South Africa's Trade with G20 and Top ten African Countries-Applying Gravity Model

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ABSTRACT: In this paper, we have used the Gravity model to evaluate the factors or parameters, which eventually influence international trade activities of South Africa based on panel data. We have utilized data of nineteen countries and European Union (Austria, **Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Greece**, Hungary, Ireland, Latvia, Lituania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden) accounting for the G20 nations and top ten African countries namely Nigeria, Egypt, Algeria, Morocco, Sudan, Kenya, Angola, Libya, Tunisia between the time period 2007 to 2016 and the data has majorly been collected from International Trade Centre (ITC), and United Nations Conference on Trade and Development (UNCTAD). The estimated results affirm that there is a definite influence of economic size, market size and distance as they are important determining factors for trade flows in South Africa.

KEYWORDS: G20 Countries, South Africa, Gravity model, trade potential

1. Introduction

The Economy of South Africa is the second largest economy after Nigeria in the continent accounting for almost thirty-five percent of Africa's Gross Domestic Product (GDP). South Africa is one of the fastest growing economies of the world and since 1996, at the end of over twelve years of international sanctions, South Africa's GDP has practically triplicated to $400 billion, and foreign exchange reserves have augmented from $3 billion to virtually $50 billion generating a differentiated economy. The nation is one of the G20 countries of the world and the only African member in the list. Mining has been the key behind the memoir and development of South Africa that is Africa's one of the most advanced economy. Discovery of a diamond in the banks of the orange river by Erasmus Jacobs in 1867 was the driving force behind large-scale mining and the succeeding unearthing and operation of the Kimberly pipes a few years later. The Witwatersrand gold Rush deserves a special mention in activating the economy of South Africa in 1886. South Africa is one of the leading mineral processing and mining countries in the world and represents sixty percent of its exports. Despite the numerous positive economic achievements since 1994, South Africa has struggled to entice substantial foreign direct investment (FDI). The

situation may have commenced to amend, however, with the inflow of the largest single FDI into South Africa in 2005. The 2010 year sighted for two multi-billion dollar deals by HSBC and Wal-Mart.

The major Strengths of the country are natural resource base, which includes gold, platinum, chrome, manganese, diamonds etc. Economic size stimulates regional dominance and judicial and business environments are aligned with westerns norms. The other strengths include sound monetary and fiscal policies and good strategic relations with IFI's etc. The country has certain weaknesses like structural problems, which include unemployment, skewed incomes, poverty, weak educational standards etc. Unlike old times where high dependence of mining was there, currently the dependence of the nation in mining is less (13% OF GDP) But still vulnerability to commodity prices fluctuations exist.

The countries have been distributed into four main categories where the G20 has been distributed in three, namely the top three countries of the world, the European Union and the rest of G20. The data represents economic variables of twenty-nine countries and EU divided in four groups:

Group I: Top three countries in the world-USA, Japan and China.
Group II: Rest of the G20 Countries
Group III: European Union
Group IV: Top ten African Countries.

This paper is further divided into four sections:

Section 2: Reviews Theories of the model as a conventional base of the study
Section 3: Provides overview of trade between South Africa and other partner countries taken in the study
Section 4: Elucidates Methodology and Practical results
Section 5: Conclusion.

1.1 Overview of South Africa's Foreign trade

Major global trading partners of South Africa include Germany, the United States of America, Spain, China, United Kingdom and Japan. The top five countries in the world from whom South Africa imports the maximum are China (18%) followed by Germany (10%), Saudi Arabia (7%), US and India (6%) respectively. The top five countries to which South Africa exports the most are China (16%) LDC's in Africa (10%), U.S.A (7%), U.K (7%) and India (6%). Chief exports include fruits, gold, diamonds, metals and minerals, wool and sugar. South Africa imports machinery and transportation equipment's, which account for chief commodities of import and also constitute to one third of total imports. Other major imports include petroleum and manufactured goods as a whole. South Africa is the 33rd largest export economy in the world (OEC 2016) with a trade amount of more than 142 Billion USD in 2016.

2. Review of literature and Theoretical framework

The Absolute and Comparative Advantage theory

The first ever proposed theory of trade was from the father of Economics Adam Smith who in this famous book, "The Wealth of nations" mentioned that countries must specialize in production of those commodities for which they have an absolute advantage. This theory formed a base for international trade yet failed to prove many aspects of International Trade which in turn was proposed by the famous English economist David Ricardo who came up with the theory of comparative advantage of trade. Comparative advantage theory mainly propounded the concept which clearly stated that a nation may gain from trade by exporting

commodities for which it has the maximum comparative advantage in productivity and import commodities for which it has the least comparative advantage (Lindert 1991).

The Hecksher Ohlin Model
Eli Hecksher and Bertil Ohlin, Swedish Economists who added that capital and land together with labor and other essential factors of production further extended the theory David Ricardo. Hecksher Ohlin model states that a nation will export commodities that use its plentiful factors intensively, and import goods that use its insufficient factors intensively. "A capital-abundant country will export the capital-intensive good, while the labor-abundant country will export the labor-intensive good," a two factor case.

New Theories and Gravity Model
It is true that the classical theories clearly stated that only the countries who have different factor endowments can gain maximum from trade which definitely fails to explain the huge trade delta between countries who have close to similar factor of endowments and intra industrial trade which essentially dominate the trade of developed nations. Herein emerged the scope of new theories of trade.

Recently the Gravity model has been used to illustrate the bilateral trade between countries. Gravity model is a workhorse employed by economists to analyze trade flows between countries. Based on the Newtonian concept, they seek to describe patterns of trade between two countries in terms of their size and the distance between them (Behar 2009, 439). The Newton's law of Gravitation states that the gravitational attraction between objects or particle is directly proportional to their masses and inversely proportional to the square of distance between their centers.

The Gravity Model is represented as follows:

$$G_{ij} = C \frac{Y_i Y_j}{D_{ij}^2} \quad \ldots\ldots(I)$$

G_{ij} is the Gravitational attraction
M_i and M_j are the mass of two objects say i and j
D_{ij} is the Distance between two objects
C is the constant

A Dutch Economist Timbergen applied this model for the first time and since Timbergen in 1960's many economists have studied about bilateral trade between nations with the help of the gravity model. The model applied was very clear as to the trade flow between two nations was considered to be the dependent variable and the GDP which was considered as economic size and distance between the two countries was considered to be the independent variables in the study. The estimates showed positive impact of economic size and negative impact of distance on the dependent variable of the study.

The Gravity model utilized by Krugman and Obsfeld in International Trade is as follows:

$$T_{ij} = X \frac{Y_i Y_j}{D_{ij}^2} \quad \ldots(II)$$

T_{ij} -Total trade flow from origin country I to destination country j.
Y_i - Economic size or Gross Domestic Product of country i.
Y_j - Economic size or Gross Domestic Product of country j.
D_{ij} - Distance between country I and j.
X - Constant

The Gravity model has turned out to be extremely popular used extensively by different scientists to determine International trade. In a research, Bac Xuan Nguyen (2010) uses gravity model to evaluate exporting activities of Vietnam with other countries during the 20 year period up to 2006. The independent variables are GDP, distance, average real exchange rate and dummy variable ASEAN. The results show that the value of export from Vietnam to another country increases when the GDP increases, exchange rate and the partner being in ASEAN and the distance negatively affects exporting value.

In a working paper, Bhattacharya and Banerjee (2006) applied the gravity model to the data of India's yearly trade with her trade parameters in the second half of the twentieth century. The conclusions were very clear and decisive. According to the core Gravity model India's direction of trade fluctuated by about forty three percent after the second half of the twentieth century. India's trade responds more than proportionally to distance and less than proportionally to size. The research was mainly focused on the second half of the twentieth century and the colonial heritage was still found to be an important determinant of direction of India's trade. India traded more with the developed countries rather than the underdeveloped. Yet the size of the trading partner countries had more impact than the level of development in determining trade between them and India.

In his research, Thai Tri Do (2006) examined the Bilateral Trade between Vietnam and twenty-three European Union Countries from the years 1993 to 2004. The empirical results indicated that the market size, economic size and exchange rate of the European Union countries and Vietnam played a major role in Bilateral trade. Distance and History according to the study does not have significant impact on the bilateral trade. The study further calculated the trade potential between Vietnam and the twenty three chosen nations and conclusion drives to the result that there is room for growth of trade.

Montanari (2005) and Rahman (2003) have applied augmented gravity model to find the bilateral trade by measuring economic mass of exporting and importing countries by GDP, GNP (Gross National Product), GNP per capita and GDP per capita. They also found and propounded that countries with lower income tend to trade less and those with higher income tend to trade more. Rahman further determined that trade in Bangladesh with its major trade partners depended on economic size, distance, openness and GNP per capita.

Martinez et al. (2004) classify export sectors in terms of their sensitivity to distance and economic mass and further they have applied gravity model to point out the commodities enjoying export strength. Blomqvist (2004) applied Gravity model to evaluate trade of Singapore and concluded that GDP has a positive and distance has a negative impact on the trade flows of countries. Tang (2003) finds there was a trade decrease with ASIAN (Association of Southeast Asian Nations) and NAFTA (North American Free Trade Agreement) after the integration of the European Union. In a research Thornton and Goglio (2002) proved the importance of distance and economic size in bilateral trade for ASEAN. In fact they also proved that common language plays a very important role in intra regional trade. Based on the literature framework the Hypothesis formulated are as follows: Hypothesis I , II and III:

H_{01}: There is a positive impact of economic size on Bilateral Trade

H_{02}: There is a positive impact of market size on Bilateral Trade

H_{03}: There is a negative impact of distance on the Bilateral Trade.

3. Overview of trade between South Africa and other partners

The countries have been distributed into four main categories where the G20 has been distributed in three, namely the top three countries of the world, the European Union and

the rest of G20. Panel data on the International trade has been derived from the International Trade Centre (ITC), United Nations Conference on Trade and Development (UNCTAD), World Bank (WB) and the International Monetary Fund (IMF).

The data represents economic variables of twenty-nine countries and EU divided in four groups:

Group I: Top three countries in the world-USA, Japan and China
Group II: Rest of the G20 Countries
Group III: European Union
Group IV: Top ten African Countries.

3.1 Imports and Exports of South Africa from Partner countries
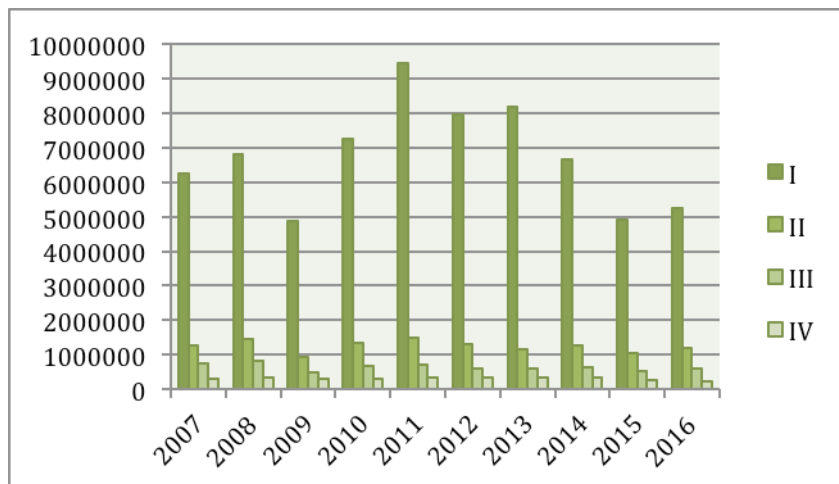
Figure 1: Imports of South Africa from Partner Countrie in US Dollar
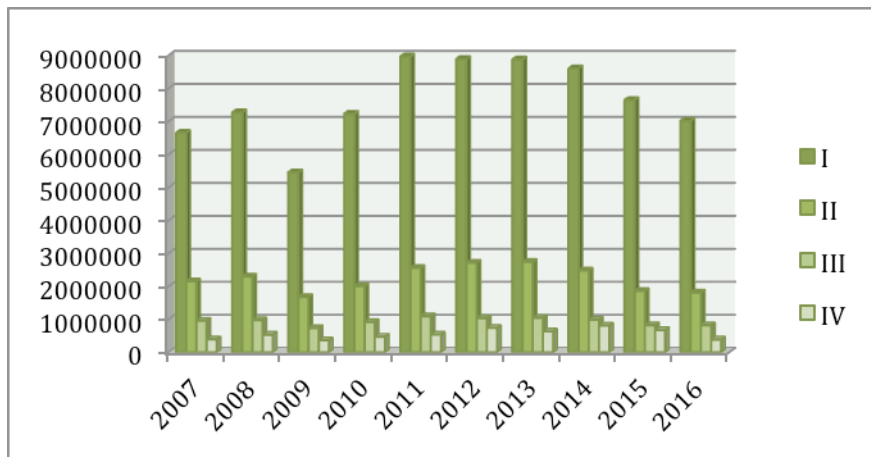
Source: ITC

In the figure as noticed section I has outperformed as well as section II which includes the other G20 countries and I, which include the top developed countries in the world, are so far the highest. The imports have decreased in the year 2009 because of economic crisis and was the highest in the year 2011. After 2014 there is marked decrease in imports of South Africa from the partner nations.

Figure 2: Exports of South Africa to Partner Countries in US Dollar

Source: ITC

In the figure as noticed section I has outperformed as well as section II which includes the other G20 countries and I, which include the top developed countries in the world, are so far the highest. The exports have decreased in the year 2009 because of economic crisis and was the highest in the year 2011. After 2013 there is marked decrease in exports of South Africa to the partner nations.

3.2 Average Share of Values of export, imports and trade as a percentage of Total Trade of South Africa with partner countries from 2007 to 2016

Figure 3: Share of values (Average) in percentages of Total Exports, Imports and Total Trade of South Africa
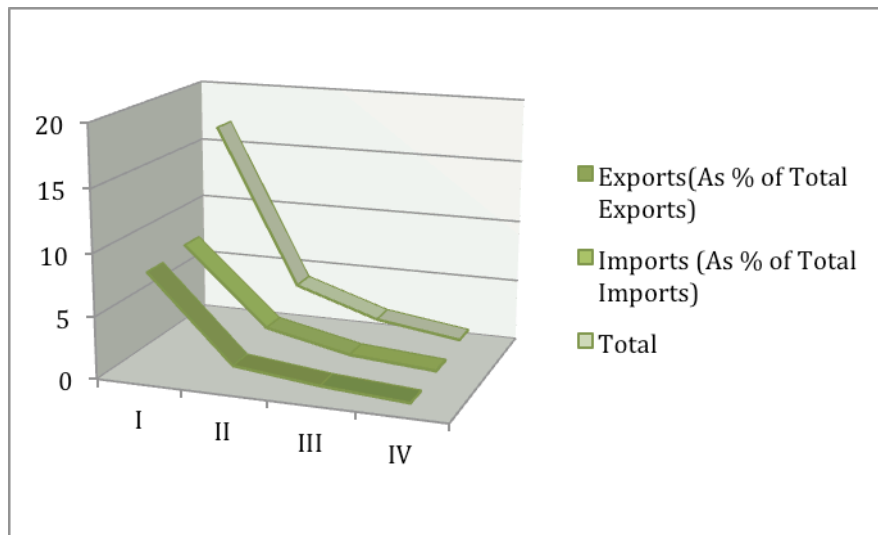
Source: ITC

The share of values of exports to countries as a percentage of total exports differs from the year 2007 to 2016 respectively. South Africa so far has exported and imported the maximum to and from the Group I countries that is China, Japan and the United State of America with an average 17.05% of total exports for the ten years time period. The average share in value of total trade for the group II nations are 4.19% and that for the group III nations are 1.95%. For group IV nations the average share in value of trade for these ten years is 1% respectively.

3.3 Top 15 Trading Partners of South Africa among the chosen countries in 2007, 2012 and 2016

Table 1: Highest trade values Top 15 countries (from highest to Lowest) with South Africa in 2007, 2012 and 2016

In US Dollars

2007			2012			2016		
Country	Trade Value	Group	Country	Trade Value	Group	Country	Trade Value	Group
Germany	12544320	II	China	24532349	I	China	22818038	I
China	12494914	I	U.S.A	15803964	I	Germany	15957570	II
U.S.A	12478077	I	Germany	14708263	II	U.S.A	12038018	I

Japan	10133034	I	Japan	10426697	I	India	8528426	II
U.K	7433378	II	India	7760778	II	Saudi Arabia	8392436	II
Saudi Arabia	3540889	II	U.K	7420026	II	Japan	7527637	I
France	3376108	II	Saudi Arabia	4804795	II	U.K	6499941	II
India	3161069	II	Nigeria	4504878	IV	Italy	3788219	II
Italy	3038742	II	Italy	4047837	II	Korea	3188479	II
Nigeria	2455593	IV	Angola	3803472	IV	France	3064631	II
Angola	2417955	IV	Korea	3775180	II	Nigeria	2508262	IV
Australia	2361427	II	France	3660670	II	Australia	2078624	II
Korea	2296905	II	Australia	2478681	II	Brazil	1985587	II
Brazil	1762022	II	Brazil	2455477	II	Angola	1834350	IV

Source: ITC

Table 1 illustrates the total trade values of the top fifteen countries who have gained with maximum with the maximum trade values with South Africa. Three specific years were chosen to represent the transition of values from the year 2007 too 2016 respectively. Among the top five China, U.S.A. and Germany are common and Japan, India and Saudi Arabia make their appearances in the rest of the two spots in these three chosen years.

4. Statistical Variables and Methodology

Here we have applied a variation of the Krugman and Obsfelt Gravity model in case of South of South Africa. In the original model only GDP and Distance were taken as independent variable but in this case we have just added population in order to see the impact of market size of partner nations on trade flows.

The growth model is estimated in the logarithmic form:

$$\text{Log } T_{ijt} = \alpha_0 + \alpha_1 \log Y_{it} + \alpha_2 \log Y_{jt} + \alpha_3 \log N_{it} + \alpha_4 \log N_{jt} + \alpha_5 \log D_{ij} + e_{ijt} ..(\text{III})$$

Here i denotes South Africa and j denotes rest of the partner countries considered in the study.

T_{ijt} – Total trade flow from origin country I to destination country j in time t.

Y_{it} – Economic size or Gross Domestic Product of country i. in time t

Y_{jt} – Economic size or Gross Domestic Product of country j in time t

N_{it} – South Africa's population in time t.

N_{jt} – Population of country j in time t.

D_{ij} – Distance between country I and j.

The time period that is small t in this study is considered from 2007 to 2016 (ten years). The T_{ijt} is nothing but the annual trade of South Africa with the partner countries from 2007 to 2016 respectively which has been considered as the dependent variable. Data from the year 2007 to 2016 has been collected from the International Trade Centre (ITC).

The Gross Domestic Products of partner countries give an estimate of their economic sizes of the partner nations and the GDP of South Africa gives the economic size and power of the country. In this model both are taken as independent variables and data has been collected from UNCTAD (United Nations Conference on Trade and Development). The first hypothesis formulated is to expect a positive impact of GDP as an independent variable on trade flows which is the dependent variable.

The other independent variable taken into consideration is the population which gives an estimate of the market size of both partner countries and South Africa. The population Data has also been collected from annual data center of UNCTAD. The second null hypothesis formulated is to expect a positive impact of market size as an independent variable on trade flows which is the dependent variable.

Another independent variable is the distance which is calculated as a representative of transportation costs. The data from the year 2007 to 2016 is calculated in miles from the Great circle distance between northern and southern points of grouped countries. The third null hypothesis is expected to cause a negative impact on the dependent variable.

4.1 Beginning the Empirical Analysis: Descriptive Statistics, BP Test and Estimation results

Table 2: Descriptive Statistics

No.		Description	Mean	Median	Standard Deviation	Sample Variance	Range	Minimum	Maximum	Count
1	T_{ijt}	Trade Flow	1118353.15	1821674.2	9.24	1759519335	859652.77	31	26649236	280
2	Y_{it}	GDP of South Africa	337167.65	333710.24	1.13	13.77	1.45	286769.02	416417.01	280
3	Y_{jt}	GDP of Partner Countries	7035806.03	1032121.3	5.17	148320.51	1032.66	18137.12	18729509.5	280
4	D_{ij}	Distance between South Africa & Partners	5079.9	5097.73	1.55	36.02	7.38	1300.07	9607.5	280
5	N_{jt}	Population of Partners	73089.1	64053.65	3.33	2175.15	235.07	5970.36	1403500.36	280
6	N_{it}	Population of South Africa	52735.3	52629.58	1.03	10.92	1.12	49887.18	56015.47	280

Source: Calculated from the available data

However, we have used the regression analysis to see the impact of the independent variables on the dependent variable, which is trade of South Africa with the chosen partner nations in our study. There has been traces of heteroscedasticity present in the data as well as multicollinearity which is a common statistical phenomena in the gravity model assessment. The Breush Pagan test is used to detect the presence of heteroscedasticity in the data and thus to control it the feasible generalized least square method has been used to resolve the problem.

Hypothesis IV:

H_{04}: Variance of the residuals are constant (homoscedastic).

Table 3: Breaush Pagan test (BP Test)

Breusch Pagan Test	
F	*P-value*
5.311018257	0.00001

The result is statistically significant at 1% level of significance and hence we can reject the null hypothesis and ensure the presence of heteroscedasticity in the test. However the FGLS model is applied to further evaluate the coefficients of study to empirically enumerate impact of the independent variables on the dependent so far.

Table 4: Estimation Results

Estimation results		
Independent Variables	*Variables*	*Coefficients*
Intercept		32.0505976
GDP South Africa	Y_i	0.27444471
GDP Partner Countries	Y_j	1.15792256
Distance Between I & J	D_{ij}	-1.0421311
Population of Partner Countries	N_j	0.08817951
Population of South Africa	N_i	2.66449

Source: Calculated from the available data

The results evaluate that the economics size, market size and distance influence the bilateral trade of South Africa with its partner nations. The R square value is 63 % showing variation in Y as explained by our X's or in other words there is sixty three percent variation in trade of South Africa as explained by our independent variables which are GDP, Population of own and partner countries and Distance between them.

Results further show the variation South Africa's bilateral trade is influenced by definitely the gross domestic product (GDP) that is the economic size of the partner countries and the impact is pretty intense. The coefficient value is 1.16, which means that is there is 1% change in the economic size, or GDP of the partner countries there will be a 1.16% positive change in trade between that partner country and South Africa. So if the GDP of the "j" country increases by 1%, its trade with South Africa will increase by more that 1%. There is a positive change in case of South Africa's trade and its own economic size respectively. If the GDP of South Africa changes by 1% , its impact on its trade will be 0.27% respectively. We thus accept the first hypothesis that there is a positive impact of economic size (GDP) on the bilateral trade flows of South Africa with its partner nations.

Distance has a negative impact on the bilateral trade of South Africa with the partner nations. The impact percentage is -1.04% which is significantly proving a basic characteristic of Gravity model which assumes that there is a negative impact of distance as an independent variable on the bilateral trade flows. The results further show that there is a positive impact of market size or population as an independent variable on the dependent variable that is bilateral trade of South Africa. If population or market size of partner country changes by 1% the trade will change by .08% but s positive similarly if population of South Africa increases by 1%, the trade activities will increase by almost 2.66% respectively.

The results obtained from this study definitely have similarities of other studies evaluating the impact of such variables on the trade activities of other nations using the Gravity Model. Hence it is true that economic size and market size effectively influence the commercial activities and necessarily create high demands for imports. All studies of gravity model estimation have successfully proved the negative impact of geographical distance in determining bilateral trade between nations. This study does not prove to be an exception in recreating the same result.

4.2 Estimating the Trade Potential and calculating the speed of convergence

It is true that usually in general countries fail to exploit the maximum potential of trade due to in numerous barriers and their trade potentials are either underused or overused. There is an empirical method of estimating the potential trade between two nations. On comparing the potential trade with the actual trade we can find the difference in trade which and the gap between potential and actual. Upon calculating the gap we can conclude whether the trade is overused or underused. Usually, if the result is negative then the potential trade is less than the actual trade signifying overuse and positive result will signify greater potential trade than actual hence it will mean that there is underuse of trade.

Further, the speed of convergence method which will calculate the convergence or divergence of trade will provide more accuracy for further estimating the potential level of trade between countries.

Speed of Convergence $= \dfrac{Average\ Growth\ of\ Potential\ Trade}{Average\ Growth\ of\ Actual\ Trade} * 100 - 100 \ldots$ **(IV)**

Difference: (ΔT) = Potential Trade – Actual Trade…. (V)

The average growth rate of potential trade has been calculated between individual countries and South Africa in order to see the result depicts convergence or divergence. The difference between actual trade and potential trade has also been calculated and together with the speed of convergence they can significantly depict the most potential trade partners of South Africa. In the study further we have extended our analysis with nineteen G20 countries excluding 24 European Union nations and top 10 African countries excluding South Africa. The list of G20 countries separately gas four of the G20 countries and the rest of the 24 countries are taken as one in the analysis before as a set of European Nations. But further in this study to analyze the trades potential between two nations we have eliminated the European Union to avoid the process to be lengthy and tedious. However, if the 24 nations are taken as one (EU) the analysis of Trade potential will not justify the study. Hence we will continue the analysis with nineteen and top ten African countries excluding South Africa from both.

Further with the help of the data and the formulae we have calculated the Speed of Convergence (SC) and the difference between potential trade and actual trade (PT-AT) which is denoted as ΔT. The average growth rate of potential trade has been calculated along with the average growth rate of actual trade. For some countries the average potential growth rate of potential trade is greater and for some the average potential growth rate of trade is lesser than the actual. For some countries the potential trade is greater than the actual trade and in that case ΔT is greater than zero and in some cases the potential trade is less than or in other words the actual trade is greater than the potential trade and then ΔT is less than zero. Table 5 represents calculations of Speed of Convergence (SC) and the

difference between Potential Trade and Actual Trade between partner countries and South Africa.

Table 5: Evaluation of Trade Potential: Convergence and Divergence

Convergence			Divergence		
Country	SC	ΔT=PT-AT	Country	SC	ΔT=PT-AT
Algeria	-174.0539437	29170.5082	Angola	-97.421313	-2200292.98
Brazil	-153.7273964	1955257.107	Argentina	-62.989418	-340631.401
Egypt	-89.68242634	238664.0551	Australia	-207.16216	-592331.396
France	-1642.832718	1712713.968	Canada	-913.75047	-212159.099
Italy	-354.2030359	534622.3926	China	-3.6501810	-5117852.30
Libya	-70.74548741	13321.7529	Germany	-316.78718	-7554263.78
Mexico	-152.173909	1444446.963	India	-91.499444	-1970721.32
Morocco	-112.3121514	14376.32044	Indonesia	-47.644884	-61787.6796
Russia	-184.3595072	3635273.479	Japan	-120.15498	-2660676.42
Sudan	-151.0816675	39120.75182	Kenya	-445.79683	-642367.242
Tunisia	-166.110826	12271.573	Korea Republic	-146.53076	-316443.184
Turkey	-140.0161468	426301.0081	Nigeria	-108.82010	-3311381.34
U.K	24269.20817	-2359134.231	Saudi Arabia	-112.94871	-4638272.172
U.S.A	-707.279035	11441874.49			

Source: Calculated from the available data

The analysis is divided the partner countries into two groups namely with whom South Africa shares convergence and with whom it shares Divergence.

For countries with whom South Africa shares the condition of divergence there may be overtrade and in our study there are 13 such countries with whom the condition is that of divergence. Its definitely true that there is over trade conditions with China, Germany, Japan etc with all the countries in our study with whom South Africa shares the condition of divergence. In our study the case of restricted trade does not exist.

For the countries with the condition of convergence there is a lot of potential unexploited in terms of trade. In fact the countries which seem to be the most potential partners have more magnitude of speed of convergence and less magnitude of difference in trade. The lesser the difference in trade and the higher speed of convergence more quickly the actual trade numbers will reach the potential trade numbers. South Africa has convergence condition with fourteen countries out of which 6 countries belong to top ten African countries as taken in the study and the rest 8 belong to G20 countries. Now we can further estimate the time of convergence by applying another formulae in order to find out the most potential partners of South Africa of trade with a lot of untapped potentials.

Time of Convergence(TC)= $\dfrac{\textit{Difference between Potential Trade and Actual Trade (ΔT)}}{\textit{Speed of Convergence (SC)}}$.(VI)

With the help of equation VI we calculate the Table 6 and the values are written accordingly from least time of convergence to most time of convergence of South Africa with partner countries.

Table 6: Countries time of Convergence

Country	Time of Convergence
Tunisia	73.8758171
United Kingdom	97.20688926
Morocco	128.0032504
Algeria	167.5946409
Libya	188.3053377
Sudan	258.9377816
France	1042.537045
Italy	1509.367053
Egypt	2661.213181
Turkey	3044.656047
Mexico	9492.080295
Brazil	12718.98928
U.S.A	16177.31323
Russia	19718.39443

Source: Calculated from the available data

The countries are in order with respect to the least possible time of convergence or in other words the countries are in order of best possible potential trade partners of South Africa with whom the trade potential is untapped. Countries like Tunisia U.K Morocco, Algeria, Libya, Sudan, France, Italy, Egypt, Turkey, Mexico, Brazil, U.S.A. and Russia have a lot of trade potential to be exploited with South Africa.

5. Conclusion

From the overview of trade activities of South Africa with G20 nations it can be concluded that South Africa trades most with the top 3 nations (as chosen in the study) China, Japan and U.S.A followed by the G20 countries. The imports and exports from and to these three countries together have been the highest yet has been decreasing since past few years. The least amount of trade carried out by South Africa was with the top ten African countries chosen in the study namely Nigeria, Egypt etc. The analysis was carried out for ten years (2007-16) respectively and it was interestingly found that the highest growth in trade of South Africa was with the top African countries and not the G20 countries.

However, the main purpose of the research paper was to determine the major driving factors or components of bilateral trade between chosen countries and South Africa. The study righteously determined the driving factors of bilateral trade to be the economic size, market size and the distance between countries engaged in trade. With the help of the Gravity model evaluated the impact of independent variables on the dependent variable, which in the study was trade flows between countries. Hence the group of countries taken was evaluated in terms of their Gross Domestic Product (GDP), their Economic Size (Population) and the distance between them and South Africa respectively.

The assumptions of Gravity model taken were simple and direct. Assumptions pointed out the existence of positive impact of economic size and market size on the bilateral trade flows between nations and negative impact of distance on the same. Data

was tested for heteroscedasticity and findings confirmed its presence hence detection aimed at removal of the same. Feasible generalized Least Square method was used to calculate ad thus with the help of regression analysis the coefficients were found to decide the impact of independent variables on the dependent variables. Hence the conclusion proclaims that there is a positive impact of economic and market size and negative impact of distance on the bilateral trade flows between South Africa and the partner countries considered, in our case G20 nd the top 10 African Nations (Highest GDP's in 2016).

Trade potential was found between the chosen nations and South Africa. The Speed of Convergence was calculated thus evaluating nations having convergence and divergence conditions with South Africa. Some big economies have showed signs of overtrade and some economies have showed that there is presence of enormous untapped potential of trade between them. Hence there is a lot of scope of improvement of trade with such countries and in future we may be able to see enhancement of trade of South Africa with them.

The study had lots of limitations especially the data was extremely limited. Of the world consisting more than 192 countries only a few were taken for the study. In future, we would like to extend the study by taking a much larger scale of data. However, we found the results were pretty interesting and might create a hope for future enhancement of trade of South Africa with these partner countries.

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