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INTRA-INDUSTRY TRADE BETWEEN BOTSWANA AND THE SOUTHERN AFRICAN DEVELOPMENT COMMUNITY (SADC): A CASE OF THE TEXTILE INDUSTRY

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ABSTRACT

This paper used the Grubel-Lloyd index to measure the extent of textile intra-industry trade (IIT) in Botswana's foreign trade, and tested empirically various country-specific hypotheses concerning the determinants of bilateral textile intra-industry trade between Botswana and its SADC trading partners for the period 2003-2012 using the acclaimed gravity model. The results of the econometric analysis corroborate the predictions of the theoretical models. The results indicate that the extent of Botswana's textile intra-industry trade is positively correlated with the country size for other SADC member states, the level of economic development, the existence of a common border and the participation in a regional integration scheme. On the other hand, it is negatively correlated with distance, exchange rate as well as differences in consumer tastes as well as differences in factor endowments of producers.

1. INTRODUCTION

International trade can be decomposed into inter-industry and intra-industry trade. Inter-industry trade occurs when a country imports and exports different products, while intra-industry trade is whereby a country imports and exports items that are in the same product category, for example exporting raw diamonds and importing polished ones or jewelry. The latter form of trade can further be divided into two sub categories: vertical industry trade characterized by an overlap in trade and difference in the quality of products exchanged, and horizontal intra industry trade which is characterized by trade overlap and no difference in the quality of products

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exchanged (Mogotsi I.B. *et al.*, 2014). In examining either form of international trade the main focus is in what determines the basis of trade. In an effort to address this, many theories have been developed over the years.

Intra industry-trade (IIT) has been identified as an engine that can lead to improved economic growth and development. Through IIT, economies increase their levels of output and employment and are guaranteed present and future access to a dynamic market. They achieve economies of scale through increased market access and producing at lower costs. Economies also attain efficiency in resource allocation through increased competition. This efficiency is further improved by exposure to international competition which forces firms to adopt modern technology and produce quality products that meet the demands of sophisticated consumers in international markets. Furthermore, efforts to advance economic diversification and sustainable growth and development can be realized through IIT. Hence, increased participation in world IIT has been a vital and beneficial strategy for developed countries. The degrees of benefits however vary from country to country depending on different factors that drive IIT that are either country or region specific (Sichei *et al.*, 2007).

Since IIT is most often the result of gains through economies of scale from product differentiation, this allows countries to specialize in the production of a version of some general product. This specialization often stimulates innovation and thus economic growth (Belicka, 2005). IIT may avoid the negative impacts of inter-industry trade, such as the redistribution of income from scarce resources to abundant resources and the resulting dislocation of workers and resource owners from contracting (importing) industries to expanding (exporting) industries, as described by the Heckscher-Ohlin (1950) model and the Stolper-Samuelson Theorem (1941). With IIT, the impact on income redistribution is minimized since workers and resource owners are more likely to remain within the same industry (Balassa, 1966). This in turn reduces the demands for government protection of domestic industries since with such trade there are both exports and imports within an industry (Marvel and Ray, 1987). Huffbauer and Chilas (1974) stated "The General Agreement on Tariffs and Trade (GATT) negotiations very much favor intra-industry trade over inter-industry specialization because it is easier to secure one industry's consent for lower trade barriers if that same industry stands to gain from reciprocal concessions."

Factors that have been put forward as drivers of IIT include among others: factor endowments, and relative productivity of factors, exchange rates, incomes of trading partners and levels of development. For the latter, some theorists argue that countries with the same level of development

tend to trade more with one another, where this is usually among the high income countries. This, amongst others is due to a desire for variety (for example, the UK producing Land Rovers and importing the German Mercedes Benz). Other factors such as: distance from trading partners, market size, cultural similarities and population have been highlighted by a diversely used model, the gravity model, may also determine IIT. The gravity model is a key econometric technique widely used to examine IIT determinants. It is based on the premise that IIT between two countries is positively related to the size of the partner countries and inversely related to the distance between them, distance being used as a proxy for transport cost. Given these diverse factors that influence IIT, it is important for different countries especially developing countries to be aware of the country specific factors (Badinger and Breuss, 2004). Understanding these factors, especially for developing countries, can help them in coming up with effective trade enhancing strategies; hence the motivation of the present study.

International trade has been a main contributor to Botswana's economic growth since independence. At independence, Botswana was a net exporter of agricultural products, mainly beef and beef products which accounted for 39 percent of the GDP. With the discovery of diamonds in 1967, mining became the main backbone of Botswana's economy. This saw the country gaining ground to be a middle income country over the years due to the boom in the diamond mining sector. Given that the mainstay of Botswana's economy has been trade, it has implemented a number of agreements with various trade blocs to attain its mandate of economic growth and development through improved trade (Chauvin and Gaulier, 2002).

The apparel industry in particular is an ideal formal employment entry point for the poor: it can absorb relatively large numbers of employees; does not require too much skilled employees, and therefore it can make an economic contribution to cashwage earnings even if the workers are not particularly well educated or literate. In 2004, out of the total employment in the manufacturing sector, 35.4% were attributed to the textile and apparel sector (Salm *et al.,* 2004).The textile and apparel sub sector in Botswana has over the years seen periods of impressive growth followed by periods of decline. The cyclical nature of the industry's development can be directly linked to periodic changes in Botswana's competitiveness both regionally and globally.

From literature, it is observed that there is a positive relationship between regional trading arrangements and intra industry trade. This association is not decisive,however, it is rather that preferential trading arrangements create the environment within which IIT can increase to a greater extent than otherwise (Sarmila and Ranajoy, 2011). Because of this relationship it is important to study IIT between Botswana and the Southern

African Development Community (SADC) members. Very few studies of this kind have been carried out possibly because of lack of understanding that such trade could exist in this region. It is always argued that the bulk of exports from many of the developing countries in general, and Africa in particular, is of primary commodities and that they compete for developed countries' markets. Indeed, a large portion of these countries' exports are primary commodities while imports are manufactured goods from developed countries. Nevertheless, a number of the countries do trade in manufactured products within the region, in the form of both inter-and intra industry trade.

The textile industry is one of the industries that developing countries can try to look into and try to develop because it is labour intensive and uses less sophisticated technology, therefore the costs of production would be less since it would not require expensive capital intensive equipment. And given that it is relatively labour intensive, it can be a source of employment generation. Also, provided there is a high level of IIT, the sector can also be considered as a potential engine of economic diversification away from primary products, which in the case of Botswana would befrom the mining sector. The first order of this paper, then, is to establish that IIT in the textile sector does exist in the SADC region. The study then identifies determinants of IIT and assesses the impact of these determinants.

In identifying the determinants of IIT some studies have focused on country-specific determinants while others have focused on industry-specific determinants, with a few studies focusing on both types of determinants. Some recent studies (example: Kang, 2010) have also attempted to estimate the extent of horizontal and vertical intra-industry trade and identify their determinants.

Given the tendency for IIT to be concentrated amongst developed countries where a love for variety is more prominent, the questions that arise are: to what extent do developing countries in general and the SADC region in particular create a conducive environment for IIT? Are the SADC countries ready, from the supply as well as demand side, to embark on IIT? In other words, would the SADC countries be ready in terms of technology and skills to produce varieties in qualities and styles of garments, such that there would be intra-SADC demand for such? What are the factors that determine it? Would the SADC Free Trade Area (FTA) be the catalyst that the SADC countries, in particular Botswana need, to have IIT; that is, does the FTA create conducive environment for IIT?

A recent Botswana Institute for Development Policy Analysis (BIDPA) study by Motswapong and Grynberg (2013) found that the textile sector in Botswana has failed to grow and take advantage of existing trade preferences because it is faced with many challenges, which include the following: low

production capacity; little working knowledge of investors in the export business about the complexity of international marketing, poor infrastructure and high transaction costs; non availability of training facilities locally for providing skills for the sector; influx of cheap imports that undermine the sector; limited research and unavailability of accurate data; limited labour and managerial skills; high interest rates and lack of sustainable financing; and high costs of sourcing raw materials.

This study therefore seeks to address issues of the determinants of IIT in the textile sector between Botswana and the rest of the SADC countries. The study however makes no attempts to distinguish the two IIT types (vertical and horizontal) as information on unit values of both exports and imports is lacking.

The general objective of this study is to analyze textile IIT for Botswana's trade with the SADC members.

The specific objectives are:

- To determine the existence of IIT in the textile sector;
- To determine whether membership in the SADC-FTA enhances IIT;
- To determine whether the size of the economy together with levels of economic development (as proxied by GDP and GDP per capita respectively) enhance IIT;
- To determine whether differences in factor endowments and consumer tastes (as proxied by *differences* in per capita income) enhance IIT for Botswana with SADC countries;
- To explain the relevance of the obtained results for policy making.

1. Preview of Botswana Economy and Trade Protocols

Some of the agreements that Botswana has entered into include multilateral trade agreements like being a member of the World Trade Organization (WTO) which it joined in 1995; it was also signatory to an agreement with the European Union (EU) under the Lome IV Convention until 2007. Under this arrangement, goods originating from Botswana were exported to European countries without payment of customs duties at the country of destination. This is conditional on the fact that the goods satisfy the rules of origin status. Consequently, this has seen Botswana export most of its beef and beef products to the EU region. Subsequent to the Lome IV agreement, in its place, Botswana signed an Economic Partnership Agreement (EPA) that also sees Botswana continue to export duty free to the EU. Botswana, together with other Sub-Saharan African countries, has also been given special treatment under the African Growth and Opportunity Act (AGOA) of the United States of America (USA), under which they have

duty-free access to the USA market for their export commodities. Under AGOA, Botswana's exports grew substantially with the total cumulative value of exports from 2003 to 2008 approximating US $ 364.8 million. To enhance AGOA and to promote trade for Africa's development, the Southern African Global Competitiveness Hub was established. It provides technical assistance to Southern African governments, private sectors and regional organizations on trade issues (Mogotsi *et al.*, 2014).At the regional level, Botswana has been a member of the oldest customs union; the Southern African Customs Union (SACU). Botswana is also a member of SADC. Under SADC, Botswana signed a protocol on free trade that was launched in 2000. The free trade agreement has enhanced trade liberalization as Botswana now has access to about 80% of the SADC market (because not all members have signed the SADC-FTA) with an estimated 277 million consumers (Mogotsi *et al.*, 2014).

The Textile Industry

According to Allen *et al.,* (2007), the most significant period of growth and diversification of the industry in Botswana took place in the late 1970s and early 1980s. This was principally driven by Zimbabwean businesses which relocated from Zimbabwe to the Francistown area in Botswana. Allen et al. (2007) argue that, during the late 1990s the textile and apparel sub sector in Botswana again began to grow significantly. The principal reason behind this growth was perceived competitiveness of the country brought about by the Financial Assistance Policy (FAP). Under the FAP, manufacturing companies were given mostly grants or other incentives to set up or expand businesses; and this assistance was to last for five years. In 2001, the government of Botswana decided to phase out the FAP because when the incentives worked their way out of the system many companies closed or relocated. The biggest decline in manufacturing entities, employment and exports took place in early 2001 following the phase out of the FAP.

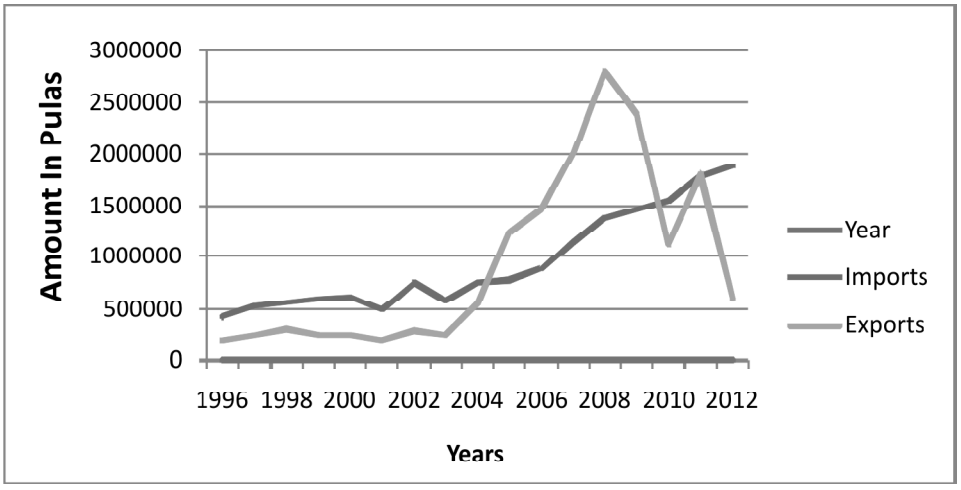
AGOA has had a measurable and sizeable impact on Botswana's trade with the US since its entry into force. However, exports have been fluctuating over the years. The sharpest decline of the textile exports to the US was between 2005 and 2006, on account of the expiration of the Multi Fibre Agreement. The year 2010 registered an even sharper decline in US textile imports, most probably as a result of the financial crisis and the possible impact of stimulus packages for US producers; this was to the detriment of AGOA beneficiaries. In 2010, because the recession had lead to retrenchments and company closures, the Botswana textile and clothing sector was hit hard. The government intervened to try and assist this sector by giving it financial aid of 38 million Pula (roughly US$4 million) to be used over a period of two years. This aid was meant to prevent further

company closures, to enable the sector to retain jobs and try to improve the sector's competitiveness (Motlhabane, 2011).

The SADC FTA was expected to have led to the establishment of a SADC Customs Union by 2010, the SADC Common Market by 2015 and the SADC Monetary Union by 2016. However, the establishment of the customs union has been suspended to an unspecified date so as to iron out some pending issues such as the stringent rules of origin as well as overlapping memberships. This has also lead to the suspense of both the Common market and the monetary union (Kalenga, 2005).

As Fig. 1 below shows, total textile exports and imports were more or less stable from 1996 to 2003. However, from 2004 we observe an upward trend in both exports and imports. Imports show an upward trend over the whole period, while exports have a very steep rise between 2004 and 2008, followed by a fall thereafter. This rise in exports may have been as a result of the AGOA which was implemented in 2001. It gave Botswana preferential treatment in sourcing its raw materials from third countries for duty and quota free exports into the US market. AGOA helped boost the textile sector especially after Botswana was allowed to use imported inputs by virtue of being a lesser developed beneficiary country. Between 2008 and 2010, however, Botswana witnessed a sharp decline in textile exports, most probably because of the financial crisis as argued above.

Figure 1: Total Textile Exports And Imports



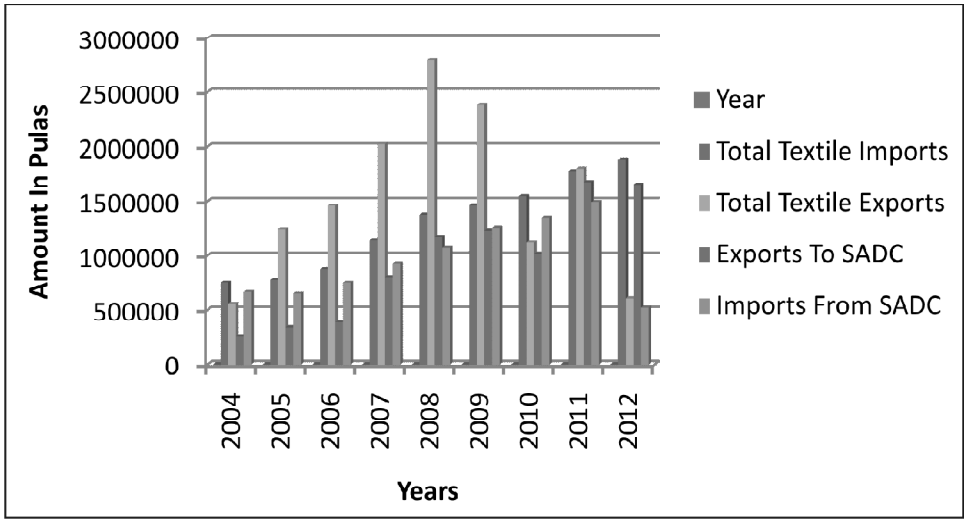
Source: Data from Statistics Botswana

Textile Trade Intra-SADC vs. Total Textile Trade

The diagram below (Fig. 2) shows that from 2004 to 2008, there was an increasing trend in total textile exports, with a decline thereafter. But total

textile imports show a general upward trend throughout. On the other hand, SADC textile exports also showed an upward trend from 2004 to 2009, then declined in 2010 then increased in 2011 followed by a consecutive decline in 2012. SADC textile imports decline from 2004 to 2005 then they increase until 2011, followed by a decline in 2012. The increased levels of intra-SADC textile trade might have been as a result of the SADC-FTA which was implemented in 2000. It enhanced trade because it has an advantage of reducing both tariff and non tariff barriers among members.

Figure 2: Textile Trade Within SADC vs Total Textile Trade



Source: Data from Statistics Botswana

2. LITERATURE REVIEW

Theoretical Literature Review

Since the 1960's, studies have been conducted on the determinants of IIT. As Zidi and Dhifallah (2013) as well as Leitao and Shabhaz (2012) pointed out, the theoretical and empirical interest in IIT has continued ever since the evidence on rapidly increasing IIT was identified. According to Kang (2010), interest in IIT arose mainly because the traditional theory of comparative costs, dealing with homogenous products, is incapable of explaining the simultaneous exports and imports of the same product. IIT describes trade in similar, but slightly differentiated products based on imperfect competition, or trade in close substitutes demanded by consumers in different countries which may have distinct tastes or preferences (Sarmila and Ranajoy, 2011). IIT is an area of study that has gained prominence, although much of the research has focused on developed countries. It has

also been closely associated with regional integration and thus is a good topic for study in the SADC region.

Analyzing the Determinants of IIT-The Gravity Model

In order to determine IIT, one method that is extensively used is the Gravity Model. This uses econometric technique to examine bilateral trade, especially intra-regional trade. The gravity model was inspired by the gravity law of physics as a tool to analyze international trade flows. Since then the model has been successfully augmented to analyze flows of varying types such as migration and foreign direct investment (FDI). These flows thus follow the physical principles of gravity. The principle postulates that the "force of attraction F_{ij} between two separate entities i and j is a positive function of the entities respective masses m_i and m_j and inversely related to the squared distance d^2_{ij} between the objects" (Makochekanwa, 2010). Formally the law can be stated as:

$$F_{ij} = G\ [(m_i m_j) / d^2_{ij}] \tag{3.1}$$

Where: F_{ij} is the force of attraction, m_i and m_j are the respective two countries masses, d^2_{ij} is the distance between objects. G is the gravitational constant depending on its units of measurement for mass and force. In analyzing IIT, the same principle stands, thus two opposite forces determine the volume of bilateral IIT between countries. The main pull factors are the size of the economy and the level of economic development of the trading partners. The impediments to IIT are the main push factors, mainly expressed through distance. Distance can thus represent transportation costs, trade policies, uncertainty, cultural differences, and limited overlap in consumer preference schemes. The traditional gravity model can therefore be stated as follows as stated by Makochekanwa (2010):

$$Trade_{ij} = \alpha\ [GDP_i^{\beta 1} GDP_j^{\beta 2} / (D_{ij})^{\beta 3}] \tag{3.2}$$

where $Trade_{ij}$ represents bilateral trade between countries i and j; $GDP_i^{\beta 1}$ and $GDP_j^{\beta 2}$ denotes country i and j's respective GDP's and D_{ij} is the distance between two trading partners. These factors are the standard variables that are always included in a gravity model that explains trade. However, over the years the gravity model has evolved and different researchers have augmented it with various trade enhancing or inhibiting factors. These may include among others: dummies for common border, common language, and preferential trade relations and monetary variables that capture the role of exchange rate variability and common currency between trading partners.

Empirical Literature Review

Damoense and Jordaan (2009) conducted a study which investigated the country and industry specific determinants of bilateral IIT patterns between

South Africa and trading partners in the automobile industry from 2000 to 2007. The study adopted a panel data econometric technique-the gravity model. The results revealed that FDI, GDP and economies of scale positively influence IIT while differences in per capita income, product differentiation, distance and automotive assistance negatively influence IIT.

Zidi and Dhifallah (2013) carried out a study to analyze trade creation and trade diversion between Tunisia and EU and also employed a gravity model. They found that GDP had a positive sign, although GDP per capita was found to not have any statistically significant impact on trade. Distance was found to have a negative sign, bilateral real exchange rate was found to have a negative sign, that is any real depreciation led to an increase in export volumes. There were also dummies representing whether or not countries shared a common language, shared a border and whether countries belonged to the same preferential trade agreement and all these dummy variables were found to positively influence trade.

Reuben, Arene and Nweze (2013) also found that IIT was influenced positively by GDP, negatively by population, distance and bilateral real exchange rate. Sharing a border and being an island impacted positively on IIT. Infrastructure index, measured in terms of number of kilometers of road, railway and number of telephone lines per capita, had a negative impact on trade. Being a member of a preferential trade arrangement seemed to increase the level of IIT.

Leitao (2011) examined the determinants of horizontal and vertical intra-industry trade of US with the trade partner of North American Free Trade Area (NAFTA), EU and Association of South East Asian Nations (ASEAN). Using a panel data approach, the results show a negative correlation between endowments and IIT. This shows that IIT occurs more frequently among countries that are similar in terms of factor endowments. Specifically, differences in GDP per capita which was used as a proxy for relative factor endowments had a negative sign. Market size was proxied by both the minimum and maximum values of GDP and it was found that minimum value of GDP was positively correlated with IIT while highest value of GDP was found to have a negative relationship with IIT. Geographical distance was found to have a negative relationship with IIT, and finally FDI was found to have a positive impact on IIT.

Botric (2012) evaluated IIT between the EU and the Balkans and also found that it is influenced negatively by distance and population, while FDI and GDP had a positive influence. Sarmila and Ranajoy (2004) carried out a causal relationship between economic growth and IIT in India from 1971 to 2000 and found that indeed economic growth does cause IIT, they also found that population and distance negatively influenced IIT. Sharing a common border, having a common language as well as FDI were found to have a positive impact on IIT.

Kang (2010) examined the trend and determinants of IIT in Europe in the manufacturing industry and found that, GDP, GDP per capita and FDI were found to positively influence IIT. Contrary to *a priori* expectations, differences in GDP per capita were found to have a positive influence on IIT, while distance had a negative relationship with IIT. On the other hand, sharing a border, having a common language, being in the same continent and having a trade agreement were all found to positively influence IIT.

Musonda (1997) performed a study about IIT between members of the PTA/COMESA. The findings were that average level of per capita income positively influenced IIT. Differences in per capita income and distance had a negative relationship with IIT. Having a common language, sharing a border and having special relations were all found to positively influence IIT.

Ekanayake (2001), conducted a study in Mexico to analyze the determinants of IIT. The findings were that IIT was influenced positively by the following variables: average income levels, average country size, trade intensity, existence of a common border, existence of a common language, participation in regional integration schemes. On the other hand the following variables were found to have a negative relationship with IIT; income inequality, inequality in country size, distance and trade imbalance.

3. METHODOLOGY

Model Specification

From the theoretical model discussed above, the empirical model adopted is the gravity model, which is augmented. The study adopts the methodology employed by Ekanayake (2001) where the dependant variable is IIT which is calculated using the Grubel-Lloyd Index discussed above. The study also includes additional independent variables like: real exchange rate, GDP per capita and differences in per capita income. The study also includes dummy variables taking into account whether SADC members are signatory to the FTA and whether countries share a border. Formally the model is stated as follows:

$$IIT_{ijt} = \beta_{ij} Y_{it}^{\beta 1} Y_{jt}^{\beta 2} D_{ij}^{\beta 3} EX_{ijt}^{\beta 4} FTA_{ij}^{\beta 5} DPCI_{ijt}^{\beta 6} BORD_{ij}^{\beta 7} GDPP_{it}^{\beta 8} GDPP_{jt}^{\beta 9} U_{ij} \quad (4.1)$$

The model specified above can be presented in natural logarithms as:

$$\ln IIT_{ijt} = \beta_{ij+} \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln D_{ij} + \beta_4 \ln EX_{ijt} + \beta_5 FTA_{ij} + \beta_6 \ln DPCI_{ijt} + \beta_7 BORD_{ij} + \beta_8 \ln GDPP_{it} + \beta_9 \ln GDPP_{jt} + U_{ij} \quad (4.2)$$

Where ln represents the natural logarithm of the variables; IIT_{ijt} is IIT for the textile industry between reference country (Botswana) and a SADC trading partner at time t; Y_{it} is the real GDP for Botswana at time t; Y_{jt} is the real GDP for trading partner at time t; D_{ij} is the distance between

Botswana and a SADC trading partner; EX_{ijt} is the real exchange rate between Botswana Pula and the US Dollar at time t; FTA_{ij} is a dummyvariable representing whether a country has signed the FTA or not; BORD is a dummy variable indicating whether or not Botswanaand country j share a border; $GDPP_{it}$ is GDP per capita in Botswana; $GDPP_{jt}$ is the GDP per capita in trading partner and DPCI is differences in per capita income between Botswana and the trading partners.

Data and Estimation Techniques

To analyze the Gravity model presented above, a cross section oriented panel data,[1] between Botswana and the other 14 SADC countries, covering the period from 2003 to 2012 will be used. Data will be analyzed using E-views. Since we are using static panel data, to determine which model to estimate, a Hausman Test (to be explained in more detail below) is carried out first to determine whether we should use the Random Effects model or the Fixed Effects Model. But nonetheless, formal tests of the data like unit root test are still carried out to avoid spurious results.If the Hausman test shows that the fixed effects model is the appropriate model, then there arises another problem. The fixed effects model cannot estimate time invariant variables directly since they are wiped out by the inherent transformation. Nevertheless, the variables can be estimated in a second stage by running a regression of individual effects on the distance variable and the dummies. Formally, this can be shown as follows:

$$IE_{ij} = \beta_0 D_{ij}^{\beta 3} FTA_{ij}^{\beta 5} BORD_{ij}^{\beta 7} U_{ij} \quad (4.3)$$

Where IE_{ij} are the individual effects, and other variables are as previously defined.

The Hausman Test

According to Baltagi (2000), the Hausman test is crucial to determine the suitable specification of the effects of a model when dealing with static panel data. This test is used to check for any correlation between the individual effects ω_i and the explanatory variables X_{it} in a model. The procedure is such that if ω_i is uncorrelated with X_{it} the random effects model is the suitable and consistent model. On the other hand, if the explanatory variables and the error components are correlated the fixed effects model is the appropriate model. Thus if the individual effects are considered random the random effects estimator (β_{re}) is the consistent estimator whereas the within estimator (β_w) is inconsistent. The β's are the vector coefficients. The test statistic is asymptotically chi-square distributed under the null hypothesis that ω_i is uncorrelated with X_{it}. Thus the test checks for the following:

H_0: $Cor(\omega_i, X_{it}) = 0$ Random Effects Model (REM) is correct

H_1: $Cor(\omega_i, X_{it}) \neq 0$ Fixed Effects Model (FEM) is correct.

Therefore the Hausman test helps to determine which model the study adopts, based on the p-values associated with relevant chi-square statistics. The Hausman test statistic is given as follows;

$$H = (\beta_{re} - \beta_w)' [V(\beta_{re}) - V(\beta_w)]^{-1} (\beta_{re} - \beta_w) \quad (4.4)$$

Where the hypotheses are:

H_0: $\beta_{re} - \beta_w = 0$ REM is the correct model

H_1: $\beta_{re} - \beta_w \neq 0$ FEM is the correct model

Panel Data Stationarity

The growing use of cross country data to study some macro economic topics has resulted in a shift towards studying the attributes of macro-economic-oriented panel data. Notably, there are numerous applications of time series methods applied to panel data, especially panel unit root tests, panel cointegration tests and long run average relations. In recent research, it is therefore common practice to analyze the stationarity of the data so as to avoid spurious results based on non-stationary data. This study therefore carries out this crucial step in panel data analysis, to ascertain the stationarity of the data.

Testing for Stationarity

Panel unit root tests are similar but not identical to the one carried out in time series analysis. The panel unit roots begin with the following Dickey-Fuller (DF) type model:

$$Y_{it} = \delta_i Y_{it-1} + \lambda X_{it} + \varepsilon_{it} \quad (4.5)$$

X_{it} represent the exogenous variables in the model.

If $|\delta_i| < 1$ Yit is weakly (trend) stationary and the data is said to be stationary. On the other hand if $|\delta_i| = 1$ then Y_{it} contains a unit root and is said to be non-stationary. This can be simplified further by subtracting Y_{it-1} on both sides so that:

$$\Delta Y_{it} = (\delta_i - 1) Y_{it-1} + \lambda X_{it} + \varepsilon_{it} \quad (4.6)$$

Let $\rho_i = (\delta i - 1)$, the Augmented Dickey-Fuller (ADF) type is:

$$\Delta Y_{it} = \rho_i Y_{it-1} + \lambda X_{it} + \Sigma_{j=1}^{\rho i} \theta it \, \Delta Yit - j + \varepsilon_{it} \quad (4.7)$$

For the purpose of testing there are two assumptions about ρ_i. The first assumes common unit root process across the cross section so that $\rho_i = \rho$, hence identical across cross sections. The second version assumes individual unit root process across the cross sections (Baltagi, 2000).

Testing for Cointegration

As it is the case for panel unit root analysis, panel cointegration tests are motivated by the search for more robust tests than those obtained by using time series tests. The study adopted the Engel-Granger based cointegration test, specifically the Kao cointegration test is used since it can take multiple variables compared to other tests.

Kao (Engel-Granger Based) Panel Cointegration Test

According to Kao (1997), the Engel-Granger cointegration test is based on an examination of the residuals of a regression performed using I(1) variables. If the residuals are I(0) then the variables are cointegrated but if the residuals are I(1) the variables are not cointegrated. Kao extended the Engle-Granger framework to tests involving panel data. Kao proposes several tests that allow for homogenous intercept and trend coefficients across cross sections. Consider the following regression model:

$$Y_{it} = \alpha_i + \delta_i t + \beta_{1i} X_{1it} + \beta_{2i} X_{2it} + \ldots + \beta_{Mi} X_{Mit} + e_{it} \quad (4.8)$$

$$T = 1, 2, \ldots, T,\ i = 1, 2, \ldots, N,\ m = 1, 2, \ldots, M$$

Where Y and X are individual non stationary I(1). The parameters α_i and δ_i are individual and trends effects respectively which may be set to zero if desired. The Kao test proposes the ADF type unit root tests for e_{it} as a test for the null hypothesis of no cointegration. Then the residuals obtained from the above regression are tested to see whether they are I(1) just like in the Engel-Granger two step procedure. Kao runs an auxiliary regression in the form:

$$e_{it} = \rho_i e_{it-1} + \Sigma_{j=1}^{p} \Phi it\, \Delta eit - 1 + v_{itp} \quad (4.9)$$

Where ρ is chosen so that the residuals v_{itp} are serially correlated. The ADF converges to a standard normal distribution by the sequential limit theorem. In order to test the null hypothesis of no cointegration i.e residuals are I(1). Hence the hypotheses can be stated as

H_0: $\rho = 1$ i.e there is no cointegration (non-stationary residuals)

H_1: $\rho < 1$i.e there is cointegration (stationary residuals)

The decision criterion for the rejection or failure to reject the null hypothesis is based on the critical probability values.

4. ESTIMATION AND ANALYSIS OF REGRESSION RESULTS

Table 1 below provides an estimation of the intra-textile IIT of Botswana with individual SADC countries. These range from 0 – 1, where zero indicates no textile IIT with that country.

Table 1
Intra Industry Trade For Botswana with SADC Countries

Year	*Angola*	*DRC*	*Lesotho*	*Mada-gascar*	*Malawi*	*Mauri-tius*	*Mozam-bique*	*Namibia*	*South Africa*	*Swazi-land*	*Tanzania*	*Zambia*	*Zimbabwe*
2003	0.00	0.00	0.00	0.00	0.09	1.00	0.00	0.48	0.72	0.99	1.00	0.98	0.74
2004	0.00	0.00	0.04	0.03	0.97	0.56	0.07	0.29	0.67	0.96	1.00	0.97	0.82
2005	0.02	0.00	0.56	0.00	0.88	0.06	0.00	0.42	0.62	0.76	0.12	0.81	0.40
2006	0.00	0.00	0.61	0.00	0.02	0.06	0.00	0.61	0.61	0.70	1.00	0.74	0.57
2007	0.00	0.00	0.29	0.00	0.01	0.11	0.02	0.41	0.48	0.65	1.00	0.64	0.47
2008	0.54	0.00	0.00	0.00	0.52	1.00	0.01	0.52	0.42	0.56	0.23	0.11	0.30
2009	0.00	0.15	1.00	0.00	0.02	0.77	0.51	0.21	0.50	0.69	0.07	0.06	0.06
2010	0.00	0.00	0.99	1.00	0.00	1.00	0.38	0.64	0.51	0.26	0.02	0.32	0.31
2011	0.00	0.00	0.94	0.00	0.00	0.22	0.42	0.07	0.41	0.46	0.78	0.05	0.15
2012	0.00	1.00	0.99	1.00	0.18	1.00	0.65	0.21	0.71	0.88	0.88	0.08	0.13

Source: Own Calculations

From the calculations, it seems that the degree of IIT is higher between Botswana and countries which are part of the SADC-FTA (being all the SADC countries except Angola and Democratic Republic of Congo as well as Seychelles) and also for those countries which share a border with Botswana (such as Namibia, South Africa and Zimbabwe).

Panel Unit Root Tests

Performing unit root tests is common practice in time series data, although with panel data it is only more recently undertaken. Time series property of a variable is of significant interest to economists, however, the statistical properties of the time series estimates depend on whether the variables are stationary or not stationary. Thus the growth in the use of macro-panels in economic analysis has brought interest into the presence of unit roots in the data. There are a number of tests suggested to test for the presence of unit root. The most commonly used tests which are also employed for the current study are the Levin, Lin and Chu (LLC) test and the Im, Pesaran and Shin (IPS) test. The natural logarithm of the variables is taken to standardize the data before the unit root tests are estimated. The LLC common unit root tests and the IPS individual unit root test results from E-Views are presented in Table 2.

Results show that the variables are not stationary at levels (have a unit root) but only become stationary after the first difference. The results are consistent for both the LLC and IPS tests. To avoid running spurious regressions, the next step then is to carry out a cointegration test to determine if there exists a long run relationship between the variables.

Examining the existence of a long run relationship among variables is important in the context of purely time series and panel data. Panel co-integration tests aim to examine the long run economic meaning of data that are not stationary at levels in order to avoid spurious regression results. In principle, cointegration tests are conducted for non-stationary dependent variables that are integrated of the same order as the other non stationary independent variables. There are seven variables considered for cointegration, hence the Kao Cointegration test which can accommodate more variables is adopted. From the results presented in Table 3, the probability value of 0.0333, which is significant at 5% significance level leads to the rejection of the null hypothesis of no cointegration. Thus we conclude that cointegration exists among the variables, therefore there is a long run relationship between the variables. Since it was established that the variables become stationary after their first difference, the model is then specified using the differenced variables to avoid spurious results.

Table 2
Unit Root Analysis

		LLC		*IPS*		
Variable	*Order: (Levels and First Difference)*	*Individual Intercept*	*Individual Intercept & Trend*	*Individual Intercept*	*Individual Intercept & Trend*	*Overall Integration Order*
Intra Industry Trade	0	0.04271	1.32485	-0.38163	-0.01903	I(1)
		(0.2503)	(0.3053)	(0.3514)	(0.4924)	
	1	-2.25405	-1.80756	-2.38196	0.40214	
		(0.0121)**	(0.0006)***	(0.0806)*	(0.0451)**	
Gross Domestic Product (GDP) for Botswana	0	-0.26306	1.29920	-0.42713	-0.34612	I(1)
		(0.3963)	(0.9031)	(0.0253)**	(0.3146)	
	1	-5.69923	-8.62239	-2.98114	-0.79906	
		(0.0006)***	(0.0000)***	(0.0000)***	(0.0212)**	
Gross Domestic Product (GDP) for other SADC Countries	0	1.62308	6.00612	1.34506	0.11597	I(1)
		(0.9623)	(0.9712)	(0.9107)	(0.5462)	
	1	-3.15403	-4.64272	-1.40410	-0.50651	
		(0.0008)***	(0.0300)**	(0.0801)*	(0.0363)**	
Exchange Rate	0	1.70144	7.99667	-0.45434	-0.26993	I(1)
		(0.6225)	(0.9743)	(0.3248)	(0.3936)	
	1	-7.60739	-5.60482	-2.27078	-1.12258	
		(0.0000)***	(0.0004)***	(0.0116)**	(0.0862)*	
Differences in per Capita Income	0	0.08123	3.21790	0.47985	-0.4457	I(1)
		(0.8331)	(0.9994)	(0.6843)	(0.3280)	
	1	-3.31046	-10.14049	-3.60445	-6.28769	
		(0.0005)***	(0.0000)***	(0.0002)***	(0.0000)***	
GDP per Capita for Botswana	0	0.19756	1.09420	-1.06806	-0.05139	I(1)
		(0.1440)	(0.8631)	(0.1427)	(0.4795)	
	1	-2.03064	-9.30440	-2.66646	-3.08200	
		(0.0211)**	(0.0000)***	(0.0038)***	(0.0104)**	
GDP per Capita for other SADC Countries	0	0.89066	4.33401	0.97320	-0.34521	I(1)
		(0.9010)	0.9325	(0.8348)	(0.6350)	
	1	-3.25892	-5.42663	-1.47993	-0.60778	
		(0.0006)***	(0.0000)***	(0.0694)*	(0.0712)*	

Values in parenthesis are the p-values while those NOT in parenthesis are the critical values.
*** Significant at 1%, ** Significant at 5%, * Significant at 10%

Table 3
Panel Cointegration Test -Kao Residual Cointegration Test

Series: IIT Yi Yj EX DPCI GDPPi GDPPj
Sample: 2003 2012
Null Hypothesis: No Cointegration
Trend Assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 1
Newey-West automatic Bandwidth selection and Bartlett kernel

	t-statistic	*Probability*
ADF	-2.264896	0.0333
Residual Variance	0.002398	
HAC Variance	0.001221	

Determinants of Bilateral Textile Intra Industry Trade Between Botswana and the SADC Member States

To study the determinants of bilateral textile intra industry trade between Botswana and the SADC member states, the Hausman test is used to decide the appropriate model between the fixed effects model and the random effects model. The test is employed in order to choose amongst the competing models that consider heterogeneity of the countries. It determines whether there is any correlation between explanatory variables and the individual specific effects.

The Hausman Test

The Hausman test is employed by many researchers to see if there is correlation between individual specific effects and the regressors in a particular model. Essentially, the Hausman specification test examines whether the regression coefficients under the fixed effects and the random effects are statistically different from each other. If they are statistically different from each other, then the fixed effects is the appropriate model even though it uses up more degrees of freedom . However, if the regression coefficients under the fixed and random effects are not statistically different from each other, then the random effects model is preferred. The results of the Hausman specification test are presented in Table 4.

Hypotheses
H_0: Random effects is the correct model (REM)
H_1: Fixed effects is the correct model (FEM)

Table 4
Hausman Test Results

Test Summary	*Chi-square Statistic*	*Chi-square degrees of freedom*	*Probability*
Cross section random	33.145778	6	0.0335**

***Significant at 1%, **Significant at 5% and *Significant at 10%.

The results displayed above in Table 5 indicate that the null hypothesis was rejected using the conventional 5% level of statistical significance. This implied that the FEM was the appropriate and unbiased model for parametric estimation in this study. Corresponding to this result is the observation that the FEM has been selected for various macro panel studies with finite cross sections. The FEM is also useful for analyzing the impact of the variables that vary over time, as is the case with most of the variables employed in this study. For the time invariant variables, an individual effects model will also be estimated to capture the impacts of such variables.

Table 5
Estimation of The Determinants of Bilateral Textile Intra Industry Trade Between Botswana and the SADC Member States Using a Fixed Effects Model and an Individual Effects Model

		Fixed Effects Model	*Individual Effects Model*
Variables	Constant	0.931091	
		(0.0342)**	
	GDP for Botswana	0.043540	
		(0.5709)	
	GDP for other countries	5.489534	
		(0.0802)*	
	Real exchange rate	-2.730686	
		(0.0582)**	
	Differences in per capita	-0.600763	
	income	(0.0506)**	
	GDP per capita for	0.030706	
	Botswana	(0.0763)*	
	GDP per capita for other	0.024533	
	countries	(0.0611)*	
	Distance		-4.310501
			(0.0127)**
	Sharing a border		0.033142
			(0.0642)**
	Being part of the		2.358964
	SADC-FTA		(0.0000)***
Model	R-Squared	0.896872	0.803295
Diagnostics	Adjusted R-squared	0.872691	0.790822
	F-statistic	22.35671	
	Prob(F-statistic)	0.000000	
	Durbin Watson stat	1.941103	

The figures in parenthesis are p-values and those NOT in parenthesis are coefficients.
*** significant at 1%, ** significant at 5% and * significant at 10%

Model Diagnosis

Before the analysis of the coefficients, the model diagnostics in the form of F-statistics, and R-squared are examined to ensure that the model has been specified correctly as shown in Table 5. The model can be said to be correctly specified given the relatively high R-squared and statistically significant

F-statistic. The high R-squared shows that the fixed effects model has a relatively good measure of fitness because about 89.7% of the variation in the dependent variable is explained by the variation in the independent variables, on the other hand, only about 10.3% of the variation is not explained by the model. The statistically significant probability of the F-statistic (0.0000) implies that all the independent variables in the fixed effects model affect the dependent variable (IIT). The Durbin-Watson statistic, which is closer to 2 implies that there is no autocorrelation in the model. The Individual Effects Model is also a good model since 80.3% of the variation in the dependent variable is explained by the variation in the independent variables while only 19.7% of the variation is not explained by the model.

Determinants of Bilateral Textile Intra Industry Trade between Botswana and the Individual SADC Member States

The gravity model is centered around the fact that two opposite (pulling and pushing) forces determine the volume of bilateral intra-industry trade. That is, there are pulling forces that enhance intra industry trade on one side, and the obstacles on the other (pushing forces). The main pull factors include the size of the economy and level of economic development. These are proxied by GDP and GDP per capita in this study. The main deterrent to intra industry trade is usually transportation costs, which are normally proxied by distance in the gravity model. Our model has been extended to include other factors like differences in per capita income, real exchange rate, and dummy variables that capture, membership in trading blocs as well as sharing a border. Additionally, for the analysis, all variables except for dummy variables are expressed in natural logarithm. Consequently, their estimated coefficients are directly interpreted as elasticities.

In large economies, many differentiated goods can be produced under conditions of economies of scale. There is also a greater demand for foreign differentiated goods in these economies and the potential for intra-industry trade is high. *A priori*, we expect GDP for Botswana and of its trading partners to have a positive relationship with IIT with those trading partners. The expectation is that when the size of Botswana economy grows then the level of IIT also rises, while on the other hand, the greater the GDP for other countries, the more they are able and willing to absorb more textile goods from Botswana, thus IIT goes up. In this paper however, GDP for Botswana is statistically not significant at 10% even though it has the expected positive sign. We therefore conclude that GDP for Botswana does not play any role in the level of textile intra industry trade between Botswana and the other SADC member states. According to theory, GDP grows overtime, and is expected to cause the manufacturing sector to also grow, as an economy undergoes structural transformation. However, the fact that

our results show that intra industry trade does not increase when there is a rise in GDP, implies that there is low level of manufacturing in Botswana; in other words, the economy is growing independently of the industrial sector, which explains why the Botswana economy is not diversifying into the textile sector. On the other hand, GDP for other respective SADC member states is found to be statistically significant at 5%, with the expected positive sign. This implies that a percentage increase in GDP of other SADC countries leads to a 5.489534 percent increase in IIT. These results are also in line with those of other studies like Botric (2012), Sarmila and Ranajoy (2004), Musonda (1997), Zidi and Dhifallah (2013), Reuben et al (2013) as well as Kang (2010) who also found GDP of trading partners to enhance IIT. The results of this study also seem to suggest that as GDP for SADC countries increases, there is a rise in Botswana's textile IIT, which implies that there is increased manufacturing in the textile sector. Therefore as a result, increased manufacturing enhances the level of intra industry trade.

Intra-industry trade with any given trading partner may tend to be higher as per capita income of the partner country rises. At low levels of per capita income customer demand is generally small and standardized with respect to product characteristics, but with higher per capita income, demand will become more complex and differentiated. This will lead to greater demand for differentiated products. Therefore, a higher per capita income tends to lead to higher intra-industry trade. The effects of this variable, of GDP per capita which is taken to measure economic development, is thus expected to be positive, reflecting enhanced demand for differentiated goods. Musonda (1997), Zidi and Dhifallah (2013), Kang (2010) as well as Leitao and Shahbaz (2012) also argued that the variable indicates the standard of living of a country as well as the level of economic development. On average, higher the per capita income, higher the level of economic development.This means the higher the desire for variety, hence an increased IIT. In the present study, both *GDP per capita* for Botswana and *GDP per capita* for other SADC member states are significant with the expected positive signs, implying that as GDP per capita rises then the level of IIT will also increase.

Intra-industry trade is expected to be negatively correlated with *differences in per capita income*, indicating differences in demand structures and differences in resource endowments. If per capita income is interpreted as an indicator of demand structure, a greater difference in per capita income implies that demand structures have become more dissimilar. This indicates that the potential for intra-industry trade decreases. For intr-industry trade to exist between two countries, there must in each country be a demand for products of high quality produced by the other. Therefore, when the difference between the per capita incomes of two trading partners is greater, the scope for intra-industry trade tends to be smaller. *Differences in per capita income* variable, was found to be statistically significant with the

expected negative sign. As per literature; Musonda (1997), Kang (2010), Leitao and Shabaz (2012), also argued that this variable represents two aspects: differences in factor endowments and consumer tastes respectively. The implication is that the greater the difference in factor endowments leads to differences in comparative advantages, leading to *inter-industry trade* rather than intra industry trade, thus reduced level of IIT. Similarly the greater the difference in per capita income, the greater will be the difference in consumer tastes which implies increased *inter industry trade* instead of IIT. The results of this study therefore indicate that a percentage increase in differences in per capita income will reduce IIT by 0.600763 percent.

The real Exchange rate also has a statistically significant impact on IIT. Given the exchange rate as defined in this study (Pula per US Dollar), which means that an increase is a real depreciation, our results imply that a depreciation of the exchange rate seems to lead to increased export levels and reduces imports. This implies that with a rise in the real exchange rate (a real depreciation), domestic goods become cheaper than foreign goods, therefore IIT level will rise due to a rise in exports. As a result a percentage increase in exchange rate will reduce IIT by 2.730686 percentage points. Zidi and Dhifallah (2013) also found similar results. On the other hand, Medupe (2012) found that exchange rate had a positive sign, this was because the indirect exchange rate had been adopted for the study (foreign currency per pula). Therefore an increase in the exchange rate means an appreciation of the exchange rate. So an appreciation of the domestic currency leads to an increase in value of exports. The positive relationship was attributed to inelastic demand[2]. That is, as prices of Botswana exports increase in the foreign country, this will result in a disproportionate decline in exports (less than the increase in prices). If the increase in prices does not lead to a major decline in quantity exported (due to inelastic demand) the result will therefore be an overall increase in value of exports. Even though the explanation is economically sound, its applicability to a small economy is highly questionable. Basically because it presumes that change in the Botswana exchange rate will have an effect in the price of the goods in foreign territory. However, as a small country Botswana will have little influence on the determination of price in world markets for its goods as a single country.

Intra-industry trade is negatively correlated with the trade barriers between trading partners. To account for barriers to trade, this study uses transportation cost. Since no information is available on transportation cost, the direct-line distance between Botswana and economic centers of trading partner was used as a proxy. Botric (2012), Sarmilla and Ranajoy (2004), Leitao (2012), Zidi and Dhifallah (2013) as well as Reuben *et al.* (2013) also used geographical distance as a proxy variable for transportation costs.

Distance is expected to be negatively related to IIT level, because the assumption is that the greater the distance, the greater the transport and transaction costs, thus reduced IIT. The results of the present study show that distance is significantly correlated with IIT with the expected negative sign, implying that the longer the distance the lesser will be the level of IIT.

The existence of common borders represents the possibilities of intra-industry trade in response to locational advantages. This factor is particularly important in explaining the large amount of cross-border trade between Botswana and the SADC member states. A dummy variable was used for countries that share a common border with Botswana. Sarmilla and Ranajoy (2004), Musonda (1997) as well as Kang (2010) argue that when countries share a border, the assumption is that this enhances IIT, because of reduced trade costs and ease of information flows. The same applies also in the present study; results show that sharing a border seems to lead to increased IIT.

The FTA dummy captures the SADC countries that are signatory to the SADC FTA. The assumption is that being part of a trade agreement enhances IIT because of reduced trade barriers. Thus, as per expectations, the variable has a positive and significant sign. We therefore conclude that indeed being a part of the signatory enhances IIT. Other researchers like Reuben et al (2013) and Kang (2010) also supported the motion that membership in a trade agreement lead to increased level of intra industry trade.

Policy Implications

The findings from the study have led to the following policy implications for trade policy makers in Botswana:

Membership in regional integration groups, like SADC increases the level of trade with fellow members. Therefore it is mandatory for Botswana to move along with trading blocs as they strive to attain greater flexibility in intra industry trade. In other words, it should move along with SADC as they work towards being a customs union, as this seems to stimulate intra industry trade. It is also recommended that distance still remains a deterrent to intra industry trade, Botswana should try to maximize intra industry trade levels with those countries that are closer to it.

The greater the market size of trading partners (proxied by GDP of SADC countries), implies that on the demand side, there is greater capacity to absorb imports while on the supply side, it implies that producers are able to manufacture enough textile products needed by Botswana customers. As a result the greater the market size, the more there will be room for increased intra industry trade since it implies greater capacity of both imports and exports. As such Botswana will benefit more by trading with countries with greater market sizes. This is so because, the greater the

market size, the greater will be the level of manufacturing in the textile industry, thus intra industry trade will tend to go up.

The greater the standard of living of countries, the greater the degree of intra industry trade. The higher the per capita GDP, the higher the level of economic development on average, which means a higher desire for variety, hence increased levels of intra industry trade. Therefore it is recommended that Botswana maintain trade with those countries that have a higher level of economic development as well as enhanced standard of living because this increases the degree of intra industry trade.

It is also highly recommended that Botswana trades with those countries with lesser differences in per capita income because on the supply side, the lesser the differences in factor endowments, the greater will be the degree of intra industry trade. The difference in factor endowments leads to development of different comparative advantages, which contribute to *inter-industry trade*. The more two countries are different, the greater the difference in factor endowment, the less IIT share they will have among them. Also on the demand side, the lesser the differences in consumer tastes, the greater will be the level of intra industry trade. Given that IIT is trade of similar goods, the more two countries are different in consumer tastes, the less likely they will have significant IIT share in trade between them.

Notes

1. In cross section oriented panel data, the number of cross sections is greater than the time dimension. In our case we have data between Botswana and the other 14 SADC member states for a period of 10 years (2003-2012).
2. If the demand for exports is inelastic, then there will only be a small fall in demand for exports when prices increase. If demand is elastic there will be a large fall as a result of price increase.

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