Asian Economic and Financial Review
ISSN(e): 2222-6737/ISSN(p): 2305-2147

journal homepage: http://www.aessweb.com/journals/5002

EFFECTS OF EXCHANGE RATE ARRANGEMENTS ON TRADE COOPERATION IN BRICS COUNTRIES

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ABSTRACT

This paper investigated the effects of imposed exchange rate arrangements on trade volume of BRICS countries. This study examined emerging economies, were consists of Brazil, Russia, India, China, and South Africa during the years 2001-2013 using the generalized gravity model and a two-step generalized method of moments, (GMM). The results indicated that applying different exchange rate arrangements has had significant influence on imports. Pegged (PG) and crawling pegged (CP) exchange rate arrangements had significant and positive effect on trade flow (export). Bilateral imports, improved with imposing managed floating (MF) arrangements. Free-floating (FL) arrangements have been meaningless, and a negative impact on the volume of bilateral trade (exports) between members. In BRICS countries, imposing pegged exchange rate arrangements improved bilateral trade toward export and inversely free-floating arrangements improved bilateral trade toward import.

Keywords: BRICS, Exchange rate arrangements, Regional trade corporations, Generalized gravity model.

JEL Classification: F15- F31-R10.

Contribution/ Originality

This study is one of very few studies which have investigated in the effects of imposed exchange rate arrangements on trade volume of BRICS countries using a generalized method of

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DOI: 10.18488/journal.aefr/2015.5.3/102.3.563.578
ISSN(e): 2222-6737/ISSN(p): 2305-2147

moments, (GMM). Our empirical evidence support different influence on trade by imposing different exchange rate arrangements.

1. INTRODUCTION

In the past decade, the emerging economies had a much faster growth rate compared to the developed economies, which led to a significant increase of their share in world GDP in international trade, in total foreign direct investment, and international financial markets. The economic crisis has led to relevant changes in global economic governance, especially the G20 replacing the G8 as international leader on the global stage. These changes can be interpreted as a manifestation toward a multipolar international economic order, where developing countries should have a much more significant role. Studies show that in globalization era almost 3 billion people from emerging countries such as China, India, Russia and Brazil have managed to integrate into the global market; and rise of the great powers is due to the boom of the emerging countries that seek to catch-up the advanced countries (Radulescu *et al.*, 2014). One of the most highlighted cases of coordinated action has been among the nations of the newly established BRIC(S) grouping, which consists of Brazil, India, Russia, China, and, at times, South Africa. This new initiative of coordinated action among developing regional powers has become one of the main vehicles for opening up consultations between emerging powers from different world regions (i.e. South America, South Asia, Central Asia, East Asia, and Sub Saharan Africa) with the aim of achieving greater cooperation and coordination when global issues are discussed within global forums and institutions (Petropoulos, 2013). During this period, an important role was played by the BRIC(S) countries have several similar features: They are developing countries with relevant global economic performance and high potential, systemic importance for the world economy and able to exert influence on the governance of the global economy (Truman, 2006). All these features together with a number of common interest's shows that BRICS countries have emerged as a coalition of developing countries where government representatives have some weight in decision-making at the international level. However, it should be noted that there are important differences in these countries in terms of production structure by sector, opening outward, exchange rate regime etc, making this coalition to be more an ambitious project (Radulescu *et al.*, 2014). Exchange rate is one of the most outstanding and effective factors in the countries' trade balance, the direction and the degree of its effect on the countries' trade balance is of utmost importance. The theoretical literature regarding the nominal and real effects of exchange rate on trade flow was different and it depended on the country's exchange system; some surveys show that the nominal exchange fluctuations have had negative significant effect on trade process and some others didn't have any effect (Ilzetzki *et al.*, 2011). The most important question of the current study is that "what is the effect of the selection of different exchange arrangements on bilateral trade level of the member countries in regional cooperation countries?" For analyzing this matter, the present study has investigated the effects of applying various bilateral exchange arrangements on bilateral trade in countries member in regional

cooperation groups of BRICS in 2001-2013 and according to the panel data and applying systematic generalized method of Moments (GMM SYS).

Hence, along with it and following it, the present study has been organized in four general parts. At the first stage there is a review on theoretical literature and the literature review of the studies carried out before; afterwards, there is the stage of explaining the model and empirical model and variables under study and finally the last step would be analysis, summing up and giving some political suggestions.

2. LITERATURE REVIEW

According to economic theories national devaluation of money against foreign currencies is considered among the factors improving payment balance; however after the collapse of Bretton Woods system in 1973 and creating float exchange system, the studies regarding this issue by researchers proved that the conventional theory of positive effectiveness of internal monetary value on foreign balance can have opposite result in short run. Of course, trade adjustments resulted from devaluation of national money does not indicate a comprehensive literature of the manner of trade deviations and regional economic integration. Therefore, other effective aspects and factors on the manner of regional economic integration especially the demand side approach should also be taken into account (Sedano, 2005). Linder theory suggests that per capital income is a determining factor in a country's demand structure and consequently if the per capita income of each country increases, the trade whereof will be increased concomitant with other similar countries (in terms of per capita income). During the years 1980 to 1990, the trade theories have been developed and a new approach in the global trade models was created. Krugman (1994) proposed the "new theory of trade" which completed other theories such as Heckscher-Ohlin-Samuelson (HOS) or Linder. The above theory is founded on some presuppositions such as return comparing to increasing scale, difference in the product and imperfect competition that is its distinctive aspect with previous models. The new theory of trade has played a major role in developing the framework of trade theories according to trade gravity model (which has extensively been applied in testing trade flow factors).

Recent studies showed that the development of regional trade cooperation has affected the relationship of the price of importing ultimate goods and it would decrease the reaction toward exchange rate in a way that trade integration caused the creation of more sensitivity and reaction on the part of exporters toward prices of their rivals and the relationship between the importing ultimate good's price and the exchange rate would decrease (Gust *et al.*, 2010). According to Viner's custom unity theory and later development of this theory by Lipsey, Massel and Cooper, Bhagwati, Wonnocut and Wonnocut the regional trade integration of the countries are evaluated based on two concepts of trade making (welfare increasing) and the effect of trade deviation (trade decreasing) and it is not clear which effect is dominant after integrating into trade cooperation groups or integration (ibid, 313). The other method of the study of economic plans is the use of gravity model that was entered into economy by Tinbergen and Linnemann and it was employed to study the capacity of economic integration in the countries, trade potential, measuring the deviation effects and trade

making, measuring the effects of distance on trade size and respectively judging regarding the specialties of trade associates based on their distance from each other or locating in a region of a continent. Now taking the mentioned model into account the basic question is that "what is the effect of the exchange rate fluctuation coming from various exchange arrangements application on trade flow among BRICS countries?" The theoretical literature regarding the nominal and real effects of exchange rate on trade flow was different and it depended on the country's exchange system. Some surveys show that the nominal exchange fluctuations have had negative significant effect on trade process and some others did not have any effect (Ilzetzki *et al.*, 2011). The existing views can be divided into two general categories of fixed and floating exchange arrangements. The most important reasoning on the part of those who are in favor of fixed exchange arrangements is that the fixed exchange rates would make the required discipline in major economic policies and pave the way for more suitable global trade development; however the advocates of flexible exchange arrangements reason in this way that there is no need to have trade limitations and investment flows for the intention of pay balance in the arrangements and the flexible exchange systems and because of that it leads to the welfare increase (Mani Ali, 2007). During the recent years there have been various arguments about exchange regimes in a way that in 1980s and early 1990s most of the arguments centering on the effect of pegged arrangements on the process of anti-inflation credentials which, after crises of emerging markets in 1990s, these arguments have been dropped and it led to a bipolar view in new theories; it is based on the fact that free floating, and pegged exchange arrangements and the arrangements between these two are not stable (Kim and Papi, 2005). The empirical studies, which have compared the effect of replaced exchange arrangements with the performance of major economic indices, have not indicated a definite view regarding the manner of the effect of each of these arrangements. Some proved that the pegged arrangements have led to less inflation and more growth (Ghosh *et al.*, 2002) while some others stated that applying the same arrangements would lead to low inflation and lower economic growth (Levy-Yeyati and Sturzenegger, 2005). The so-called criterion was applied both in theoretical models (which compare fixed and floating exchange arrangements) and in optimum monetary regional literature (Alesina *et al.*, 2003). Relative suitability of each country to select exchange regime associated to major and structural variables in the economy of that country (e.g. international trade and simultaneity of trade cycles). The countries that have a high volume of trade with each other are smaller in terms of the size, experience similar shocks and have a greatly correlated trade cycles and prices and enjoy more factor mobility and financial flexibility. These countries greatly tend to use pegged exchange arrangements including a monetary union; the reason of this tendency is that these kinds of exchange arrangements increase trade and financial exchange arrangements and most of these countries cannot use exchange rate as a suitable instrument to decrease external shocks (Kim and Papi, 2005). The theoretical literature regarding exchange arrangements have shown that developing monetary unions simultaneous with applying fixed exchange rate arrangements has led to the increase of trade (Rose, 2000; Frankel and Rose, 2002). Generally, recent studies show that although the structural features of a country play a role in selecting the optimum exchange regime of the country, the political and

organizational condition of the country are more important determining factors relating to its trade (Papaioannou, 2003); and Kim and Papi (2005). The following are some conducted studies associated to exchange arrangements and regional trade blocks.

Frankel *et al.* (1998) examined the effect of trade blocks on trade flow. They used the gravity model as well as cross sectional data from developing and industrial countries. The above study was updated from 1965 every five years. The authors perceived that European Economic Community (EEC) had a significant effect on creating trade in 1980s with its peak in 1985, after that it decreased; moreover, from the one hand if two countries are the members of EEC, their trade will be more than the case without membership by 70% (1990 estimation). Further there has been no effect of trade creation during the time under study for European Free Trade Association (EFTA). Kawai and Takagi (2000) have offered a proposed strategy under the name of regional exchange arrangements for East Asian countries, which in their view had led to the stability of intraregional exchange rate and economic growth. According to the authors in developing countries the exchange fluctuations have had opposite significant effect on investment and trade and these countries (especially east Asian countries) such as European countries are not ready to form a regional monetary arrangement; on the other hand, they have a similar intraregional trade structure, so they have had the suggestion for applying regional exchange arrangements. Soloaga and Alan Wintersb (2001) examined the effects of preferential agreements of regional trade on trade level through applying gravity model and for non-oil imports of 57 countries who have 70% of the world trade in 1980-1990. The results showed that the increase in region-orientation during 1990s didn't lead to the significant change in trade blocks. Sedano (2005) in his study titled "commercial adjustment, exchange rates and regional economic integration" through augmented gravity model investigated the deviation or creating trade between Argentina and Brazil. The results of his study showed that the exchange rate flexibility causes the deviations in these two countries trade. Kwack (2005) in a study named "exchange rate options and monetary regime for regional cooperation in East Asia" examined the commercial relations between East Asian countries. Simultaneous selection of flexible exchange rate systems with flexible inflation goal setting has been suggested to decrease exchange rate fluctuations and maintain stability in low inflation rate. Kim and Papi (2005) have searched on exchange rate arrangements and central American-Dominican Republic Free Trade Agreement (CAFTA-DR) countries integration in chapter five of the book "central America, international integration and regional cooperation". The major hypothesis of that study is based on this theory that the similarity of exchange arrangements of member countries in a Regional Cooperation Organization with other mechanisms can raise financial and commercial flows between member countries and cause their commercial cycles syncing. At first the authors investigated long-term (a decade and more) relationship of exchange regimes on regional trade cooperation. The results of the study has showed that the greater convergence in central America with the united states comparing to West European countries entails less use of independent or pegged flow systems than dollar. On the other hand, syncing commercial cycles would lead to decrease in the countries' inflation rate difference and it increases their trade flow to the United States. Tenreyro (2007) in a paper under the

title of "trade effects of nominal fluctuations of exchange rate" analyzed and reviewed common methods and basin received results in this regard, and through applying the new method attempted to remove all existing biases simultaneously and has presented a new estimation from a set of 87 countries during 1970 to 1997 through Pseudo Maximum Likelihood-Instrumental Variable (PML-IV) method. The results of his study showed that the nominal fluctuations of exchange rate did not have a significant effect on trade flow. Taguchi *et al.* (2009) have investigated the behavior of real exchange rate and various arrangements of exchange rate. The above-mentioned study was carried out through applying panel unit root tests and separately via the speed of nominal exchange rate adjustment and relative prices in a framework of correction and error model. The results of the review proved that industrial countries under "free floating" exchange system have effective real exchange rate stability, while developing countries under "hard pegged" exchange rate enjoy this kind of stability; in other words, industrial countries under free floating exchange system can explain exchange mobility regarding sensitivity toward inflation gap and developing countries under hard pegged exchange rate can create non-linear price adjustments during long-term adjustment of real effective exchange rate. Gust *et al.* (2010) in a study titled "commercial integration, competition and the decrease of exchange rate process" investigated the effect of importing prices to the process of exchange rate through applying a DSGE model of imported prices and exchange rate. The results of the study indicated that by developing trade integration, exporters get so sensitive to their competitors' prices and this issue justifies a considerable percentage of observed decrease in the sensitivity of importing prices of the United States toward the exchange rate. Aizenman *et al.* (2012) in a study named "adjusting patterns on shocks of exchange relationship: the role of exchange rate and international reserves policies" attempted to analyze adjusted methods in commodity exchange relationship shocks in Latin American countries during 1970-2012 through panel method. The results of the research showed that active management of reserves not only causes the decrease in the effects of commodity exchange relationship shocks in the short run, but it also will lead to adjustment and decrease in real long-term exchange rate fluctuations and it can be an appropriate instrumental replacement for financial policies in the countries which are more commercially closed.

In line with recent literature, present study try to investigate the effects of applying various exchange rate arrangements on bilateral trade in countries member in regional cooperation group of BRICS in 2001-2013, applying systematic generalized method of Moments (GMM SYS).

3. METHODOLOGY

With the beginning of 1860s, H. Cary used Newtonian physics for the human behavior for the first time and the gravity pattern has extensively been applied in social sciences. Thereafter empirical situations have been conducted regarding different explanation of regional and international flows such as migration and work force. Tinbergen and Poyhonen were the first who employed the gravity model for the analysis of international trade flows. Afterwards, the gravity model changed into a public instrument in terms of international trade, successfully applied for variety of migration flows, direct foreign investment, and especially trade flows. In 1990s, some

researchers brought up some questions in the field of economic facilities of gravity model. Their basic discussion was that cross sectional OLS method in gravity regression renders biased results, since it cannot calculate the heterogeneity in trade flows among countries, especially the fact that trade gravity models overestimate the effects of regional integration like the effects of invariance variables such as distance and common language. The model misspecification and the issue of omitted variables are introduced as the most important reasons for bias results (Mátyás, 1997). Bergstrand (1990) extracted the gravity equation from a Ricardo model with the condition of monopoly competition. Comparing to global gravity rule it was pointed out that the abundance of goods and services, work force and other production factors are absorbed in a region named i or (E_i)through goods and services demand and work force and other factors in the region of j or (E_j). This potential flow has the opposite relationship with two countries' distance(ϑ_{ij}):

$$X_{ij} = \frac{E_i E_j}{\vartheta_{ij}^2} \quad (1)$$

In which $X_{ij}$is the amount of exchanged goods and services traded between two countries. This basic model, which is known as the gravity model, has brought from physics to economy by Tinbergen (1962) and empirical economists frequently applied it to study the capability of the countries' economic integration, evaluating commercial potential capability, measuring deviation effects and making trade and generally stating many of trade relations at international level. The data controllability and the number of appropriate variables are among advantages associated with gravity model (Salvatici, 2013). Helpman and Krugman (1985) and Deardorff (1988) participated in this process and their studies caused the development of the model. These studies related to gravity equation were achieved as an abridged form of general adjustment model of international trade in the final goods. According to a general form, the gravity equation is in the following form:

$$X_{ij} = \vartheta_{ij}^{\beta_3} \varepsilon_{ij} \quad (2)$$

In Tinbergen primary model Tinbergen (1962), the model is given in a log-log form. Therefore, the parameters show trade flow elasticity. In the model it is supposed that comparing to non-adjacent countries, the adjacent ones are more tended for trade, that the abstract or imaginary variable shows adjacency byN_{ij}Moreover; political factors have also been added to this model, which is shown by V_{ij}abstract or imaginary variable. This variable demonstrates that the exchanged goods and services are affected by systemic or multidimensional preferences and arrangements the most important application whereof is in measuring the effect of regional trade cooperation and preference trade agreements. According to the above, it can be written that (ibid):

$$\mathrm{Ln}X_{ij} = \underbrace{\beta_0}_{\text{constant}} + \underbrace{\beta_1 \mathrm{Ln}E_i + \beta_2 \mathrm{Ln}E_j}_{\text{economicattracrors}} + \underbrace{\beta_3 \vartheta_{ij} + \beta_4 N_{ij}}_{\text{distance}} + \underbrace{\beta_0 V_{ij}}_{\text{policy}} + \underbrace{\varepsilon_{ij}}_{\text{error term}} \quad (3)$$

If this model is assessed through time or cross sectional series, it will be biased, since it has not taken the inconsistency between the countries into account. In recent years, the panel data assessment method in gravity models has been applied which bring individual effects into the model and it is a combinatory set of time and cross sectional series.

Bilateral trade of the countries might be put under factors such as cultural, political, ethnic, historical, etc. affairs which are not observable directly and they are not entered to the model

Therefore to remove this problem there should be a sentence in the model other than intercept which is equal in all countries that explains the special effects of the countries, hence, In this model, a number of variables which affect countries' bilateral trade are removed or not taken into account (Martínez-Zarzoso and Nowak-Lehmann, 2003). Due to the above fact, the generalized gravity model is applied. The generalized gravity model considers the trade volume export or import between two countries as function of two countries' income, their population and their distance as a replacement for transportation costs and a set of abstract variables facilitating and limiting trade between two countries. In this approach, a dynamic panel model is used. If the trade is an static process, estimating the stable effect will be consistent for a limited time duration of T and limited number of N countries; however, if trade is assumed as dynamic process, alterations and transfers entail removing stable effects of paired countries that causes correlation between lag dependent variable (logarithmic) and the error term which leads to great bias in OLS method and destroys consistency. In order to remove model's inconsistency, the first order subtraction and the use of Hansen two-step GMM method was proposed by Arellano and Bond (1991). If this method is suggested for a short period of panel time, there will be weak results. Arellano and Bover (1995) explained that in case the basic equations are added at the first order subtraction equations system, the condition of additional moments can increase the model's efficiency (estimator of systemic GMM). This estimator was renovated and reviewed by Blundell and Bond (1998). Compared to Arlando and Bond estimator, Systemic GMM estimator had the advantage that subtracting from the model causes omission of stable effects and considering rather limited data and persistent effects in bilateral trade relations of the countries, systemic GMM estimator gives the best results; and of course, this method's application is fairly new in the gravity model. Dynamic gravity model with the approach of systemic GMM approach possess three sets of variables including standard variables of gravity model, variables related to the inconsistency and bias and other effective variables on bilateral trade level (Nardis *et al*., 2008).

$$LnX_{ijt} = \beta_0 + \sum_{k=1}^{n} \beta_k \; LnZ_{ijt} + \delta_1 D_{ijt}^{k} + u_{ijt} \qquad (4)$$

In this relationshipX_{ijt}shows bilateral trade exchanges between two i and j countries under study in time duration oft; Z_{ijt} a set of time-variant and invariant or determinants of gravity model, $D_{ijt}^{k}$are dummy variables which have been applied in this model to investigate political effects and u_{ijt}shows model error term $\left[(u_{ijt} \sim N(0, \sigma)\right]$.

According to previously mentioned relationships (Sedano, 2005) and Salvatici (2013), dynamic gravity model with the systemic GMM approach through expanding variables of $Z_{ijt}$and $D_{ijt}^{k}$is like following:

$$LnX_{ijt} = \beta_0 + \beta_1 LnMGDP_{ijt} + \beta_2 LnDist_{ijt} + \beta_3 LnRER_{ijt} + \beta_4 LnLind_{ijt} + \delta_1 D_t^{FL} + \delta_2 D_t^{MF} + \delta_3 D_t^{CP} + \delta_4 D_t^{PG} + u_{ijt} \qquad (5)$$

Wherein $X_{ijt}$the real value of bilatral is trade between two i and j countries at the time t and is assumed as a dependent variable.

$MGDP_{ijt}$: The mean of gross domestic product in two i and j countries at time t in BRICS countries. The mentioned variable indicates economic size (dimensions) of trade side countries:

$$MGDP_{ijt} = \left[\frac{1}{2}\left(GDP_{it}+GDP_{jt}\right)\right] \quad (6)$$

$Dist_{ijt}$: is the distance between two i and j countries at time t.

RER_{ijt}: Real exchange rate equality between two i and j countries at time t in trade blocks under investigation. The index of real exchange rateRER_{ijt}according to the studies by Ekanayake *et al.* (2012) is achieved through the following relation:

$$RER_{ijt} = \left[\frac{ER_{ijt} \times P_{jt}^{f}}{P_{it}}\right] \quad (7)$$

In which $ER_{ijt}$is the bilateral nominal exchange rate between two counties at time t, $P_{jt}^{f}$the index of consumer price in the foreign country (2005=100) at time t and $P_{jt}^{f}$the index of consumer price inside the country (2005=100) at time t (Ekanayake *et al.*, 2012).

$Lind_{ijt}$: is the index of economic similarity between two i and j countries at time t in countries under study which is known as "Linder model" and it is achieved by the following relationship.

$$Lind_{ijt} = \left[\frac{GDP_{it}}{POP_{it}} - \frac{GDP_{jt}}{POP_{jt}}\right]^{2} \quad (8)$$

Wherein$\frac{GDP_{it}}{POP_{it}}and\frac{GDP_{jt}}{POP_{jt}}$respectively are per capita gross domestic products of two exporting country i and importing country j at time t.

D_t^{FL},D_t^{MF}, $D_t^{CD}$and D_t^{PG}respectively are abstract variables of floating exchange arrangements, managed float, crawling pegged , and pegged .

u_{ijt}: is a random disorder term, which is idd (distributed normally and identically).

4. DATA DESCRIPTION

Tables 1 and 2 describe economic geography indicators, bilateral trade and other variables of BRICS block used in applied model.

Table-1. Economic geography indicators of BRICS countries, 2013

BRICS countries	Area (million km2)	Population (million person)	GDP per capita ($)
Brazil	8.4	198.7	11747.6
Russia	17.1	143.5	17518
India	3.6	1237	3842.6
China	9.6	1351	9055.3
South Africa	1.2	51.19	11281.1
BRICS	39.9	2981.39	10688.92 (average)
World	129.8	7255.8	10610.22 (average)
% in the world	30.7	41.09	-

Source: Based on data from: www.imf.org, World Economic Outlook, 2014.

Table-2. Bilateral trade and variables of BRICS block, 2001-2013

BRICS countries	Variables*	Brazil	Russia	India	China	South Africa
Brazil	Xij:	-	2893378.00	1929712.85	18407608.00	1297356.38
	Dist.:	-	11192.67	14251.55	16948.04	7900.19
	RER:	-	2.26	2.26	2.26	2.26
	LIND:	-	711657.5	18011855.61	8127048.17	115844.57
	DFL:	-	0.3846	0.3846	0.3846	0.3846
	DMF:	-	0.3077	0.3077	0.3077	0.3077
	DCP:	-	0.3077	0.3077	0.3077	0.3077
	DPG:	-	0.0000	0.0000	0.0000	0.0000
Russia	Xij:	1134349.00	-	4002375.62	18342388.92	83279.46
	Dist.:	11192.67	-	4341.88	5795.45	9913.28
	RER:	29.41	-	29.41	29.41	29.41
	LIND:	711657.46	-	24728413.62	12503071.51	416656.70
	DFL:	0.6154	-	0.6154	0.6154	0.6154
	DMF:	0.0000	-	0.0000	0.0000	0.0000
	DCP:	0.3846	-	0.3846	0.3846	0.3846
	DPG:	0.0000	-	0.0000	0.0000	0.0000
India	Xij:	2481234.46	1175917.77	-	9184050.62	2377710.08
	Dist.:	14251.55	4341.88	-	3785.03	8000.75
	RER:	47.65	47.65	-	47.65	47.65
	LIND:	18011855.61	24728413.62	-	2284760.32	20650795.32
	DFL:	0.0000	0.0000	-	0.0000	0.0000
	DMF:	0.0000	0.0000	-	0.0000	0.0000
	DCP:	0.7692	0.7692	-	0.7692	0.7692
	DPG:	0.1538	0.1538	-	0.1538	0.1538
China	Xij:	14674835.54	22437335.23	23863489.38	-	7436808.54
	Dist.:	16948.04	5795.05	3785.01	-	12967.77
	RER:	7.41	7.41	7.41	-	7.41
	LIND:	8127048.17	12503071.51	2284760.32	-	10026797.27
	DFL:	0.0000	0.0000	0.0000	-	0.0000
	DMF:	0.0000	0.0000	0.0000	-	0.0000
	DCP:	0.3077	0.3077	0.3077	-	0.3077
	DPG:	0.6154	0.6154	0.6154	-	0.6154
South Africa	Xij:	468685.615	185044.54	13796205.15	4881031.62	-
	Dist.:	7900.190	9913.28	8000.75	12967.77	-
	RER:	7.948	7.95	7.95	7.95	-
	LIND:	115844.569	416656.70	20650795.32	10026797.27	-
	DFL:	0.8462	0.8462	0.8462	0.8462	-
	DMF:	0.1538	0.1538	0.1538	0.1538	-
	DCP:	0.0000	0.0000	0.0000	0.0000	-
	DPG:	0.0000	0.0000	0.0000	0.0000	-

*- All value of variables are average of years 2001-2013

Source: IMF:Direction of Trade Statistics (DOTS), Trade map, UNCTAD Statistics, CEPII, UN, WDI, Ilzetzki, Reinhart and Rogoff.

5. RESULTS

Before assessing the research model, it is required to test the stationary state of all applied variables in estimations; since being stationary in variables regarding either time-series data or panel

data causes creating some problems of false regression. In this test, an auxiliary regression pattern is assessed as follows:

$$\Delta Y_{it} = \alpha Y_{i,t-1} + \sum_{j=1}^{p_i} \beta_{ij}\, \Delta Y_{i,t-j} + X'_{it}\delta + \varepsilon_{it} \quad (9)$$

In which$\alpha = p - 1$, and H_0 and H_1 are:

$$\begin{cases} H_0: \alpha = 0 \\ H_1: \alpha < 0 \end{cases}$$

In order to test unit root of panel test, Levin Lin Chu measures the following statistic and decides about stationary or non-stationary variable:

$$\text{LLC}: \qquad t^*_\alpha = \frac{t_\alpha - (N\tilde{T})S_n\hat{\sigma}^{-2}se(\hat{\alpha})\mu_{m\tilde{T}^*}}{\sigma_{m\tilde{T}^*}} \rightarrow N(0,1) \quad (10)$$

5.1. Stationary and Convergent Variables

The results of common unit root test of the variables of LLC test for three selected groups are demonstrated in the following tables.

Table-3. Results of LLC test of common unit root of the effective variables on trade level. Obs=220. Intercept and trend

Variable	Level	BRICS	
		Probability	Statistics
X_{ijt}	I(0)	0.0000	-5.08682
$MGDP_{ijt}$	I(0)	0.0000	-6.95451
RER_{ijt}	I(0)	0.0001	-3.69366
$Lind_{ijt}$	I(0)	0.0018	-1.89778

Source: Research findings

According to the results of common unit root test of the variables, the statistic $t^*_\alpha$was significantly below zero for all variables and the null hypothesis stating the existence of common unit root (i.e. $\alpha = 0$ In equation number 10) in the current amounts of variables is denied at 99 percent of P value; that is, the existence of a common unit root for the above mentioned variables is strongly rejected, and their stationary state is confirmed at level (i.e.$\alpha < 0$); therefore there is no need to conduct convergence test and estimate the aimed model.

5.2. Model Estimation

In order to estimate the research model, generalized method of moments (GMM) has been used developed by Arlano-Bond, Arellano and Bover (1995), Holtz-Eakin *et al.* (1988) and Rose (2000) for dynamic panel pattern. In order to estimate the model and to remove the fixed effects, Arlando-Bond subtraction method and for the removal of variable correlation with interval and other explanatory matrices, the instruments matrix has been applied. In this method Arlano-Bond, suggest two-step generalized estimator moment method. To examine the validity of instrument matrices Sargan test was applied wherein the null hypothesis implying the lack of correlation of the

instruments with disruptive components. Sargan test statistic has Chi2 distribution with same degrees of freedom equal to the number of extra-specified limitations. The null hypothesis rejects correlation between residuals and instrumental variable. It is followed by testing serial correlation (M2) and investigating first rank correlation at level, correlation of the second rank is investigated in subtraction. Testing instrument validity (moment limitation), is testing serial correlation from the second rank of residuals. The lack of serial correlation shows that all interval values of explanatory variables can be used as the instrumental variables. The applied model in this estimation is in the following form:

$$\mathrm{LnX_{ijt}} = \beta_0 + \beta_1 \mathrm{LnMGDP_{ijt}} + \beta_2 \mathrm{LnDist_{ijt}} + \beta_3 \mathrm{LnRER_{ijt}} + \beta_4 \mathrm{LnLind_{ijt}} + \delta_1 D_t^{FL} + \delta_2 D_t^{MF} + \delta_3 D_t^{CP} + \delta_4 D_t^{PG} + u_{ijt} \quad (11)$$

The results of model estimation through systemic generalized moment method of regional trade cooperation group are like below:

Table-4. Results of GMM estimation of systemic dynamic panel data in BRICS

Depend Variable: LnXij

System dynamic panel-data estimation 2001-2013 (Two-step results, No constant)

	D-8			
Explanatory variables	Coefficient	St.dev	Stat.	Prob.
LnXij(-1)	-0.24933	0.09703	-2.5695	0.01086
LnMGDPij	0.427284	0.025581	16.70314	0.0000
LnDistij	-0.378448	0.075368	-5.021342	0.0000
LnRERij	0.292048	0.033858	8.625552	0.0000
LnLinderij	-1.260339	0.459734	-2.741451	0.0066
DFL	-0.127870	0.524935	-0.243591	0.8077
DMF	-0.604451	0.460386	-1.312922	0.1904
DCP	0.606357	0.491305	1.234176	0.2183
DPG	0.427284	0.025581	16.70314	0.0000

Number of obs=260 Sargan test: (J Stat = 104.1756) Prob > chi2 = 0.7455

Wald test = 34.5417 (Prob:0.0021) AR(1) test: Prob>z = 0.0188

Source: Research findings

The results of estimation of dynamic panel model in member countries of BRICS showed that bilatral exports have had negative significant effect on trade volume in a lagged form. The gross domestic product mean in paired countries (Indicates the size and volume of economy), has had positive significant effect on bilateral trade with coefficient of 0.427. The distance between two countries also has opposite significant relationship with trade as predicted with coefficient of -0.378. In this group, the cooperation of exchange rate fluctuation between each of the two countries with the coefficient of 0.292 has had significant positive effect on export flow of the member countries; to put it another way, the increase of exchange rate has improved the trade flow toward export. Linder hypothesis, too, (which states economic similarity of the member countries) has not confirmed in this empirical estimation and it has significant negative relationship with the coefficient of -1.26. Among dummy variables tested, pegged and crawling pegged exchange arrangements, have had fully significant and opposite effect on the trade of paired countries in a way that crawling pegged exchange arrangements with the coefficient of 0.6063 have had the greatest effect on the increase of

trade volume between countries in BRICS; after it pegged exchange arrangements with the significant coefficient of 0.4272 improved exports in this trade block. Imposing free and managed floating exchange arrangements respectively with the coefficient of 0.1278 and 0.6044, inversely improved bilateral trade flow toward import. The results of the study confirm by Ilzetzki *et al.* (2011) and Kim and Papi (2005).

6. CONCLUSION AND FUTURE DIRECTIONS

Economists who are interested in analyzing and describing the development process in regional trade cooperation must attempt to understand the factors that drive trade from the perspective of the integration in block countries. This research has provided some insight into this phenomenon by investigating on emerging economies. Theoretical literature and empirical researches of economic integrations, confirm that exchange rate is one of the most outstanding and effective factors in the countries' trade balance; and the managing, directing and degree of its effects on the countries' trade balance is of utmost importance. This research investigated the effects of various exchange arrangements application on regional trade cooperation in the BRICS countries composing of five emerging economies (Brazil, Russia, India, China and South Africa) through generalized gravity model and two-step generalized moment method (GMM) during 2001-2013. At first, analyzed the theoretical literature regarding the relationship between exchange arrangements application and conducted trade balances as well as empirical studies, and then codified a generalized gravity model according to dynamic panel data pattern and a two-step systemic generalized moment method. It was followed by testing common unit root for dynamic panel data, Sargan and serial correlation sequentially to investigate variables stationary state, the lack of correlation between instruments and disturbance term and instruments validity and moment limitations.

The results of the study showed that applying various exchange arrangements (free float, managed float, crawling pegged, and pegged) have had significant different effect on trade flow among different member countries. In this huge economic block, applying pegged (PG) and crawling pegged (CP) exchange rate arrangements, had significant and positive effect on trade flow and improved export of block member. Inversely, move toward imposing managed (MF) and free-floating (FL) arrangements have a negative impact on the volume of bilateral trade (exports) between members and direct trade toward import.

While this research does not conclusively demonstrate the applicability of exchange rate arrangements effects to all of developing and emerging countries and blocks in the world, it does present some intriguing evidence on the possible validity of this theory in this setting. Up to now, the literature of this theory has not seriously tested in emerging countries specially BRICS countries. A more complete treatment of this issue certainly would involve applying this estimation technique to other trade cooperation blocks and would be analyzed factors of trade directions separately.

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