but also of the obtained results. Thus, our study is relevant because it provides policymakers with useful information for identifying the positive and negative aspects associated with their current policies; it also indicates which strategies are suitable for SADC countries. Moreover, it also serves as a benchmark for future related research.

In this context, the general objective of this study is investigating how far international trade has contributed to economic growth in SADC. Its specific objectives are: (i) to empirically measure the effects of selected international trade variables on SADC member countries' economic growth; and (ii) to empirically assess whether the formation of SADC has brought about improvements in the performance of the member countries' economies, especially

[3] According to this author, the investment rate affects the per capita availability of capital, whereas outward orientation accelerates technological development in the economy. Both should produce more rapid growth.

after the organization took a significant step towards the establishment of a SADC customs union and implementation of common external tariffs in 2015.

The validity of both the hypotheses of a positive relationship between economic growth and selected trade variables and whether the formation of SADC has brought about improvements in the performance of its member countries' economies are empirically tested using balanced panel data for SADC for the period 2005-2017. More specifically, the study uses appropriate econometric techniques to estimate a growth regression in capital, labor, energy, and technology inputs, as well as in trade-related control variables such as exports, foreign direct investments, total debt service, the real effective exchange rate, openness to international trade, terms of trade, intercept dummy variable for the regional integration agreement, and slope dummy variables as interactions between exports and RIA, and between FDI and RIA. The model's estimation uses data for SADC collected from the World Development Indicators' website.

We did an econometric study using balanced panel data and estimated both the fixed-effects and the random-effects models (Baltagi, 2009). The paper also uses the Hausman specification test to determine which of the two models to choose from. The results of this test show that the validity of the random-effects model is rejected so the focus of our analysis is based on the fixed-effects model. Our estimation results show that during the study period export expansion was associated with a higher level of the SADC countries' economic growth, more openness to international trade reduced the growth rate of output, and that the remaining trade-related variables (FDI, total debt service, the real effective exchange rate, terms of trade, and the three dummy variables) appeared to have no significant impact on SADC countries' economic growth.

The rest of the paper is organized as follows. The second section gives background information on SADC and its economy. Section 3 describes regional integration and SADC. Section 4 summarizes what economic theory says about the relationship between international trade and economic growth. Section 5 presents selected empirical studies on the relationship between trade variables and economic growth. Section 6 describes the methodology of analysis and specifies the log-linear growth model used in the study. In Section 7 we describe the panel data used in this paper to estimate the models. Section 8 introduces and analyzes the econometric results. The last section gives the conclusions and recommendations of the study.

2. SADC AND ITS ECONOMY

The Southern African Development Community (SADC), currently formed by 16 Southern African countries, was established by the Windhoek Treaty of 1992 as a successor to the Southern African Development Co-ordination Conference, which had a strong anti-apartheid political orientation driven by the posture of its member states. SADC's founder member countries are Angola, Botswana, Eswatini (former Swaziland), Lesotho, Malawi, Mozambique, Tanzania, Zambia, and Zimbabwe. Comoros Island, the Democratic Republic of Congo, Madagascar, Seychelles, Mauritius, and South Africa joined SADC in 2017, 2005, 1977, 1997, 1995, and 1994 respectively. With the signing of the protocols by member states,

SADC became operational as a regional integration agreement (RIA) organization with the ending of apartheid in the Republic of South Africa in 1993.

According to the Windhoek Treaty, a major reason for forming SADC was "the overriding need to accelerate, foster and encourage the economic and social development of their countries in order to improve the living standards of their peoples" (SADC Secretariat, 1992: p. 5). The primary instruments for achieving this objective are "the creation of a free trade area by 2008, establishment of a SADC customs union and implementation of a common external tariff by 2010, establishment of a SADC central bank and preparation for a single SADC currency by 2016, creation of a SADC regional development fund and self-financing mechanism by 2005, and a common market pact by 2012" (SADC Secretary, 2001: pp. 66-67). Most of these deadlines have been missed and the respective instruments have not been established so far. The missed deadlines include those for the establishment of a SADC central bank and preparations for a single SADC currency, creation of a SADC regional development fund and self-financing mechanism, and a common market.

Table 1 provides basic economic indicators of SADC countries in 2017. The table shows that in 2017, SADC's combined GDP was approximately US$747.7 billion. Notice that there are considerable economic disparities among the SADC countries. For instance, South Africa, the dominant economy in the region, had a GDP of US$426.8 billion in 2017, which is double the combined GDP of the other SADC countries. Another example of disparities is given by Shams (2003) according to whom, "alongside South Africa, Zambia, Mauritius and Zimbabwe have the largest manufacturing sectors, in Angola, Namibia, and Botswana mining accounts for a high proportion of the GDP, while Malawi, Mozambique, and Tanzania remain highly agricultural" (Shams, 2003: p. 27).

Table 1: SADC: Economic and demographic indicators, 2017

Country	Real GDP (millions US$)	Real GDP Growth (%)	*Per Capita* GDP (US$)	Population (millions)
Angola	101,673.0	-3.40	3,413.66	29.8
Botswana	17,240.8	0.51	7,523.28	2.3
Congo, D. R.	33,277.6	0.38	409.12	81.3
Eswatini	5,442.5	0.07	3,980.61	1.4
Lesotho	2,911.9	-3.58	1,303.82	2.2
Madagascar	10,788.1	1.41	421.89	25.6
Malawi	9,058.6	1.04	486.44	18.6
Mauritius	12,898.9	3.72	10,199.91	1.3
Mozambique	15,400.9	0.80	519.09	29.7
Namibia	14,797.0	-3.06	5,839.88	2.5
Seychelles	1,355.5	4.00	14,142.81	1.0
South Africa	426,813.0	0.06	7,525.29	56.7
Tanzânia	50,100.9	3.86	900.52	57.3

Zâmbia	27,957.3	0.36	1,635.49	17.1
Zimbabwe	17,985.6	2.30	1,088.06	16.5
Regional Total	747,702.0	0.56	2,183.56	342.4

Source: The World Bank (2019).
Notes: Congo, D. R. = Democratic Republic of Congo. Eswatini is former Swaziland. Comoros Island joined SADC in 2017, and is not included in the selected sample.

In the view of SADC founding countries, expansion of trade through the formation of a RIA organization was expected to bring about rapid economic development in member countries. However, the existence of SADC has been hampered by a host of factors including political instability and lack of political will among leaders of the member countries. Thus, most of the expected gains from the RIA in terms of rapid expansion of an intra-union trade, growth of total trade, and accelerated economic development have not yet materialized. For instance, the growth rate of per capita GDP in SADC during the study period was very disappointing. For example, "from an average per capita GDP level of $1,033.00 in 1995, the SADC average per capita income rose to $1,985.00 in 2004" (SADC Secretariat, 2005: p. 2). This gives an annual growth rate of per capita income of 4.5 percent, which compares quite unfavourably with the record of Asian countries (Hong Kong, Singapore, Thailand, South Korea, Taiwan, Indonesia, Malaysia, and China) "which as a group recorded an average annual growth rate of per capita income exceeding 5.5% between 1965 and 1988" (Singer, 1989: pp. 46-56).

Our understanding is that the dismal economic performance of SADC countries reflects the general poor overall economic performance of sub-Saharan Africa, especially during the 1980s "which has given that decade the sobriquet of the *lost decade* of development opportunities" (Singer, 1989: pp. 46-56). Besides, Table 1 also shows that per capita GDP levels in eight of the 15 SADC countries were far below the regional level average. Moreover, the expected gains from the RIA in terms of rapid expansion of intra-union trade have not materialized either. Table 2, which gives this situation, shows that intra-regional trade is heavily oriented towards South Africa and the smaller countries in the region trade comparatively very little with each other.

Table 2: Direction of trade: Exports (in million US$), 2016

Country	World Total	Advanced Economies	Emerging and Asiatic Developing Countries	sub-Saharan Africa	South Africa
Angola	11,400	6,100	22,309.6	1,123.9	567.2
Botswana	5,600	800	298.9	4,483.2	3,724.5
Congo, D. R.	4,500	1,200	1,284.8	2,131.0	795.1
Eswatini	1,500	100	90.1	1,219.6	1,164.5
Lesotho	1,400	100	97.6	1,160.3	1,148.8
Madagascar	3,200	800	1,304.2	327.4	156.6
Malawi	1,500	200	456.9	570.9	364.6

Mauritius	4,200	1,700	1,679.2	430.3	327.8
Mozambique	8,000	1,300	2,669.4	2,786.2	2,287.6
Namibia	6,400	800	375.1	4,699.0	3,556.5
Seychelles	1,000	400	150.3	104.8	67.0
South Africa	82,400	36,600	20,877.9	..	..
Tanzania	10,600	1,800	6,031.5	1,010.1	444.4
Zambia	5,900	600	755.2	3,601.5	2,091.4
Zimbabwe	3,700	300	546.7	2,558.3	2,013.5

Source: International Monetary Fund (2018).

However, the SADC leadership has made some attempts at improving intra-regional trade. For example, a SADC protocol on trade was signed in 1996 and launched in 2000. In addition, after missing the 2010 deadline, the SADC leadership took significant steps towards the establishment of a SADC customs union and implementation of common external tariff in 2015. SADC's transformation into a customs union has been viewed by the Southern African leadership as a key to deepening regional integration before the region moves towards a common market and a monetary union.

3. REGIONAL INTEGRATION AND SADC

As indicated in the previous section, SADC is a RIA organization formed in 1993 which currently has 16 Southern African countries as its members. In 1996, SADC took a significant step towards the establishment of a regional free trade area. These two events occurred in the context of an increase in regional trading blocs, often known as regional integration agreements (RIAs).

According to the World Bank (2000: p. 1), "the growth of such a type of blocs is one of the major developments of international relations of the recent years" and "the structure of regional agreements largely varies, but all of them have one thing in common – the objective of reducing trade barriers between the member countries." The World Bank further adds, "in their simplest way of acting, the member countries merely remove tariffs on trade of goods within the bloc, but many go beyond that to cover non-tariff barriers and to extend liberalization to trade and investment; in their deeper way of acting, they have the economic union objective and involve the creation of shared executive institutions, judicial and legislative." It is in this context that the primary instruments for achieving SADC's central objective were created.

The growth of RIAs can be explained by their possible economic effects, which are of two types: 1. "scale and competition" effects. Removing trade barriers is an enlargement of the market given that the separated markets move towards integration in a regional market. This allows firms to benefit from a greater scale and attract foreign direct investments for which the market size is important. Removing barriers also forces firms from different member countries to compete against each other more closely. The effects of "trade and location" are the second source of economic change. The preferential reduction of tariffs within a regional

agreement induces purchasers to move from demand to supply by the partner countries at the expense of both domestic production and imports from non-member countries, that is, trade creation and trade diversion (The World Bank, 2000: pp. 7-8).

Since the formation of SADC in 1992, many authors have written on this RIA organization. Among the existing studies are those by Holland (1995), Gibb (1998), Cleary (1999), Hess and Hess (2007), and Bronauer and Yoon (2018).

Holland (1995) presented a summary description of SADC, emphasizing both the incorporation of South Africa in SADC in 1994 and the economic differences that characterize the Southern African countries. Perhaps because South Africa is a major economy in the Southern African region, Holland points out that "it was argued by some that rather than SADC incorporating South Africa, the Republic would in effect annex the region economically, becoming the dominant core surrounded by dependent satellite states."[4] However, according to Holland, "the comparison with the economic integration of the nascent European Community of the I950s and I960s was used to support the argument that economic differences in themselves were not impediments to establishing regional integration" (1995: p. 269).

Like Holland (1995), Gibb (1998: p. 303) also presents a summary description of SADC's history, but emphasizes on what he calls "impressive record of protocols promotion." In many of these protocols, the member countries have the task of coordinating several sectors. However, according to Gibb despite this "many commentators and donor agencies are becoming more critical to the organization." An important critique by Gibb is that "the SADC system of giving to the countries the task of coordinating several sectors has resulted in minimal integration."

Cleary (1999: p. 1) examines "the viability of SADC - a relatively new organization that seeks to break the depressing pattern of previous regional organizations within Africa." He argues that "if it is to do so, it must moderate its objectives and not attempt the full scale economic integration to which it is currently committed" and that "rather it should focus on more immediate and pressing issues within the region, namely inadequate infrastructures and an absence of human resources." He further argues that "once those needs are met, the development and economic objectives of the region become more realistic goals."

Hess and Hess (2007) sketch out the main RIAs within Eastern and Southern Africa and highlight the potential problems of overlapping memberships, particularly those with commitments to forming a customs union with its associated common external tariffs and the negotiations of economic partnership agreements with the European Union. According to these authors, within Eastern and Southern Africa there are a number of RIAs and numerous bilateral agreements that include SADC. With regard to SADC, Hess and Hess point out that the group began focusing increasingly on trade issues with the SADC protocol on trade being signed in 1996 and launched in 2000.

[4] According to the same author, "within a SADC context, in 1988 South Africa represented 31.6% of the population and 74.5% of the GNP (the per capita equivalent of 235% for the region)."

Bronauer and Yoon (2018) examine the current and future SADC situation and point out that SADC's aim of deeper regional economic integration continues to depend on the effective implementation of its current initiatives. The authors maintain that there are barriers to trade and investments within SADC and that there are a host of different programs and institutions addressing them. They point out that member states' compliance will determine whether these measures are successful in their objective of industrializing and further integrating the region. Bronauer and Yoon underline that recent data shows the difficulty of achieving stable economic growth with many countries relying on primary commodities for a large share of their exports. However, they maintain that intra-regional trade and investments will continue to be influenced by global commodity prices in the foreseeable future. They recommend that it is essential for SADC member states to concentrate their efforts on developing viable domestic sectors.

4. TRADE AND GROWTH: A THEORETICAL PERSPECTIVE

As a background to the empirical investigation, this section presents a theoretical perspective on the relationship between international trade and economic growth. The question whether trade promotes growth is controversial. While the traditional view maintains that trade acts as an engine of growth, some in the 20th century claimed that trade can only perpetuate the underdevelopment of poor countries. According to Harbeler (1988), in the traditional view four vital points may be identified when examining the benefits of trade for participating LDCs. First, trade provides material means (capital goods, machinery, raw materials, and semi-finished materials) which are indispensable for economic development. Second, trade is the means and vehicle for the dissemination of technological knowledge, the transmission of ideas, the importation of know-how, skills, and managerial talent, and entrepreneurship. Third, trade is also a vehicle for the international movement of capital especially from the developed to the underdeveloped countries. Finally, free international trade is the best anti-monopoly policy and the best guarantee for maintaining free competition (Harbeler, 1988: p. 335).

On the traditional view, Grossman and Helpman (2015) state that theoretical literature identifies a number of potential linkages between globalization and growth which stand out. Firstly, the integration of peoples and cultures facilitates the flow of ideas between national borders. Foreign ideas can be useful for considering new products, improving existing products or for producing goods at a lower cost. Secondly, the integration of product markets through international trade allows those who invent or improve the products to move to a market with more potential where they can collect returns even if it subjects them to additional competition from foreigner rivals. Thirdly, the integration of the world markets has general equilibrium implications for input prices and products' relative prices. These price changes affect innovation costs and the attractiveness of different directions of industrial research. Finally, international interactions not only improve incentives for creating new knowledge, but also those of technological diffusion, with analogical implications for productivity growth (Grossman and Helpman, 2015: p. 103).

The beneficial effects of international trade on growth are supported by empirical evidence. According to Robertson (1938: p. 5) "since 19th century up to now, international trade has

been an engine of growth for the global economy." In addition, "international trade has also acted as an elixir of growth and economic development for particular national economies." For instance, "in the 19th century, international trade contributed powerfully to the transformation of Canada, Australia, New Zealand, Sweden, and Denmark from underdeveloped to developed countries, and in the second half of the 20th century, it acted as an engine of growth and development for the newly industrializing countries (NICs) of Southeast Asia" (Minford et al., 1995: p. 15).[5]

Grossman and Helpman (1990) conclude that "casual observations and more systematic empirical research suggest that countries that have adopted an outward-oriented development strategy have grown faster and achieved a higher level of economic well-being than those that have chosen a more protectionist trade stance." The authors also conclude that "the LDCs potentially stand the most to gain from their international relationships, since they can draw upon the large stock of knowledge capital already accumulated in the industrialized world."

However, contrary to what the free traders maintain, international trade does not necessarily lead to economic growth and development because it is possible to find cases where trade has inhibited economic growth and development, and cases where it has been neutral to both growth and development. In what follows, we briefly discuss only the former cases which are associated with what some have suggested for present-day LDCs that international trade tends to inhibit economic growth. This is also the Prebisch-Singer hypothesis, according to which "the foreign sector is doomed to lag behind domestic growth partly due to insufficient demand for the primary products of LDCs from industrial countries, and partly because of the necessity of LDCs to buy capital goods from the industrialized countries" (UNECLA, 1950). Although the Prebisch-Singer hypothesis is controversial, the fact remains that in the 20th century, international trade in primary products did not transmit growth from the developed countries to the LDCs the way it did in the 19th century. In particular, income per capita has been growing rapidly in the industrialized countries but it has apparently not led to a proportional increase in demand for primary products.

One major reason for international trade lagging in present-day LDCs is the existence of adverse demand conditions in the industrial countries. There are many explanations for this. According to Sodersten (1990), Nurkse (1962) advanced the following explanations. First, advanced economies' emphasis on industrial production is shifting away from light industries towards heavy industries (such as engineering and chemicals), that is, from industries where the raw material content of the finished output is high to those where it is low. Second, the share of services in the total output of advanced industrial countries is rising, which tends to lead to their raw material demand lagging behind the increase in their national product. Third, the income elasticity of demand for many agricultural commodities tends to be low. Fourth, agricultural protectionism in advanced countries has adversely affected imports of primary products. Fifth, substantial economies of scale have been achieved in industrial uses of natural materials. Finally, the leading industrial centers have

[5] South Korea, Taiwan, Hong Kong, and Singapore.

tended to displace natural raw materials by synthetic and other man-made substitutes (Sodersten 1980: p. 435).

In addition to these adverse demand conditions, the existence of adverse supply as a contributory factor for the ineffectual role of trade in present-day LDCs must also be considered. It seems clear that internal conditions (supply conditions, political and social-cultural conditions, and commercial policies) have been critical factors in explaining why primary export expansion has not led to sustained growth and development in LDCs in the 20^{th} century, as well as in the last few years of this century. Furthermore, insufficient linkages between the export sector and the rest of the economy have also tended to inhibit growth.

The role of appropriate trade regimes and trade policies also cannot be overemphasized. According to the World Bank (1994), while a good trade policy may not by itself lead to development, an ill-conceived trade policy can undo the effects of other factors. Overall, experience has shown that successful export performance requires a broadly supportive policy environment including macroeconomic stability, public investments in infrastructure and human capital, as well as policies that provide adequate incentives for investments in the export sector. Above all, these policies should be consistent, transparent, and steadily maintained over a long period of time.

5. EMPIRICAL STUDIES

Using sources of foreign exchange earnings as a proxy for trade and percentage changes in income per capita or in income as a measure of economic development or economic growth, many researchers have attempted to test the hypothesis of a significant positive relationship between trade and growth. If obtained, such a significant statistical relationship would suggest the validity of Robertson's (1938) description of trade as an engine of growth. Many of these studies are bivariate, comparing exports and growth but a few are also multivariate. Many of the studies have adopted a cross-country approach while some have used panel data as well as time series data to study this relationship. Most of the empirical results reported so far support the proposition that trade stimulates growth.

Hendrik and Lewer (2007) reviewed these studies and concluded: Over the last four decades, economists have produced a large quantity of statistical evidence on the relationship between international trade and economic growth. They have used datasets covering a large variety of countries, time periods, and economic variables. Their results largely support the hypothesis that keeping all other factors constant openness to international trade provides higher incomes and higher economic growth rates. The research is even more definitive in its rejection of the alternative hypothesis that trade reduces economic growth. There is no convincing statistical evidence suggesting that trade and economic growth are negatively correlated (Hendrik and Lewer, 2007: p. 1).

Among the important cross-country and panel studies are those by Massell et al. (1972), Voivodas (1973), Balassa (1978), Tyler (1981), Salvatore (1983), Ram (1985), Edwards (1998), and Frankel and Romer (1999). Massell et al. (1972) studied a sample of 11 Latin American countries and found that export earnings had a greater impact on output growth

than other sources of foreign exchange earnings such as FDI. Voivodas' (1973) study concentrated on 22 LDCs while Balassa (1978) used rank correlation and pooled data for 11 countries to study this relationship. Both these authors found a strong relationship between exports and economic growth. Using data for 55 countries, Tyler (1981) also found strong evidence in favor of the proposition that exports act as a stimulus for growth.

Since most of these studies used bivariate statistical and single equation regression techniques, they were naturally subject to the criticism of not allowing for feedback. Thus, Salvatore (1983), Ram (1985), Edwards (1998), and Frankel and Romer (1999) specified and estimated appropriate econometric models. Salvatore (1983) specified a simultaneous equations model of trade and growth. He estimated this using a sample of 52 countries and also undertook dynamic policy simulations. His simulations revealed that exports in fact stimulated growth, but they suggested that trade was a handmaiden rather than an engine of growth. Ram (1985) investigated the relationship between exports and growth using a sample of 73 LDCs. He found the coefficient of exports to be statistically significant, thus confirming the finding that trade stimulates economic growth. Edwards (1998) used comparative data for 93 countries to analyze the robustness of the relationship between openness and growth. His results suggest that more open countries have experienced faster productivity growth. Finally, using trade data that covered trade among 63 countries, Frankel and Romer (1999) examined the correlation between trade and income. Their results suggest that trade has a quantitatively large and robust positive effect on income.

Among the more important time series studies are those by Emery (1967), Krueger (1978), Ogbokor and Meyer (2017), and Malefane and Odhiambo (2018). Emery (1967) did a bivariate regression analysis to investigate the export-growth nexus and found evidence in favor of exports acting as a stimulus for economic growth. Krueger (1978) used a simple log-linear specification to analyze the impact of exports on growth in 10 countries using data for 1954-1971. She found that real gross national product depended more on export earnings than on total foreign exchange availability. Ogbokor and Meyer (2017) tested the long run relationship between external trade and economic performance in South Africa. Their results indicate cointegration relationships between the investigated variables and also show that exports contributed more to economic performance as compared to the openness of the economy and exchange rate. Based on these results, they concluded that external trade will remain one of the key propellers of economic growth in South Africa.

Malefane and Odhiambo (2018) investigated the dynamic impact of trade openness on economic growth in South Africa. Their long run empirical results show that trade openness had a positive and significant impact on economic growth when the ratio "total trade-*GDP"* was used as proxy of trade openness, but not when other proxies were used.[6] Their short run empirical results showed that when the first three proxies of openness were used, trade openness had a positive impact on economic growth, but not so when the trade openness

[6] The other proxies of trade openness are: ratio "exports-GDP", ratio "imports-GDP", and a trade openness index.

index was used. Based on these results, they concluded that promoting policies that support international trade was relevant for the South African economy.

Among additional panel data studies are those by Chang and Mendy (2012), Dava (2012), Zahonogo (2017), Tinta et al. (2018), and Moyo and Khobai (2018). Chang and Mendy (2012) investigated the empirical relationship between trade openness and economic growth in sub-Saharan Africa (SSA). Their results showed that there was a significant positive relationship between trade openness and economic growth. Based on these results, they concluded that openness to international trade had a significant positive impact on economic growth in SSA. Dava (2012) examined the effect of trade liberalization on real GDP growth in a sample of seven SADC countries (Botswana, Madagascar, Mauritius, Mozambique, South Africa, Tanzania, and Zambia). His fixed-effects' results showed that the annual average increase in real GDP growth rate from the previous period to the period after trade liberalization was 4.1 percentage points. Based on this result, he concluded that on average, trade liberalization seemed to have had a positive and significant impact on SADC countries' growth rates. Zahonogo (2017) empirically investigated the effects of trade openness on economic growth in SSA. He employed a dynamic growth model using data covering the period 1980 to 2012 in 42 SSA countries. His results showed the existence of a trade threshold below which an increase in trade openness had beneficial effects on economic growth while above this threshold the effects tended to decline.

Tinta et al. (2018) examined whether countries should develop strategies to increase international trade through an increase in the degree of openness or whether countries should develop policies to strength community or regional trade through potential value chains within regional integration. For this, they estimated two models with fixed-effects panels. The models' estimations used data from ECOWAS countries covering the period 1995 to 2012. Their results showed that regional integration needed to be strengthened and better promoted to stimulate the potential of each country to move from discontinuous growth to sustained growth. Based on these results, they concluded that international trade is not a better solution for ECOWAS countries for fostering economic growth but regional trade connected to the creation of value chains is.

Moyo and Khobai (2018) investigated whether trade openness had a positive effect on economic growth in SADC by doing a panel data analysis for 11 countries for the period 1990-2016. Their results showed that trade openness had a negative impact on economic growth in the long-run. Based on these results, the authors concluded that trade openness jeopardized growth in SADC countries in the long-run.

6. METHODOLOGY AND MODEL SPECIFICATIONs

In our study, we did a multivariate regression analysis for SADC countries. Drawing from previous work an empirical analysis of the relationship between international trade and economic growth requires estimating the following stochastic Cobb-Douglas production function:

(1) $Y = AK^{\alpha_i} L^{\alpha_2} E^{\alpha_3} T^{\alpha_4} Z^{\alpha_j} e^{u}$

where the dependent variable (*Y*) denotes the real gross domestic product (*GDP*), *K* is the capital input (*CAP*), *L* stands for labor input (*LAB*), *E* refers to energy use (*ENE*), *T* represents technology (*TECH*), *Z* is the vector of trade related variables, $A, \alpha_1, \alpha_2, \alpha_3, \alpha_4, \text{and} \, \alpha_j \; (j = 5,\ 6, ...,\ 10)$ are the unknown model parameters, and e^u is the multiplicative disturbance term. The *Z* vector includes the following elements: exports (*EXP*), foreign direct investments (*FDI*), the real effective exchange rate (*REER*), trade openness (*OPS*), total debt service (*TDS*), and terms of trade (*TOT*).

Equation (1) is a multiplicative exponential function. In logarithmic form, it is linear and estimable:

$$(2)\ \ln Y = \beta_0 + \beta_1 \ln K + \beta_2 \ln L + \beta_3 \ln E + \beta_4 T + \sum_{j=5}^{10} \beta_j \ln Z_j + u$$

where *log* denotes the natural logarithm, $\beta_0 = \ln A$ is the intercept, the subscript $j \; (=5,...,10)$ is the number of the mentioned above elements of the *Z* vector, and all the variables and unknown parameters are defined as previously. This *log-log* functional form makes the partial regression coefficients to be interpreted as elasticities. The dependent variable, *lnY*, stands for economic growth and it measures the percentage changes in SADC countries' real GDP.

We undertook a direct test of a relationship between economic growth and the selected trade variables by specifying a simple regression of percentage changes in real *GDP* (*lnY*) on logarithms of *K*, *L* and *E*, *T* and logarithms of *EXP*, *FDI*, *TDS*, *REER*, *OPS*, and *TOT* (labelled as Z_1, …, Z_6). These explanatory variables are included in the model as possible determinants of economic growth in SADC countries. The analysis was conducted using panel data covering the period 1990-2017. The following flexible form of the relationship in question was adopted:

$$(3)\ \ln Y_{it} = \beta_0 + \beta_1 \ln K_{it} + \beta_2 \ln L_{it} + \beta_3 \ln E_{it} + \beta_4 T_t + \sum_{j=5}^{10} \beta_j \ln Z_{jit} + u_{it}$$

where the subscript *i* (=1, 2, …, N) is the cross-section dimension that represents the SADC countries, and the subscript *t* (=1, 2, …, T) is the time-series dimension that represents years. The residuals follow a one-way error component consisting of time-invariant country effects and the random error term, $u_{it} = \mu_i + v_{it}$.

Our study did a panel data analysis covering a 13-year period, with an explicit distinction between the pre-2015 period (that is, before the establishment of a SADC customs union and implementation of common external tariffs) and the post-2015 period (that is, after SADC's transformation into a customs union). Such a distinction therefore accounted for the transition marked by the transformation of the organization into a customs union in 2015, the year in which that RIA organization became operational as a regional free trade area. Recall that the formation of SADC was supposed to bring about improvements in the performance of its member countries' economies. It is assumed that the launch of the SADC protocol on trade in 2000 by the SADC countries' leadership and consequent changes in intra-union trade and total trade improved the performance of SADC countries' economies. In addition, removing trade barriers is as an enlargement of the market that allows firms to

benefit from the greater scale and attract more *FDI* for which market size is important. Our analysis was conducted by introducing an intercept dummy variable labeled "D_{it}" and two interaction slope terms "$D_{it}\ln Z_{1it}$" and "$D_{it}\ln Z_{2it}$" corresponding to the 10 years before and three years after the event in question. Hence, the model given by equation (3) becomes:

$$\ln Y_{it} = \beta_0 + \beta_1 \ln K_{it} + \beta_2 \ln L_{it} + \beta_3 \ln E_{it} + \beta_4 T_t + \sum_{j=5}^{10} \beta_j \ln Z_{jit} + \delta D_{it} + \gamma D_{it} \ln Z_{1it} + \lambda D_{it} \ln Z_{2it} + u_{it} \quad (4)$$

where δ is the coefficient on the intercept dummy variable, γ is the coefficient on the first slope dummy variable $D_{it} \ln Z_{1it}$, and λ is the coefficient on the second slope dummy variable $D_{it} \ln Z_{2it}$.

The final regression model specified in equation (4) includes 14 variables. Table 3 describes these variables.

Table 3: Variables' descriptions

Variable	Description
1. Left-hand side variable	
ln*Y* = Economic growth	Percentage changes in real *GDP* (constant 2010 US$)
2. Right-hand side variables	
2.1 Factors of production:	
ln*K* = Logarithm of capital input	Gross fixed capital formation (constant 2010 US$)
lnL = Logarithm of labor input	Total labor force (units of people)
ln*E*= Logarithm of energy	Energy use (in kg of oil equivalent per capita)
T = Technology	Technology (represented by a time trend)
2.2 Trade related variables:	
lnZ_1 = Logarithm of exports	Exports of goods and services (constant 2010 US$)
lnZ_2 = FDI	Foreign direct investment inflows (constant 2010 US$)
lnZ_3 = Total debt service	% of exports of goods, services, and primary income
lnZ_4 = Logarithm of REER	Real effective exchange rate index (2010 = 100)
lnZ_5= Trade openness	Total trade/real GDP (Total trade = Exports + Imports)
lnZ_6 = Logarithm of terms of trade	Net barter terms of trade index (2000 = 100)
2.3 Dummy variables:	
D = Intercept dummy variable	= 1 in period after 2000, 0 otherwise
DZ_1 = Slope dummy variable	Interaction between *D* and exports
DZ_2 = Slope dummy variable	Interaction between *D* and *FDI*

Table 3 shows that there are 11 continuous variables and three binary variables included in the model. It also shows that all current values of the monetarily measured variables were deflated with the help of the *GDP* deflators (2010=100) by the source of the respective data.

Note that trade-related factors are variables of interest for our study, while the four factors of production (capital, labor, energy, and technology) are the control variables.

In equation (4), the variable "total debt service" ($\ln Z_3$) is included in the model as a measure of debt overhang, "*log* of real effective exchange rate index ($\ln Z_4$)" is included in the model as a measure of exchange rate distortions and variability, and "*log* of trade openness ($\ln Z_5$)" is used as a measure of outward orientation and insufficient demand for primary products. Deterioration in the terms of trade characterizes the LDCs' economies in general and the SADC countries' economies in particular, so the "*log* of terms of trade ($\ln Z_6$)" variable is included to capture the effect of adverse demand conditions on growth. The intercept dummy variable (D_{it}) is used for measuring the average impact of RIA on economic growth. Finally, the slope dummy variables ($D_{it}\ln Z_{1it}$)) and ($D_{it}\ln Z_{2it}$)) are used to measure the marginal impact of RIA on economic growth.

Also in equation (4), $u_{it} = \mu_i + v_{it}$ is a one-way error component, where following Baltagi (2009), μ_i is the unobservable time-invariant country-specific effect, and v_{it} denotes the remainder disturbance. The subscripts *i* and *t* denote SADC countries and time periods.

The producer theory predicts positive marginal products of factors of production. In line with this theory, we expected positive signs of the marginal products of inputs of capital, labor, energy, and technology. Based on the international trade literature reviewed, we conducted this study with the assumption that export expansion, high levels of *FDI*, and more openness or outward-orientation stimulates growth. On the other hand, and taking into account the economic realities of the SADC countries, we also assumed that real exchange rate variability, high levels of external debt-income ratio, and deterioration in the terms of trade inhibit growth. Given these assumptions, we expected positive estimates for the coefficients of exports, *FDI*, and trade openness. In addition, we also expected negatively signed estimates for the coefficients of the debt-income ratio,[7] the real effective exchange rate index, and terms of trade. Given the fact that the formation of SADC as a RIA organization was supposed to bring about improvements in the performance of the member countries' economies, we predicted that the coefficients on the intercept dummy variable (δ) and also on the two slope dummy variables $(\gamma \text{ and } \lambda)$ would have a positive sign.

The model was first estimated with the fixed-effects and the random-effects models[8] after which we performed the Hausman (1978) specification test to determine which of the respective estimators was valid. To do this we used the Stata standard package. The focus of our analysis is based on the accepted model.

[7] According to the debt overhang hypothesis, an excessive debt burden reduces investments and hence the growth rate of output (Borensztein, 1991).

[8] Following Baltagi (2009), the fixed-effects model is given by equation (4) by assuming that the unobservable country-specific effect μ_i can be correlated with each independent variable in all time periods. However, in the random-effects model one assumes that μ_i is not correlated with any independent variable. Consistency, unbiasedness, and efficiency properties of the parameters estimated determine the choice of the model.

Finally, since serial correlation and heteroscedasticity are common in panel data models we needed to test for the two econometric problems. Hence, we carried out the modified Bhargava et al. (1982) Durbin-Watson test statistic to test for autocorrelation and Bartlett's test to test for homogeneity of the variances.

7. DATA

To estimate the final model given by equation (4), cross-sectional time series data on each of its variables presented in Table 3 was collected annually between 2005 and 2017 (see Annex A).[9] Reliable data for the period was obtained for only 14 of the 16 SADC countries.[10] The choice of the study period is based on data availability. We used secondary data the main source for which is the World Bank (2019). Data on the two slope dummy variables was generated.

There were a few cases with missing data values for some of the model's variables. These cases were supplemented with the use of data imputation. One method for imputation of missing values is "the supplementation of missing values with values determined with the use of a certain algorithm" (Gąsior and Skowron, 2016: p. 62). For this we used one of the simplest approaches which includes the method of supplementation with an arithmetic average or median calculated or using forward and backward trends from the available values of the variable in question. Descriptive sample statistics for the variables included in the model are presented in Table 4.

Table 4: Summary statistics for the variables, NT=14x13=182 observations

Variable	Mean	Std. Dev.	Minimum	Maximum
Real GDP (billion US$)	45.40	97.10	1.87	427.00
Capital (US$ billion)	8.21	19.50	4.36	87.40
Labor (# of labor force members)	8,779,774	8,347,161	336,225	31,600,000
Energy (kg)	679.20	630.70	9.60	2,913.10
Technology (time trend)			1	13
Exports (US$ billion)	15.90	29.80	63.70	125.00
FDI inflows (US$ billion)	1.14	1.74	0.01	11.00
Total debt service (%)	7.05	7.83	0.67	43.11
Real effective exchange rate (index)	98.98	13.76	66.80	148.88
Trade openness (ratio)	0.92	0.35	0.36	2.43
Terms of trade (ratio)	119.63	38.15	69.27	250.99
$RIA=D_{it}$=Intercept dummy variable			0	1
Slope dummy variable "$D_{it}\ln Z_{1it}$"				

[9] The monetary data presented in Annex A, was deflated by the GDP deflators (2010 = 100) by their source.

[10] The two countries for which reliable data could not be obtained are Comoros Island that joined SADC in 2017 and Seychelles that lacked several key trade related variables.

Slope dummy variable "$D_{it}\ln Z_{2it}$"				

Source: Authors' calculations based on the data extracted from the World Bank (2019). Z_1 and Z_2 are exports and FDI inflows.

Table 4 gives the summary statistics for each of the 14 variables included in the model. It shows some interesting patterns in the data. For example, all the continuous variables appear to be somehow skewed to the right since their mean values are much closer to the minimum end of the range of values in the data.

8. ANALYSIS OF ECONOMETRIC RESULTS

Using the standard Stata econometric package (*xtreg* and *xtgls* commands), the estimation of the final model given by equation (4) produced fixed-effects and random-effects estimates which are given in Table 5.

Table 5: Fixed-effects and random-effects estimates, Dependent variable: *log(GDP)*

Independent variable	Fixed-effects	Random-effects
log(Capital)	0.078	0.072
	(0.000)	(0.000)
log(Labor)	0.182	0.094
	(0.172)	(0.000)
log(Energy)	-0.017	0.011
	(0.820)	(0.689)
Technology	0.028	0.010
	(0.000)	(0.001)
log(Exports)	0.255	0.737
	(0.000)	(0.000)
log (Foreign direct investment)	0.014	0.022
	(0.010)	(0.025)
Total debt service	0.001	0.003
	(0.315)	(0.064)
log (Real effective exchange rate)	0.029	-0.040
	(0.476)	(0.577)
Trade openness	-0.236	-0.748
	(0.000)	(0.000)
log (Terms of trade)	-0.067	0.038
	(0.081)	(0.549)
Regional integration agreement (D_{it})	0.042	-0.274
	(0.826)	(0.438)
Slope dummy variable "$D_{it}\ln Z_{1it}$"	-0.016	0.010
	(0.137)	(0.599)
Slope dummy variable "$D_{it}\ln Z_{2it}$"	0.020	0.002
	(0.021)	(0.895)

Intercept	13.414	4.153
	(0.000)	(0.000)
Number of observations	182	182
R-squared	0.832	0.843

Note: Numbers in brackets are p-values of *t*-statistics of the estimated parameters. Z_1 and Z_2 are exports and FDI inflows.

Table 5 gives the regression results obtained from the *xtreg* Stata command. When comparing the two estimates, it is clear that the effects of all independent variables differ widely in the two models, a fact that may be accounted for by the differences in the assumptions underlying them. Hence, we performed the Hausman's specification test based on the differences between the two models. This test was used to test the null hypothesis that the individual effects are not correlated with the regressors in the model, and the results were used to choose one of the two estimators. A rejection of this null hypothesis would mean the adoption of the fixed-effects model, and non-rejection of the random-effects model. The test's results imply that the null hypothesis is rejected. Thus, the focus of the analysis that follows is based on the fixed-effects estimators presented in the first column of Table 5.

However, before using the parameters estimated from the chosen model and since heteroscedasticity is a common problem in panel data regression models, we did the Bartlett's test for homogeneity of variances. In this context, we examined the null hypothesis of constant variances of the error term against the alternative hypothesis that the variances in question are not equal. This test statistic signifies that the null hypothesis of homogeneity of variances is rejected. These results imply that the heteroscedasticity problem is present in the model.

Since serial correlation is also a common problem in panel data regression models, we examined the null hypothesis of no autocorrelation against the alternative hypothesis of autocorrelation. The second column of Table 6 presents the regression results obtained from the *xtregar* Stata command for the growth model given by equation (4), with fixed-effects and a first-order autoregressive *AR(1)* remainder disturbance term.

Table 6: Fixed-effects estimates AR(1), Dependent variable: *log(GDP)*

Independent variable	(1)	(2)
log(Capital)	0.058	0.058
	(0.000)	(0.000)
log(Labor)	0.161	0.161
	(0.489)	(0.489)
log(Energy)	0.105	0.105
	(0.015)	(0.015)
Technology	0.025	0.025
	(0.003)	(0.003)
log(Exports)	0.172	0.172
	(0.000)	(0.000)
log (Foreign direct investment)	0.003	0.003

	(0.243)	(0.243)
Total debt service	-0.0003	-0.0003
	(0.499)	(0.499)
log (Real effective exchange rate)	0.047	0.047
	(0.185)	(0.185)
Trade openness	-0.132	-0.132
	(0.000)	(0.000)
log (Terms of trade)	0.009	0.009
	(0.746)	(0.746)
Regional integration agreement (D_{it})	-0.003	-0.003
	(0.988)	(0.988)
Slope dummy variable "$D_{it}\ln Z_{1it}$"	-0.0002	-0.0002
	(0.979)	(0.979)
Slope dummy variable "$D_{it}\ln Z_{2it}$"	0.0004	0.0004
	(0.939)	(0.939)
Intercept	14.961	14.961
	(0.000)	(0.000)
Number of observations	168	168
R-squared	0.850	0.850
rho-ar (ρ)	0.839	0.839
$F_{(13,\ 141)}$ statistic	12.19	12.19
Modified Bhargava et al. DW statistic (d_P)		0.649
Baltagi-Wu (LBI) statistic		0.923

Notes: Numbers in brackets are p-values of *t*-statistics of the estimated parameters. Column (1) gives the regression results obtained from *xtregar* Stata command for the chosen fixed-effects model. Column (2) gives the regression results obtained by specifying the locally best invariant (*lbi)* option to the *xtregar* Stata command for the same growth model.

Figures in the second column of Table 6 show that there is a possibility of positive serial correlation between the within residuals (the remainder disturbance v_{it}). Notice that the first-differentiating reduced the number of time-series observations by one per cross-sectional unit from 182 to 168.

Since 0.839 is the default of the Durbin-Watson (DW) estimator of ρ, the fact that this study uses a balanced equally spaced panel dataset led us to perform the modified Bhargava et al. (1982) DW test statistic by specifying the locally best invariant (*lbi)* option to the *xtregar* Stata command.[11] The last column of Table 6 gives the regression results obtained which shows that the modified Bhargava et al. DW statistic (d_P) is 0.649. Thus, the null hypothesis of no first-order serial correlation cannot be rejected at the 5 percent significance level since

[11] According to Baltagi (2009), for a fixed-effects model with $v_{it} = \rho v_{it-1} + \varepsilon_{it}$, i.e., v_{it} following an *AR(1)* process, Bhargava et al. (1982) suggest testing the above null hypothesis against the alternative hypothesis using the Durbin-Watson statistic only based on within residuals (the v_{it}).

$d_P < 2$.[12] This test result tells us that the model is free of both autocorrelation and heteroscedasticity problems and implies that the estimates of the regression coefficients in question are consistent and efficient and the standard errors are unbiased. The last column of Table 6 also shows that the Baltagi-Wu (*LBI)* statistic is 0.923, but no firm conclusion can be based on it since no critical values' tables are currently available for the Baltagi-Wu (*LBI*) statistic (Stata Press, 2003).[13]

In what follows, the focus of our analysis is based on the results presented in the last column of Table 6. These results show that the value of the overall coefficient of determination (0.8496) is high enough, meaning that the regressors explained about 85 percent of the variations in the SADC countries' economic growth during the study period and the remaining percentage (about 15 percent) is explained by other unobservable random factors captured by the error term that also affect economic growth.

The last column of Table 6 shows that the F-value (12.19) is also high and passes the overall significance test at the 5 percent significance level. This result tells us that the null hypothesis of no systematic linear relationship between the dependent and the vector of the right-hand-side variables of equation (4) is rejected.

On the basis of the p-values, the last column of Table 6 shows that the estimated equation produced five significant explanatory variables at the 5 percent significance level: capital, energy, technology, exports, and trade openness. In addition, it also shows that we failed to reject the null hypothesis that the coefficients of the remaining explanatory variables (labor, foreign direct investments, total debt service, the real effective exchange rate, terms of trade, the intercept dummy variable, and the two slope dummy variables) are different from zero. As a result, these variables are not significant determinants of the level of SADC countries' economic growth. A detailed analysis of the estimates shows:

a) The positive signs of the estimates for the logarithm of capital, logarithm of labor, logarithm of energy, and technology are consistent with economic theory that predicts positive marginal products of input factors of production. All these four estimates are statistically significant at the 5 percent significance level, with the exception of the logarithm of labor. The magnitudes of the three significant estimates signify that during the study period, a 1 percent increase in capital inputs, energy use, and technology brought about an increase in SADC countries' economic growth of about 0.06 percent, 0.11 percent, and 0.03 percent respectively *ceteris paribus*.

b) The estimate for the coefficient of the logarithm of exports has the correct sign and is statistically significant, meaning that during the study period, export expansion by 1 percent led to an increase in SADC countries' real *GDP* of about 0.17 percent

[12] According to Bhargava et al. (1982), when $T = 6$ or 10 with 5 percent significance points, the null hypothesis of serial independency is rejected if $d_P < d_{PL}$, the null is accepted if $d_P > d_{PU}$, and for $d_{PL} < d_P < d_{PU}$, the test is inconclusive.

[13] In 1999, Baltagi and Wu published a critical values table only for testing for zero serial correlation in unequally spaced panels.

ceteris paribus. This result, which is consistent with those obtained by Emery (1967), Voivodas (1973), Ballassa (1978), Krueger (1978), Tyler (1981), Salvatore (1983), Ram (1985), and Ogbokor and Meyer (2017) confirms the hypothesis that export expansion stimulates growth.

c) Likewise, the estimate for the coefficient of foreign direct investments (*FDI*) is positive, as expected, but it is statistically insignificant meaning that during the study period, an increase in *FDI* did not lead to a rise in SADC countries' real *GDP*. This finding, which is different from those obtained by Massell et al. (1979), does not confirm the proposition that sources of foreign exchange earnings such as *FDI* stimulate investments and are growth enhancing.

d) Conversely, the sign of the estimate for the coefficient of the total debt service is negative, as expected, but statistically insignificant signifying that during the study period a rising debt burden did not reduce economic growth. This result is not consistent with the debt overhang hypothesis according to which an excessive debt burden reduces investments and hence the growth rate of output.

e) Contrary to expectations, the estimate for the coefficient of the logarithm of the real effective exchange rate index is positive and statistically insignificant. This result is not similar to that obtained by Dollar (1992), and does not confirm the validity of the proposition that growth is negatively associated with distortion and variability in the real exchange rate.

f) The estimate for the coefficient of trade openness is negative, which is also contrary to what was expected, and statistically significant. This result, which is different from those reported by Edwards (1998), Chang and Mendy (2012), and Malefane and Odhiambo (2018) does not confirm Grossman and Helpman's (1990) conclusion that more openness or outward orientation accelerates growth. However, this result is similar to that of Moyo and Khobai (2018) who concluded that trade openness jeopardized growth in SADC countries.

g) The estimate for the coefficient of the logarithm of the terms of trade does not have the expected negative sign, and is statistically insignificant. This result is not consistent with the proposition according to which a deterioration in the terms of trade reduces economic growth.

h) Finally, the estimates for the coefficients of both the intercept dummy variable and the first of the two slope dummy variables have unexpected negative signs, while the estimate for the coefficient of the second slope dummy variable (FDI inflows) is positive, as expected. However, all of them do not pass the individual significance test at the 5 percent level. These results are not consistent with the Southern African leadership's view that expansion of trade through the formation of SADC was expected to bring about rapid economic development in its member countries.

i) The time trend effect is positive and statistically significant. This suggests an output growth of 2.5 percent per year for given inputs which is attributed to technological changes.

j) Returns to scale measured as the sum of the input coefficients is less than one suggesting decreasing returns to scale in SADC countries.

9. CONCLUSIONS

This paper analyzed the impact of trade on economic growth in SADC from a theoretical perspective. A review of related literature showed that international trade can either stimulate growth or inhibit it. On the one hand, trade through exports can provide a stimulus for a greater utilization of idle human and capital resources, foreign exchange for financing imports of raw materials, and the capital goods needed in the industrial sector. In addition, trade through foreign direct investments (*FDI)* can stimulate investments, especially in LDCs' export sectors. On the other hand, the effect of trade on economic growth may depend on many factors such as the nature of foreign demand, domestic supply conditions, the nature and characteristics of the primary products, debt burden, the stability of the macroeconomic environment, and the existence of appropriate domestic trade policies. Thus, trade can inhibit growth when foreign demand is not favorable and the trade policies are not appropriate.

This study empirically tested the hypothesis of a positive relationship between economic growth (measured as percentage changes in real *GDP*) and six trade-related variables - exports, *FDI*, trade openness, the regional integration agreement (*RIA*), interaction between exports and *RIA*, and interaction between *FDI* and *RIA* - using econometric evidence from SADC countries. At the same time, the study also tested the hypothesis of a negative relationship between economic growth and three other trade-related variables (the real effective exchange rate, total debt service, and terms of trade).

Using 2005-2017 balanced panel data for 14 of the 16 SADC countries, a log-linear regression equation of real *GDP* on four control variables (capital input, labor input, energy use, and technology), as well as on six trade-related variables (exports, *FDI*, the real effective exchange rate, openness, total debt service, terms of trade, an intercept dummy variable for *RIA*, a slope dummy variable as interaction between exports and *RIA*, and another slope dummy variable as interaction between *FDI* and *RIA*) was fitted. The 14 explanatory variables explained about 85 percent of the variations in economic growth.

As expected, the four factors of production (capital, labor, energy and technology) and exports, *FDI*, and the interaction between FDI and RIA had positive signs, while total debt service and terms of trade had negative signs. Contrary to expectations, the real effective exchange rate, trade openness, the regional integration dummy variable, and the interaction between exports and the RIA dummy variable had negative signs. Exports and trade openness were the only trade-related variables that were found to be statistically significant. Results related to the first variable suggest that during the study period export expansion was associated with a higher level of the SADC countries' economic growth. This confirms the traditional view and Robertson's (1938) conclusion that trade can and does act as an engine of growth. This finding leads to the tentative fundamental conclusion of our study that international trade through export expansion is a better solution for SADC countries to accelerate, foster, and encourage economic growth. In this context, we recommend that policymakers in the Southern Africa region should consider the adoption of economic

policies aimed at supporting increased international trade through promotion of export expansion.

In contrast, the results for trade openness, which suggest that more openness to international trade reduces the growth rate of output, seem to be consistent with the content of the Prebisch-Singer hypothesis that trade is a lagging sector (that is, it tends to inhibit economic growth in LDCs). Following Moyo and Khobai's (2018) reasoning, this finding leads to another tentative fundamental conclusion of this study that more openness to international trade jeopardizes economic growth in SADC countries. In this context and also following Moyo and Khobai, we recommend that policymakers should consider the adoption of trade policies aimed at achieving strong absorption of negative chocks that usually result from external trade.

Finally, although the remaining explanatory trade-related variables (*FDI*, total debt service, terms of trade, and the last of the three dummy variables) have the expected signs, they appear to have no significant impact on SADC countries' economic growth. Hence, no firm inferences can be based on these. However, the results related to the three dummy variables suggest that the formation of SADC has not yet brought about any average and marginal effects on SADC countries' economic growth perhaps because the primary instruments for achieving the central objective of the formation of the RIA organization have not been fully achieved. Hence, we recommend that the SADC countries' leadership should consider the possibility of implementing the remaining primary instruments (namely the establishment of a SADC central bank and preparing for a single SADC currency, creation of a SADC regional development fund and self-financing mechanism, and a common market).

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