DETERMINANTS OF INTRA-INDUSTRY TRADE BETWEEN ZAMBIA AND IT'S TRADING PARTNERS IN THE SOUTHERN AFRICAN DEVELOPMENT COMMUNITY (SADC)

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Abstract

Intra-Industry trade (henceforth IIT) has generally been perceived to be a feature of the industrialized countries. As the past few years have seen a rapid increase in Zambia's trade with its trading partners in the Southern African Development Community (SADC), trade statistics reveal that a substantial part of such intra-SADC trade is in fact of the IIT form. This study seeks to establish the extent of IIT between Zambia and its trading partners in the SADC region and to identify the determinants of IIT at this level.

Using a modified gravity model in a panel data framework for the 1998-2006 period, the estimation results from the Feasible Generalized Least Squares in the random effects model evaluates the existence of IIT between Zambia and its trading partners in the SADC. The empirical results reveal that gross domestic product, dissimilarities in per capita income, transportation costs (distance and common border) and colonial ties (common language) are significant factors explaining IIT between Zambia and its trading partners in the SADC. The results also reveal that IIT between Zambia and its trading partners in the SADC is positively determined by GDP, distance, and dummies for common border and common language while dissimilarities in per capita income (DPCI) depresses it.

Key words: Intra-Industry Trade, Gravity Model, Feasible Generalized Least Squares in the Random Effects Model, Panel Data, Zambia, SADC Countries.

JEL Classification: F12

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1. Introduction

International trade involves the exchange of various commodities between countries. There are two types of trade: intra-industry and inter-industry trade. Intra-industry trade (IIT) is the simultaneous import and export of products belonging to the same group, such as the two-way exchange of differentiated textiles or vehicles while inter-industry trade refers to trade in products that belong to different industrial groups, for instance the import of textiles and the export of maize.

While there are a number of studies[2] on developing countries' IIT, previously most trade studies placed greater emphasis on a country's comparative advantage as the basis of trade rather than on economies of scale. This tendency however, ignored the IIT theories which are important in understanding and analysing trade patterns between countries which are relatively similar and produce relatively similar products. IIT arises from the fact that countries try to take advantage of economies of scale in production and because of this it has generally been regarded as a way in which countries involved in trade stand to benefit. This can be achieved through increasing trade among them, and it is in this vein that many countries in the Southern African Development Community (SADC) have realized the potential benefits and have therefore advocated for its expansion.

It has been assumed that the degree of specialization in IIT is highly correlated with the level of a country's development. Therefore, since specialization mostly characterizes manufacturing goods and not primary commodity exports on which countries in the SADC are mainly dependent for their economic survival, IIT has generally been perceived to be a feature of the industrialized countries. However, trade statistics show that substantial part of the intra-SADC trade is in fact IIT. For instance in 2004, the G-L index[3] as calculated at a four digit Harmonised System (HS) code level, revealed that Zambia's top 15 categories of products had a G-L index above 0.6 in its trade with other countries in the SADC region except South Africa (TIPS[4], 2007).[5]

[2] Studies on developing countries' IIT include Aquino (1978), Balassa (1979), Havrylyshyn and Civan (1983), Manrique (1987), Lee and Lee (1993), Stone and Lee (1995), Gonzalez and Velez (1995), Havrylyshyn and Kuznel (1997), Hu and Ma (1999), and Nilsson (1999).

[3] The G-L index estimates the proportion of trade accounted for by IIT for an industry or sector.

[4] Trade and Industrial Policy Strategy

[5] A G-L index value of 0.6 means that the proportion of IIT is high.

This study in its own right tries to establish the extent of the existence of IIT between Zambia and its trading partners in the SADC region and to identify the determinants of IIT between Zambia and its trading partners in SADC. Although IIT is considered to have potential benefits in terms of improving a country's economic prospects, the only study on Zambia's IIT is a study by the Trade and Industrial Policy Strategies (2007). The study measured the existence of IIT in certain industries using the Grubel Lloyd Index and established that the country has substantial IIT in the manufactured copper products such as insulated wire, sugar, confectionery, cement, electric energy products in which the country may exhibit some comparative advantage. No study however, has been undertaken in Zambia to measure the determinants of IIT between Zambia and its trading partners; therefore this study tries to make a modest contribution to knowledge and to Zambia's IIT.

Studies that have attempted to identify the determinants of IIT can be divided into two groups: country-specific studies and industry-specific studies. The country-specific studies explain IIT through the macroeconomic variables in each country, such as per capita income, country size, distance, and trade orientation (DeRosa and Roningen, 2003). Industry-specific studies explain an industry's IIT as a function of industry-specific variables, such as scale variables, advertising/sales ratio and firm concentration ratio (*Ibid*). Some studies[6] have attempted to combine both country and industry variables to identify determinants of IIT. This study, however, employs the country variables using the gravity model of trade which explores the trade partner composition as well as the trade commodity composition. Despite the theoretical relevance and successful empirical performance of the gravity model[7], no studies have focused on Zambia's IIT using the model although there is strong evidence for increasing IIT among developing countries.

Many studies on IIT state that IIT is prevalent among countries with almost similar economic structures. One thing to note from theoretical and empirical studies involving the determinants of IIT among developing countries is that bilateral trade depends primarily on three variables – the size of an economy, the level of development and the geographical distance between economic centres (Verdoorn, 1960, Kimura and Lee, 2004). Most studies have paid insufficient attention to the role of other country-specific factors such as adjacency, historical ties, trade intensity and exchange rate.

[6] Verdoon (1960), and Damoense and Jordaan (2010)
[7] Chidoko *et. al.,* (2006)

This study is significant in the following aspects; by evaluating the existence of IIT, the study determines whether trade in actual fact takes place among countries with similar economic structures and therefore provides policy guidelines within SADC. Furthermore, by outlining the determinants of IIT between Zambia and its trading partners in SADC, this study sheds more light on how IIT is determined by various economic factors other than the size of an economy, level of development and the geographical distance between economic centres. Therefore, this study is expected to equip trade policy makers with some insights to design strategies for improvement of overall trade in the region, and more precisely Zambia's trade balance.

The remainder of this study is organized as follows: The next section discusses the theoretical foundation of the study. Section 3 discuses the nature and extent of IIT in Zambia. In section 4 the methodological approach, data and variables used for the analysis employed will be discussed. Section 5 will then discuss the estimated results from the specified model used for this study. Finally, section 6 summarizes the study with respect to the study's contribution to the literature of IIT.

2. Theoretical Framework

Although the factor endowment theories or any other comparative advantage theory predicted that trade involves the exchange of different products and should be greater the more the countries differed in their relative production possibilities, most of the enormous growth in trade in recent years came in relatively similar goods between relatively similar countries (Neary, 2009).

Failure of the traditional trade theories to explain IIT has seen the emergence of other theories of trade. One such model is the Linder hypothesis (1961). The model argues that countries with similar levels of per capita incomes have similar preferences and in turn trade more with each other in similar but differentiated productions (Montenegro and Soto, 1996). In his argument, Linder (1961) also looked at production quality as well as tastes as the main determinants for the basis and direction of trade with the proposition that a country will produce first for home consumption and the surplus for export to countries with similar preferences. The high income countries will have low income earners and low income countries will have high income earners. Thus, the low income country will produce low quality goods and export to the markets of the rich countries for low income earners and high income countries will produce high quality goods and export them to low income countries for high income earners. This

proposition cannot be dismissed as it is evident in the increasing bilateral trade patterns in the SADC.

Another theory giving an explanation of IIT is that formulated by Krugman (1979). This marked the birth of the New Trade Theories (NTT). The NTT explain world trade based on economies of scale, imperfect competition and product differentiation which relax the strict assumptions of Traditional Trade Theories of constant returns to scale, perfect competition and homogenous goods (Do, 2006). Under these new assumptions countries can specialize in producing a narrower range of products at larger scale with higher productivity and lower cost. Then it can also increase the variety of goods available to the consumer through trade. In short trade is likely to occur even when countries do not differ in their factor endowments or technology. Krugman (1979) made two simplifying assumptions: that consumers prefer a diverse choice of brands and that production favours economies of scale. He stated that the existence of differentiated products say different versions of a car can be explained by consumer's preference for diversity but because of economies of scale, it is not profitable to spread the production of one version all over the world. Therefore production will be concentrated in a few factories and therefore in a few countries. This logic gave an explanation of how each country specialised in producing a few brands of any given type of product and in essence IIT.

3. Nature And Extent of Intra-Industry Trade in Zambia

In 1991, Zambia autonomously liberalised trade. As a policy measure to promote exports, the Zambian government liberalised the capital and current accounts and restructured its tariff structure (TIPS, 2007). These policies had a mixed impact on the overall trends of Zambian trade. Despite the negative effects that have been associated with liberalisation, such as the collapse of the manufacturing industries, the country's trade has more than doubled over the period (TIPS, 2007). In terms of direction of merchandise trade, prior to liberalization, high income countries especially Europe and Asia absorbed more than 66 percent of Zambia's exports and were the source of over 60 percent of its imports. In that period SADC absorbed only 4 percent of Zambia's exports and supplied 8 percent of its imports (TIPS, 2008). Between 1995 and 2004 the situation changed as trade with the SADC region became so dominant that it outgrew its trade with the rest of the world, as shown in the table below.

Table 1: Zambia's Export and Import Destination by Region: 1995-2004.

Region	Exports (%)			Imports (%)		
	1995-1997	2000-2002	2004	1995-1997	2000-2002	2004
COMESA	8.50	15.20	13.40	13.40	4.70	6.00
SADC	12.00	36.80	48.10	48.00	75.10	58.90
EU	19.70	16.60	26.20	22.90	10.50	14.00
USA	4.50	1.80	2.80	4.90	2.20	2.00
ASIA	50.60	28.70	7.90	9.20	5.80	15.40
OTHERS	4.70	0.90	1.60	1.60	1.70	3.70

Source: (DTIS)[8], (CSO)[9]

Historically, Asia was the largest export market for Zambian commodities, however evidence from Table 1 shows that this is no longer the case as Zambia's exports have declined from 51 percent in the 1995-1997 period to 8 percent in 2004. On the import side, the EU secured 14 percent of Zambia's imports from that region in 2004, a reduction of 8 percent from 23 percent in the 1995-1997.

Table 1 shows Zambia's import and exports to various regions between 1995 and 2004. The table shows that by 2004 the SADC region supplied 59 percent of Zambia's imports and absorbed about 48 percent of its exports. The SADC region has over the past few years experienced increased volumes of trade with Zambia and has increasingly become important to Zambia as a market for both its non-traditional and traditional exports. The reduction in trade with the rest of the world (ROW) and the increase in trade with SADC give evidence of the occurrence of IIT as countries in the SADC are assumed to have similar economic structures as well as the same levels of development.

[8] Ministry of Commerce Trade and Industry (2005). Zambia: Diagnostic Trade Integration Study.
[9] Central Satistical Office-Department of External Trade.

Table 2: Zambia's Trade with SADC: 1998-2006 (Percentage and Total Volume)

Zambia Exports	1998	2003	2006	Zambia Imports	1998	2003	2006
Angola	0.27	0.27	0.06	Angola	0.01	0.00	0.00
Botswana	2.19	0.81	0.87	Botswana	0.79	0.41	1.05
DRC	18.65	8.71	18.77	DRC	0.01	1.18	1.74
Lesotho	0.00	0.04	0.66	Lesotho	0.00	0.43	0.00
Malawi	18.09	4.80	8.41	Malawi	0.32	0.93	0.74
Mauritius	0.02	0.88	0.10	Mauritius	0.32	0.21	0.14
Mozambique	0.35	0.14	0.19	Mozambique	0.08	0.93	0.94
Namibia	1.61	0.20	2.58	Namibia	0.23	0.35	0.47
RSA	36.44	48.57	8.60	RSA	75.10	73.55	81.72
Seychelles	0.00	0.00	0.00	Seychelles	0.13	0.00	0.01
Swaziland	0.02	0.06	0.13	Swaziland	1.17	0.00	0.30
Tanzania	14.26	31.17	2.02	Tanzania	2.03	2.31	3.09
Zimbabwe	8.10	4.35	7.56	Zimbabwe	19.80	19.48	9.80
SADC (US$m)	257.2	421.1	684.3	SADC (US$m)	571.5	1081.0	1750.0
ROW (US$m)	1025.8	980.8	3694.3	ROW (US$m)	1092.8	1518.9	2916.9
SADC in Total Trade (%)	25.07	42.93	18.52	SADC in Total Trade (%)	52.30	71.21	60.02

Source: CSO, SADC Trade Database

Table 2 shows the trends in Zambia's trade with its trading partners in SADC in the period 1998 to 2006. Zambia's trade with SADC continues to increase substantially as can be seen in Table 2. The total value of Zambia's exports rose from US$ 257.22 million in 1998 to US$ 421.31 million in 2003. In 2006, the exports rose even further to US$ 684.30 million, the share of Zambian exports to SADC as a proportion of total exports rose from 25 percent in 1998 to 43 percent in 2003 but later fell to 19 percent in 2006. This could be attributed to the impact of the global economic recession on trade. On the import side, the total value of its imports rose for US$ 571.51 million in 1998 to US$ 1 081 million in 2003 and then further rose to US$ 1 750 million in 2006. In terms of import shares to SADC as a proportion of total imports, they rose from 52 percent to 71 percent in 1998 and 2003, respectively before falling to 60 percent in 2006. Most of Zambia's imports from SADC came from three countries (RSA,

Tanzania and Zimbabwe) of which RSA is the largest, representing 82 percent in 2006. Generally this was attributed to RSA's competitive advantage in production, its capacity to export a wide range of products and the increased investment undertaken by RSA companies into the Zambian economy of total imports since 2003 (TIPS, 2007). Major products imported include iron, steel, vehicles, paper and paper products, industrial equipment, petroleum products, foodstuffs and beverages (UNCTAD, 2006). Zambia's export destination within the region as of 2006 was dominated by three SADC countries, RSA (59 percent), DRC (19 percent) and Zimbabwe (8 percent). The volume of trade sent from Zambia to RSA could be explained by high industrial activity in RSA, the short distance between the two countries and the preferential market access which, via the SADC Trade Protocol, allowed Zambia to export a wide range of products on a duty and quota free basis to that partner country (TIPS, 2007). South Africa remains the country's major trade partner within the region. Other important SADC trading partners are DRC, Tanzania, Zimbabwe, Malawi, Botswana and Namibia. Zambia's major export products to SADC are cotton, stock feeds, fresh vegetables, sugar and processed foodstuffs. Other major exports are; copper, scrap metal, wood and electricity (UNCTAD, 2006). Although Zambia's trade with SADC countries outside RSA is relatively small, recent developments reveal positive trends.

Zambia has witnessed an improvement in its economic growth over the past few years and this coincides with the substantial and increasing trade taking place with its trading partners in the SADC. This has resulted in an improvement in the economic performance of Southern Africa since the mid nineties. This improved economic performance of Southern Africa results also in part from better economic policies and structural reforms that led to an improvement of macro-economic indicators (reduced inflation rates, budget deficits). Progressive trade liberalization was also an important component of the opening up of the economies and of the strengthening of export performance.

4. Model Specification and Interpretation of Results

In establishing the determinants of Intra-Industry Trade this study applies the Gravity model which is a variation of the standard gravity model used by Chidoko, *et al.*, (2006) augmented by adding an extra dummy variable for common language. The theoretical foundation of the model is the Linder hypothesis which predicts that patterns of trade will be determined by the aggregated preferences for goods within countries. Matyas and Harris (1998) observed that the gravity model has performed particularly much

better than other trade models in analysing trade flows between countries and therefore has been deemed appropriate for policy analysis by most economists.

In estimating the determinants of IIT, a log-linear function is employed so as to make the estimates less sensitive to extreme observations as well as to enable interpretation of the coefficient terms as elasticities. The logarithmic transformation of the estimated model is as follows;

$$\begin{aligned}\text{Log IIT}_{ijk} = {} & \beta_0 + \beta_1 \text{LogGDP}_k + \beta_2 \text{LogPCI}_k + \beta_3 \text{LogDPCI}_k + \beta_4 \text{LogTI}_{jk} \\ & + \beta_5 \text{LogEXRT}_{jk} + \beta_6 \text{LogDIST}_{jk} + \beta_7 \text{D}_1 + \beta_8 \text{D}_2 + \varepsilon_{ik}\end{aligned} \quad (4.1)$$

where;

i represents the industry.

j is the trading country, which in this study is Zambia.

k is the partner country.

The dummies are in linear form because they assume the values of zero or one.

β_0 stands for the country effects.

Definition and Measurement of Variables in the Model

Dependent Variable

In this study the dependent variable is the IIT Index as defined by Grubel and Lloyd (1975). The IIT index measures the proportion of IIT in total trade between Zambia and country *k* as a measure of the IIT_{ijk} and can be written as;

$$\text{IIT}_{ijk} = \left[1 - \frac{\sum |X_{ijk} - M_{ijk}|}{\sum (X_{ijk} + M_{ijk})}\right] * 100 \quad (4.2)$$

where;

IIT_{ijk} is the intra-industry trade index in industry i between Zambia and country *k*.

X_{ijk} are Zambia's exports of industry *i* to country *k*.

M_{ijk} are Zambia's imports of industry *i* from country *k*.

The dependent variable lies within the range of (0, 100), depending on the importance of IIT (Musonda, 1997).

Explanatory Variables and Expected Signs

EXPLANATORY VARIABLE	EXPECTED SIGN
Real Gross Domestic Product (GDP) GDP is a basic measure of a country's economic performance and is a proxy for economic size. It is hypothesised that the greater the economic size, the higher the IIT. Therefore GDP determines the level of international trade. In agreement with this, Filippini (2003) states that just as any other economic activity, trade will generally increase with an increase in the size of the economy. In this study GDP is measured in United States Dollars (USD$) and is expected to have a positive sign.	**Positive (+)**
Per Capita Income (PCI) Per Capita Income is simply the GNP per capita. It is calculated by dividing the total income of a country by its population. PCI measures the level of a country's economic development and is used in comparing levels of economic development between countries. It is believed that IIT with any given trading partner may tend to be higher as PCI of the partner country is higher since IIT is a phenomenon of countries with similar economic levels of development. In this study PCI is measured in constant base year prices denominated in United States Dollars (US$).	**Positive (+)**
Dissimilarity in Per Capita Income (DPCI) Dissimilarity in per capita income also known as the Linder term is simply the absolute difference between the PCI of the trading countries. It is defined as follows; $DPCI_{jk} = \left\lvert PCI_j - PCI_k \right\rvert$ **(4.3)** Where; $DPCI_{jk}$ is dissimilarity in per capita income between Zambia and partner country k. PCI_j is the PCI for Zambia. PCI_k is the PCI of the partner country. Linder (1961) and other researchers use dissimilarities in per capita income as proxies for consumer tastes and preferences. It has been argued that countries with similar levels of PCI will have similar tastes and will produce similar but differentiated products and therefore will tend to trade more among themselves.	**Negative (-)**

Distance (DIST) — **Negative (-)**

Distance is the geographical distance between the economic centres of trading partners; it is a proxy for transport costs. The distance used in this study is the actual road distance between capital cities of trading countries measured in kilometres. The distance between capital cities of trading countries is likely to affect the search and transaction costs. This will in turn affect the bilateral trade as larger distances tend to be associated with greater costs. Therefore, the longer the distance, the lower the IIT between countries expected.

Trade Intensity (TI) — **Positive (+)**

Trade intensity measures the degree of trade between the two partner countries. It is hypothesised that the higher the trade intensity between trading partners, the greater the IIT. Therefore, as two countries engage in more and more trade, the level of IIT is believed to increase. It is given as follows;

$$TI_{jk} = \frac{X_{jk} + M_{jk}}{GDP_j} \qquad (4.4)$$

where;

TI_{jk} = Trade intensity between Zambia and partner country k.

X_{jk} = Zambia's exports to partner country k.

M_{jk} = Zambia's imports from partner country k.

GDP_j = Zambia's gross domestic product.

Real Exchange Rate (EXRT) — **Negative (-)**

The study uses the real exchange rate between trading partners which is calculated as follows;

$$RER_{jk} = E_{jk} \times \frac{P_k}{P_j} \qquad (4.5)$$

where;

RER_{jk} = Real exchange rate between Zambia and trading partner k.

E_{jk} = is the nominal exchange rate between Zambia and trading partner k.

P_j = Zambia's GDP deflator.

P_k = GDP deflator for the trading partner.

The real exchange rate is used because it gives a measure of an economy's competitiveness in terms of exports and imports and because it also takes into account the real as well as the nominal price changes. Empirically, it has been shown that the exchange rate in gravity type studies has been significant in explaining trade variations among countries involved in trade (Do, 2010). Appreciation of the Zambian kwacha makes exports more expensive while imports become cheaper thereby discouraging IIT.	
Common Border (D1) The dummy variable for common borders represents SADC countries with a common border with Zambia. The existence of common borders represents the possibilities of IIT in response to locational advantages (Balassa and Bauwens, 1987). Therefore, Cēterīs paribus, IIT between countries which share a common border is likely to be higher than between countries which do not share a border. $D_1 = \begin{cases} 1 & \text{if countries share a common border} \\ 0 & \text{otherwise} \end{cases}$	**Positive (+)**
Common Language (D2) The existence of a common language in both trading countries is likely to enhance a flexible flow of information and lower transaction costs, therefore increase IIT between the countries. Common language is measured as a dummy variable which is defined as follows: $D_2 = \begin{cases} 1 & \text{if countries use a common language} \\ 0 & \text{otherwise} \end{cases}$	**Positive (+)**

Estimation Technique

The model is estimated using a panel data framework in Stata. The use of panel data methodology in this study can be justified based on its advantages;

- Panel data analysis allows control of heterogeneity of cross-sectional units.
- Generates more variability, more degrees of freedom and at the same time reduces multicollinearity problems thereby improving the efficiency of the econometric estimates.

It should also be noted that panel data may lead to inconsistent estimates because it may be affected by problems of non-stationary time series, however, these problems are usually of concern when the time series is lengthy. This study uses a short time series of 9 years, therefore, panel data unit root tests and panel data cointegration tests will not be carried out.

Estimation Models

There is a distinction in the literature between static and dynamic panel data models. Static panel data models include the fixed effects and the random effects methods, while dynamic panel data models are those that include a lagged dependent variable as an explanatory variable. This study, however, considers the static panel data models as opposed to the dynamic panel data models because in the dynamic panel data models, the lagged dependent variable is correlated with the error component which complicates estimation and therefore yields biased and inconsistent estimates. Static panel data regression models can be estimated using pooled estimation, fixed effects and random effects (Asteriou, 2006).

This study uses the random effects model as opposed to pooled and the fixed effects estimation methods. The reasons for this model choice are the following: Firstly, the pooled estimation method has a tendency of giving biased results by ignoring country effects. Secondly, the fixed effects estimation method does not take time invariant variables such as distance, common border and common language into account therefore rendering the Hausman Specification test inappropriate to this study. Lastly, the use of a dummy for each cross-sectional unit in the fixed effects model creates losses in degrees of freedom.

Given the results of Appendices 2 and 3, which show that the disturbance variance of the country-specific effects varies across countries (Heteroskedastic) and the errors are serially correlated over time, it is important to control for both Heteroskedasticity and Autocorrelation. Therefore, in order to obtain consistent and efficient estimators the model is estimated by Feasible Generalized Least Squares (FGLS) in the random effects model. The assumption behind FGLS is that all aspects of the model are completely specified; here that includes that the disturbances have different variances for each panel and are constant within panel. The advantage of FGLS estimation in the random effects model is that it is able to handle both Heteroskedasticity and serial correlation.

Data Type and Sources

This study makes use of secondary data for the years 1998 - 2006 and covers 21 sectors of commodities which Zambia trades with its partners in SADC. The sample contains 11 countries in SADC which include; RSA, Zimbabwe, Malawi, Botswana, DRC, Tanzania, Namibia, Angola, Mozambique, Mauritius and Swaziland. The choice of countries was influenced by the availability of data for the variables used in the model as well as whether the commodities exhibit IIT. The data was obtained from various sources including: The Department of External Trade, the Zambian Central Statistical Office (CSO), World Development Indicators and the Penn World website: www.pennworld.com. Other sources include the International Monetary Fund, World Economic outlook database, the SADC trade database and the World Bank-World Trade Indicators (2008).

5. Results and Discussions

Diagnostic Test Results

Testing for Multicollinearity using the Correlation Matrix, the results in Appendix 1A show that PCI and DPCI were highly collinear (0.88) thus the need to correct for Multicollinearity by dropping one of the collinear variables. In this study PCI is dropped and the model is run using DPCI.

Results from the likelihood ratio test for Heteroscedasticity shown in Appendix 2 indicate the presence of Heteroskedasticity across panels. Since the presence of Heteroskedasticity across panels may lead to estimates that are consistent but not efficient, it is taken into account by the use of Feasible Generalised Least Squares (FGLS).

The study tested for Autocorrelation using the Wooldridge test for Autocorrelation in panel data and the results are presented in Appendix 3. The null hypothesis of no first order Autocorrelation was rejected at all levels of significance in favor of the alternative hypothesis of first order Autocorrelation. Since Autocorrelation is regarded as a very big problem it has to be corrected (Woodridge, 2002), in this study autocorrelation is corrected by the use of FGLS.

Regression Results and Interpretation

After dropping PCI the empirical results from the regression using Feasible Generalized Least Squares (FGLS) in the random effects model are reported in Table 3. PCI is dropped in order to control for Multicollinearity. With an overall R^2 of 0.778, it shows that the model is a good fit as approximately 78 percent of the variations in the dependent variable are explained by the independent variables. The descriptive statistics in Appendix 4 show that the dependent variable had the highest level of variability in the variables with a standard deviation of 2.2, while the dummy variables had lower standard deviations of 0.45 and 0.48 for D1 and D2 respectively, meaning that the variability was lower in the variables.

Table 3: FGLS Regression Results Table after dropping PCI

Variable	Coefficient	Standard Error	Prob. > |z|
LogGDP	0.9176383	0.2270798	0.000***
LogDPCI	-0.6029963	0.3083821	0.051*
LogEXRT	-0.0971468	0.1054887	0.387
LogDIST	1.165163	0.7008871	0.096*
LogTI	0.1633474	0.1033916	0.114
D1	3.938728	0.5812316	0.000***
D2	3.969157	1.002791	0.000***
Constant	-28.06041	8.244858	0.001***

denotes significance at 10%, ** denotes significance at 5%, * denotes significance at 1%.*
No. of observations = 99, No. of groups = 11, Time periods = 9, Prob > chi2 = 0.0000, R-sq: overall = 0.7789

Using a single equation model as specified in equation 5.1, the results show that after dropping PCI all the variables are significant with the exception of LogEXRT and LogTI. LogEXRT and LogTI have the expected signs however. The empirical result of LogEXRT suggests that fluctuation of the Zambian Kwacha has not supported IIT. Since exchange rate liberalization, the Zambian Kwacha as compared to other currencies has been unstable; this implies that the effect of the change in the exchange rate on imports and exports have been cancelling each other, thereby having no effect on IIT.

The study establishes the extent of the existence of IIT between Zambia and its trading partners in SADC and the estimation results reveal that economic size (GDP), dissimilarities in per capita income (DPCI), transportation costs (distance and common

border) and colonial ties (language) are significant factors in explaining IIT between Zambia and its trading partners in the SADC. The findings of this paper are consistent with other empirical studies[10] in explaining IIT using the gravity model.

GDP is found to be statistically significant at 1 percent and positively related to IIT, which suggests that the larger the size of the economy the larger the IIT to be conducted. The results show that an increase by 1 percent of Zambia's trading partner's GDP will increase the proportion of IIT between that trading partner and Zambia by 0.91 percent. The intuition behind this pattern is that, the larger the size of the economy, the larger the opportunities for production of differentiated goods under conditions of economies of scale and therefore the greater the demand for foreign differentiated goods in these economies. This leads to larger opportunities for trade in these goods. Zambia has shifted its trade from the European Union (EU) and Association of South East Asian Nations (ASEAN) to countries in the SADC as these countries have similar economic structures and therefore produce and trade in similar but differentiated goods (TIPS, 2008). This has led to increased production and trade in the economies for instance the increased trade flows between Zambia and RSA that have been recorded in recent years. Since RSA is a large economy, the opportunity to produce differentiated goods under economies of scale is large and therefore its demand for foreign differentiated goods from Zambia has been high leading to increased IIT between the two countries. This finding is in line with the findings of Balassa (1986) and those of Clark and Stanely (1999).

The Linder hypothesis states that countries with similar levels of PCI will have similar demand structures and will produce similar but differentiated products and therefore trade more among themselves. The Linder term in this study which is represented by Dissimilarities in Per Capita Incomes between Zambia and its trading partners is found to be consistent with the Linder theory. DPCI is found to be weakly significant and negatively related to IIT, which generally suggests that as countries become similar in their income levels, IIT becomes more pronounced. The results show that a 1 percent increase in the DPCI of trading partners will reduce the proportion of IIT by 0.60. This result shows the wider the gap in the resource endowments or demand structures of trading partners the lower the IIT. Therefore economies which share a lot in common economically will conduct more IIT as compared to those that have little or nothing in common. A study by Ekanayake (2001) shows that if PCI is interpreted as

[10] Balassa (1986), Clark and Stanely (1999), Ekanayake (2001), Chidoko, et al., (2006) and many others.

an indicator of demand structure, a greater difference in PCI implies that demand structures have become more dissimilar which indicates that the potential for IIT decreases. The explanation to this is that, for trade to exist between two countries there must be in each country a demand for differentiated products produced by the other country. Therefore, when the gap between the PCIs of the two trading partners widens, the scope of IIT tends to lessen. This finding conforms to the findings of Balassa (1986).

The estimated coefficient for DIST is found to be weakly significant and positively related to IIT. The positive sign indicates that Zambia's IIT is more pronounced with countries that are geographically further from it. This result is not in conformity with the earlier expectation that long distance discourages IIT and is in contrast to Balassa (1986) who argued that IIT will tend to be greater when trading countries are geographically close to each other. The major explanation to this could be attributed to the fact that despite the large geographical distance between Zambia and RSA, Zambia tends to conduct more trade with RSA which is further away as compared to other countries which are geographically closer. Being a landlocked country, Zambia's cheapest mode of conducting trade is through overland transportation, in particular road transport. Therefore this result could be influenced by the large trade volumes between Zambia and RSA which could be as a result of the good road infrastructure between the two countries.

In line with the findings of Grubel and Lloyd (1975) who suggested that in sharing a common border, IIT may take place in products that are functionally homogenous but differentiated by location. This study reveals that the estimated coefficient for common border is strongly significant and has the anticipated positive sign. The result shows that countries that share a common border tend to trade more than those that do not because the geographical distance between the two countries sharing a border will be relatively shorter. This in essence means that transport costs will be reduced significantly if Zambia conducts more trade with countries geographically close to her as compared to countries geographically further from her. However, for this result to have intuitive appeal there should be economic complementarity between the two trading partners involved in trade. Countries in SADC usually lack complementarity and this could be attributed to the dominance of one or two commodities in the export baskets of partner SADC countries. This finding however, shows that there exists economic complementarity between Zambia and its trading partners in SADC.

The language dummy is found to be strongly significant and has the expected positive sign. The language dummy represents the 11 SADC members used in this study with colonial ties to Zambia. The language dummy essentially indicates how colonial ties influence the magnitude of IIT. The result suggests that the seven (7) countries used in this study that have English as their official language conduct more IIT as compared to the four (4) non-English speaking countries in this study. The explanation to this could be that the existence of common language will contribute to freer information flows (Balassa and Bauwens, 1987, Stone and Lee, 1995) and therefore is expected to enhance IIT. This finding is consistent with the findings of Ekanayake (2001).

6. Summary and Conclusions

Summary of Results

The main objective of the study was to establish the extent of the existence of IIT between Zambia and its trading partners in the SADC region and to identify the determinants of IIT between Zambia and its trading partners in the SADC. In a panel data framework the study used the Feasible Generalized Least Squares in the random effects model to estimate the gravity equation covering a period of 9 years from 1998 to 2006. Although the gravity model has been criticised for being ad hoc and lacking theoretical foundation, this study reveals that it is an important empirical tool in explaining trade flows as it has been able to evaluate the existence of IIT between Zambia and its trading partners in SADC as well as to establish the determinants of this trade.

The empirical results establish the extent of the existence of IIT between Zambia and her trading partners in the SADC and reveal that apart from the common gravity equation variables (GDP, PCI and DIST), IIT between Zambia and her trading partners in SADC is also determined by other variables such as DPCI, common border and common language. The results further reveal that GDP, DIST, Common Border and Common Language have a positive impact on IIT, while DPCI depresses it. EXRT and TI, however, seem to have no effect on IIT between Zambia and its trading partners in the SADC as they are found to be statistically insignificant although with the anticipated signs.

Conclusion of the Study

Global trends reveal that IIT has gained ground in world trade and in this regard Zambia has not been an exception. Over the years, Zambia's trade with other countries in the SADC has been on the rise, trade statistics show that substantial part of the intra-SADC trade is in fact IIT. For instance in 2004, the G-L index as calculated at a four digit Harmonised System (HS) code level, revealed that Zambia's top 15 categories of products had a G-L index above 0.6 in its trade with other countries in the SADC region except South Africa (TIPS, 2007). This is surprising considering that countries in the SADC region have similar economic and productive structures (except RSA) therefore tend to produce and trade in similar but differentiated goods within the same industry.

The contributions of this study can be stated as follows; Firstly, the results suggest that IIT between Zambia and its trading partners increases, the larger the economic size (GDP) of a country. This means that economic growth will strongly affect trade relationships, that is to say IIT between Zambia and its trading partners in SADC is likely to expand as the economies become larger. Secondly, the results show that similarities in per capita income is a very important aspect in increasing IIT between Zambia and its trading partners in the SADC. Therefore, if Zambia is to increase IIT and maximize her gains from this kind of trade, she has to engage more in trade with countries with similar per capita incomes. Thirdly, in order to expand IIT, Zambia has to trade more with her neighbours and this is evident from the large and significantly positive effect of the coefficient of the common border variable. Fourthly, historical ties have been found to have a very important role to play in expanding IIT between Zambia and its trading partners in SADC. Although the results suggest that Zambia should engage more in trade with other former British colonies because of the easy information flows. Doing so, however, would limit Zambia's trade within the region and thereby affect IIT considering the fact that there has been increased trade activity in countries like; Angola, DRC, Tanzania and Mozambique which are not former British colonies.

While many studies[11] on developing countries have found the exchange rate to be a significant factor in explaining IIT, this study however finds that in the case of Zambia, the exchange rate though having the anticipated sign is insignificant. This suggests that

[11] E.g. Chidoko, *et al.* (2006), Do (2006), Simwaka (2006)

the exchange rate has not supported IIT. This finding can be explained by the fact that the Zambian Kwacha has constantly been appreciating and depreciating ever since it was liberalized. Currency appreciation causes exports to be more expensive and imports to be cheaper while currency depreciation causes imports to be more expensive while exports become cheaper. Therefore, exchange rate instability does not support IIT because the effects of the change in the exchange rate on imports and exports tend to cancel each other out. In this regard the real exchange rate cannot be used as a determinant of IIT in a country with an unstable exchange rate.

In addition, the study finds distance to be a significant factor in explaining IIT. This means that the distance between trading centres is a very important factor in explaining trade.

Lastly, for a very long time IIT has been perceived to be a feature of developed countries however, this study shows that IIT is a feature of both the industrialized countries as well as developing countries; this finding is confirmed by the significance of the dissimilarities in per capita income (DPCI) variable.

Policy Implications

Trade is considered as a very important aspect in the economic performance of a country. It is for this reason that it is important to investigate IIT, for this may be an area where substantial benefits could be reaped if properly nurtured. Therefore, there is need for policy to be aimed at expanding it in order to improve a country's economic prospects. The results reveal that IIT does in actual fact exists, therefore since this trade is beneficial to the country, there is need to direct efforts to expand this form of trade. This can be achieved through paying particular attention to the determinants of IIT as established by the gravity model in this study. Firstly, economic size (GDP) has been found to be one aspect that can increase IIT. Therefore policy must be aimed at encouraging economic growth and this can be achieved through expanding the production sectors of the economy. Expansion of the productive sectors entails an expansion in the production of goods and services and therefore leads to an increase in income (Gross Domestic Product and Per Capita Income). In order to achieve this, this paper recommends that policy makers put in place stabilization policies and an attractive business environment which will attract Investment and will therefore contribute to a higher growth rate in the economy. This study also recommends that Zambia promotes and maintains good relations with its neighbours as well as countries

with which it has historical ties with. This has potential benefits in terms of reducing transaction costs because of closeness. The other recommendation is that Zambia enters into bilateral trade agreements with her neighbours as this would result in the elimination of trade barriers and therefore enable reciprocal non-trade barrier trade between her and her neighbours. Distance is also an important determinant of IIT between Zambia and its trading partners in the SADC. As many countries in the SADC are landlocked; one of the most important features of trade in the SADC is that it is dominated by road transport. Road transport is Zambia's main link to other countries in the SADC, therefore improvement in the road infrastructure as well as reduction in the delays at border posts would be necessary steps to the expansion of IIT within the region. Improvement of the road network is particularly beneficial to the country in terms of increased export earnings to countries like DRC, Angola and Zimbabwe which have in recent years experienced growing demand for consumer goods.

A key objective of the Government is to reposition the economy with a view to take advantage of the rebound in global economic activity and trade. The promotion of trade is integral to Zambia in its efforts to find additional regional and international markets for its products. Zambia has continued to maintain a liberal trade policy regime aimed at enhancing productivity and competitiveness of Zambian products in both the domestic and international markets. The main objective of Zambia's trade policy is to contribute to economic growth and national development through the creation of viable and competitive export sectors in the economy:[12] this led to the formation of the Zambia Development Agency (ZDA). The policy seeks to achieve this objective by directing resources to the most productive areas for export production, therefore, this study can act as a guide to policy makers as they formulate National Development Plans (NDPs) in terms of ways of fostering economic growth and development in Zambia through the promotion of IIT with its trading partners in SADC.

[12] This objective has been enshrined in key national policy documents such as the Commercial Trade and Industrial Policy (CTIP), the Fifth National Development Plan (FNDP) and the Vision 2030, which articulate the country's long term development objectives (Katotoka, 2010)

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Appendices

Appendix 1: Correlation Matrices

Appendix 1A: Correlation Matrix with LogPCI

(obs=99)

	LogIIT	LogGDP	LogPCI	LogDPCI	LogEXRT	LogDIST	LogTI	d1	d2
LogIIT	1.0000								
LogGDP	0.2071	1.0000							
LogPCI	0.0737	0.3806	1.0000						
LogDPCI	0.0353	0.3372	0.8836	1.0000					
LogEXRT	0.0229	0.0896	0.4185	0.3502	1.0000				
LogDIST	0.3477	0.0846	0.2515	0.2894	0.3377	1.0000			
LogTI	0.2658	0.3671	0.0862	0.1580	0.0737	-0.0531	1.0000		
d1	0.3183	0.2346	0.5493	0.5338	-0.1208	-0.332	-0.4139	1.0000	
d2	.1755	0.0697	.5712	0.5841	0.4506	-0.3624	0.3568	-0.4629	1.0000

Appendix 1B: Correlation Matrix after droping LogPCI

(obs=99)

	LogIIT	LogGDP	LogDPCI	LogEXRT	LogDIST	LogTI	d1	d2
LogIIT	1.0000							
LogGDP	0.2071	1.0000						
LogDPCI	-0.0353	0.3372	1.0000					
LogEXRT	0.0229	0.0896	0.3502	1.0000				
LogDIST	-0.3477	0.0846	0.2894	-0.3377	1.0000			
LogTI	0.2658	0.3671	0.1580	-0.0737	-0.0531	1.0000		
d1	0.3183	-0.2346	-0.5338	-0.1208	-0.3321	-0.4139	1.0000	
d2	.1755	-0.0697	0.5841	0.4506	-0.3624	0.3568	-0.4629	1.0000

Appendix 2: Likelihood Ratio Test for Heteroscedasticity

Cross-sectional time-series FGLS regression

Coefficients: generalized least squares
Panels: heteroskedastic
Correlation: no autocorrelation

Estimated covariances	= 11	Number of obs	= 99
Estimated autocorrelations	= 0	Number of groups	= 11
Estimated coefficients	= 8	Time periods	= 9

R-sq: overall = 0.7789
Wald chi2(7) = 87.79
Prob > chi2 = 0.0000

LogIIT	Coef.	Std. Err.	z	P>|z|	[95% Conf	Interval
LogGDP	1.00137	.1674127	5.98	0.000	.673247	1.329493
LogDPCI	-.5015895	.1545782	-3.24	0.001	-.8045572	-.1986219
LogEXRT	-.0707713	.0477486	-1.48	0.138	-.1643568	.0228143
LogDIST	1.152163	.3801933	3.03	0.002	.4069975	1.897328
LogTI	-.0029988	.1091277	-0.03	0.978	-.2168852	.2108876
d1	3.367093	.4506935	7.47	0.000	2.48375	4.250436
d2	3.737611	.5863582	6.37	0.000	2.58837	4.886852
_cons	-29.98961	4.666829	-6.43	0.000	-39.13643	-20.8428

Appendix 3: Wooldridge Test for Autocorrelation in Panel Data

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F(1, 10) = 34.691
Prob > F = 0.0002

Appendix 4: Descriptive Statistics

	Obs	Mean	Std. Dev.	Min	Max
logiIt	99	1.877805	2.229945	-7.145463	4.268123
loggdp	99	22.67257	1.206293	20.89851	26.2645
logdpci	99	6.597309	1.321443	3.870002	8.521646
logexrt	99	5.132428	1.970125	.375566	11.64926
logdist	99	7.130415	.5129907	6.075786	8.049336
logti	99	-.5430343	2.295744	-6.93765	3.236551
d1	99	.7272727	.4476283	0	1
d2	99	0.6363636	.4834938	0	1