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Article

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Investigating a threshold effect in Twin Deficit Hypothesis: Evidence from the BRICS Economies

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Abstract: Over the years, empirical evidence on twin-deficit hypothesis has been inconsistent. While some support it, others affirm the prevalence of the Ricardian Equivalence. This study therefore examines a nonlinear/threshold relationship between the deficits among the BRICS economies using the Panel ARDL (1, 1) model with a quarterly data spanning from 2000q1 to 2019q4. The efficient estimator of PMG based on the Hausman test shows that twin divergence holds among the BRICS market up to a certain threshold beyond which the hypothesis holds. This suggests that BRICS countries face a dampening effect of fiscal/current deficits on their current account/fiscal deficits to a point after which further increases in either of the deficits will significantly raise the other. The static fixed effect technique and second-order U-shaped test reveal a consistent result. The speed of adjustment to long-run steady state for the current account deficits and the fiscal deficits models are 27.4 and 52.5 per cents respectively, at 5 per cent significance level. However, higher growth shocks and interest rate lead to divergence of the deficits while exchange rate and trade openness dampen it. Fiscal deepening and management within a bound were recommended as the panacea for twin-deficit problems.

ABOUT THE AUTHOR

Tochukwu Timothy Okoli has just completed his PhD programme in Economics from the University of Zululand, South Africa. He has about eight years' experience in teaching and research and his areas of research interest are but not limited to financial economics FinTech adoption, macroeconomic modeling, risk-management, growth dynamics, financial stability, etc. This article is one of the articles he wrote during his doctoral programme in collaboration with Professor Devi Datt Tewari, a Professor of financial economics, and Dr K. D Ilesanmi, a postdoctoral fellow both from Economics department, University of Zululand, South Africa. Professor Tewari has over thirty years' cognitive experience in teaching and research and he has produced over twenty PhD students. He is a researcher, a reviewer, and the ex-Dean of the faculty of Commerce, Administration and Law (2014–2018). Moreover, Dr Ilesanmi has over five years cognitive experience in teaching and research with lots of publications.

PUBLIC INTEREST STATEMENT

This study assessed the relationship between fiscal and current account balances often referred to as twin-deficit hypothesis. Economic theory affirms a positive relationship between them; that is, deficit in fiscal balance leads to deficit in current account balance and vice versa. This study, therefore, investigates this nexus and a possible threshold effect (in case of its violation) among the BRICS economy using the Keynesian national income model and quarterly data spanning from 2000q1–2019q4. The threshold effect was used to investigate whether; continuous increases/decreases among these deficits will reach a point after which a negative/reverse effect among them is obtained, should the twin-deficit hypothesis be violated. Our findings reveal that the hypothesis was violated for the period under investigation, however, a significant threshold effect holds in the long-run. This suggests serious policy implications and management of the fiscal and current account balances for BRICS economies especially in the long-run.

Subjects: Social Sciences; Economics, Finance, Business & Industry; Macroeconomics; Econometrics

Keywords: Fiscal deficit; current account deficits; BRICS economies; panel ARDL

1. Introduction

Over the years, there has been a contrasting view between economic theory and empirical evidence on the twin-deficit hypothesis. Economic theory postulates that fiscal deficit can lead to current account deficit and vice versa¹. However, empirical findings on this issue have been inconsistent among countries. Although this hypothesis is theoretically plausible, empirical evidence suggests that the results differ from one country to another as well as when different econometric techniques and model specifications for the same country data are used (Mukhtar & Ahmed, 2007; Shastri et al., 2017). Therefore, the theoretical plausibility of this concept does not guarantee its empirical reality; and so, twin-deficit hypothesis could be both subjective and time bound.

This study identifies three channels through which a positive relationship between fiscal and trade deficits can emerge, particularly under a small open-economy condition. First is the interest rate channel. An increase in fiscal deficit increases the interest rate, leading to net capital inflows and its resultant domestic currency appreciation, hence an appreciating exchange rate will deteriorate current account deficit. Secondly, negative current account balance reduces tax revenue accruing to the government, thereby leading to fiscal deficit. The third channel is the income/expenditure approach. This is because when government pursues an expansionary fiscal policy by cutting tax, the extra income from tax cut will increase fiscal deficit by increasing total absorption (private consumption, domestic investment and government expenditure) above the aggregate domestic output; hence, the extra spending in the economy comes from outputs produced in foreign economies/increased import. As import rises beyond the economy's export, current account deficit becomes inevitable.

The Ricardian equivalence hypothesis denies this interrelationship. He argues that since people are rational beings, they will tend to save the extra income arising from an expansionary fiscal policy of tax cut by the government to pay for higher taxes in the future (Shastri et al., 2017). Therefore, the decrease in government savings in terms of higher expansionary policy of tax cut will be offset by a commensurate increase in private savings in anticipation of future increase in tax. This therefore flouts the twin-deficit hypothesis. However, this study argues that the Ricardian equivalent hypothesis can be flawed under two conditions.

First, if government expansionary fiscal policy arises through increased government expenditure rather than through a tax cut, the expansionary fiscal policy with greater multiplier effect² will increase aggregate income above total absorption. This will reduce the pressure on trade deficit to deteriorate through increased import. However, the resultant increase in aggregate demand leads to a rise in domestic interest rate above the foreign rate. This will lead to capital inflow thereby worsening the trade balance when exchange rate appreciates. Its increasing impact on the domestic interest rate can be worse if the extra government spending is financed through the public. Therefore, fiscal deficit through increased government expenditure can as well lead to trade deficit. Though the effect of this differs in its magnitude, it is still true both under the flexible and fixed exchange rate system (Akbostanci & Tunç, 2001).

Second, Ricardo's hypothesis suggests that the extra income that rational households receive due to tax cut will be saved. However, rational consumers are more likely to invest extra income than save it. Should the extra income be invested either domestically or in foreign markets, trade deficit can worsen as a result. This is because an increase in domestic investment will increase domestic absorption ($C + I + G$) above the aggregate output. Therefore, the extra demand will fall on foreign goods and services in terms of increased import thereby

worsening the current account balance. These contrasts are yet to be cleared in the economic literature.

2. Empirical literature review

Over the years, empirical evidence on twin-deficit hypothesis has been ambiguous and inconsistent. While some studies (Ahmad et al., 2015; Bolat et al., 2014; Kumhof & Laxton, 2013; Shastri et al., 2017) affirm a consistent view with theory, others (Sobrino, 2013; Kim & Roubini, 2008; Muller, 2008;; Corsetti & Müller, 2006) report that the theory is violated by finding an inverse relationship between the two deficits; and yet others (Kaufmann et al., 2002; Papaioannou & Yi, 2001 and Enders and Lee 1990) found no significant relationship between the two deficits, particularly during the long-run.

These mixed results have been blamed by some authors (Ahmad et al., 2015; Bolat et al., 2014; Chihi & Normandin, 2013; Holmes et al., 2010) on factors such as the model specification, estimation techniques and the state of economic development. Holmes et al. (2010) used the AR-based bootstrap techniques and found that the twin-deficit hypothesis is violated when allowances are made for cross-sectional dependence and structural breaks. They found that fiscal deficit among the European Union (EU) countries was stationary with persistent current account deficits into the long-run. Their conclusion suggests that there is no long-run relationship between fiscal deficits and current account deficits when structural breaks were accounted for (Grier & Ye, 2009). This implies that peculiar factors such as the way fiscal policy issues are handled across countries (cross-sectional dependency) and major macroeconomic variations (structural breaks) influences the direction of impact between fiscal and trade deficits. Therefore, this intensifies the need to use models that consider both the short-run and the long-run dynamic properties of twin-deficit hypothesis such as an ARDL model in investigating the relationship between fiscal deficits and current account deficits. The twin-deficit hypothesis is supported when advanced estimation techniques for panel data are used (Deniz & Çelik, 2009).

Moreover, the absence of a causal relationship between these deficits has been blamed on the assumption of a symmetric and a static relationship by previous studies (Holmes, 2011). Praggidis et al. (2013) affirmed that adjustments to fiscal shocks could be asymmetric. The impact of fiscal expansion differs according to the size of the deficit and it can change when the deficit exceeds a critical threshold level (Ahmad et al., 2015). This suggests that although the twin-deficit hypothesis may be violated within a bound on deficits, it can hold as the deficits exceed a given threshold and vice versa. This can be more pronounced among emerging and developing economies, given their huge trade liberalization. Therefore, an asymmetric model can be captured by modelling non-linear relationships between fiscal deficit and current account deficits. This aspect is lacking in the literature, particularly among the BRICS economies.

Studies that investigate a threshold relationship between the two deficits, particularly among the BRICS (emerging) economies, are lacking in the literature. The few others that assessed an asymmetric/threshold relationship did that within the context of developed or undeveloped markets. Notable among such studies are Ahmad et al. (2015), Bolat et al. (2014), Kumhof and Laxton (2013), Deniz and Çelik (2009), Cavallo (2005), and Ahmad et al. (2015) used the Hansen and Seo (2002) threshold cointegration technique to investigate a non-linear/asymmetric relationship between the fiscal deficits and the current account deficits in a panel of nine African economies for a sample period of twenty-nine years. Their findings support an asymmetric relationship between the two deficits and a long-run positive relationship exists among six of the nine countries while the relationship was negative for the other three. They attributed the reason for these differences between these two groups of countries to the way fiscal policy issues are handled among them.

Given these contrasting evidences, there has not been a consensus among the empirical findings on the direction of causality between these two deficits. Although the theoretical background supports a positive relationship between them, it is less clear from either theory or empirical evidences at what

point/magnitude will this interrelationship hold. It is in this background that this study examines possible threshold effect between fiscal and current account deficits among the BRICS³ economies using the Panel ARDL⁴ model and a quarterly data for the period 2000 to 2019. Moreover, caution was taken to account for the role various estimation techniques, data frequency, country specific/panel analyses, model specifications and threshold effect could have on the conclusions in this study.

The remainder of the study is organized as follows. Section 3 presents and discusses the theoretical model, while the methodology and data are presented in section 4, followed by the results and discussion in section 5. Finally, the paper conclusion and policy implications are highlighted in Section 6.

3. Theoretical model

The theoretical model on which this study is based is the Keynesian national income model. The model specifies that the aggregate output in an economy is a function of expenditures from the four different economic agents thus:

$$y = c + i + g + (x - m) \dots \dots \dots (1.1)$$

- Where: c = private consumption expenditure,
- i = domestic investment/expenditure in capital goods,
- g = government expenditure on goods and services, and;
- $x - m$ = net export (i.e. export minus import).

This model reveals that aggregate income in any economy must equal its aggregate expenditure at any given time. Therefore, recall that total national income in any economy has three possible uses as consumption (c), savings (s), and tax payment to government (t). This is also expressed as:

$$y = c + s + t \dots \dots \dots (1.2)$$

The variables are as defined above. Equating Models (1.1) and (1.2) for aggregate income, and rearranging to derive the internal and external balances, yields model (1.3) thus:

$$(m - x) = (i - s) + (g - t) \dots \dots \dots (1.3)$$

Equation (1.3) recognizes that trade deficit ($m - x$) as a function of the aggregate net investment ($i - s$) and fiscal deficit ($g - t$). Equation (1.3) represents the twin-deficit hypothesis for an economy; where simultaneous deficits were experienced both in the current account balance and fiscal balance (Vyshnyak, 2000). The fiscal/budget deficit will deteriorate as government expenditure exceeds the amount of tax revenue they collected without a commensurate increase in net investment. In order words, if net investment is held constant, an increase in fiscal deficit will reflect a commensurate increase in trade deficit. We can also rewrite the twin-deficit hypothesis of model (1.3) to capture the economic chain of causation from fiscal deficit to trade deficit for an open economy, thus:

$$fd(t) = s(r) - I(r) - td(e) \quad \frac{\partial bd}{\partial t} > 0; \frac{\partial td}{\partial e} < 0; \frac{\partial i}{\partial r} < 0 \text{ and } \frac{\partial s}{\partial r} > 0 \dots \dots \dots (1.5)$$

Where the fiscal deficit is an increasing function of the tax rate (t); trade deficit is inversely related to the exchange rate (e), defined as domestic currency units of foreign currency; gross domestic investment and savings were inversely and directly related to the interest rate (r) respectively. An increase in the exchange rate (e) implies a depreciation of the domestic currency. Thus, an exogenous increase in the fiscal deficit can only be financed by an increase in domestic

savings, a reduction in domestic investment and/or increases in the nation's trade deficit or inflow of net foreign savings.

4. Methodology and data

The study employed the panel ARDL bound testing estimation technique to analyse the data. The justification for this is anchored on a number of criteria. First, the study objective aims to verify the dynamic nonlinear relationships between current account deficit and fiscal deficit among the five BRICS economies for the period 2000q1 to 2019q4. This requires a model that will allow the data dimension to exhibit dynamic short-run and long-run relationships. Second, a panel ARDL technique produces efficient estimate when the data series are a mixture of $I(0)$ and $I(1)$ variables (Pesaran & Shin, 1999). Moreover, this technique works best when the time series or the cross-sectional identities are small (Pesaran et al., 1999). Both the time series identity ($T = 20$) and the cross-sectional identity are very small ($N = 5$). It is on this ground that we could not use the dynamic GMM estimation technique because it tends to produce spurious results when N (the cross-sectional identity) is small and less than its time identity ($T = 20$) (Roodman, 2006). Moreover, the problem of the non-exogeneity of the instruments and the fact that GMM captures only the short-run dynamics and ignores the stationarity of the variables and the structural long-run equilibrium (Christopoulos & Tsionas, 2004) further disallows its use.

On the other hand, a static model such as the pooled OLS, fixed effects and random effects were not used as the main models of this study because its static nature is not compatible with the dynamic objective. Besides, it has a number of shortcomings. For instance, a pooled OLS is highly restrictive in that it assumes common intercept and slope coefficients. Again, the parameter estimates of a fixed effects model are biased when some regressors are correlated with the error term and are endogenous (Campos & Kinoshita, 2008). Moreover, a static panel estimator does not capture the panel dimension of the data because it does not distinguish between the short and long-run relationships (Loayza & Rancière, 2006). However, the static models were still employed for robustness check.

Model (1.7) is therefore estimated using the panel ARDL technique based on three different estimators. They are the pooled mean group (PMG) estimator, the mean group (MG) estimator and the dynamic fixed effects estimator (DFE). These estimators have their uniqueness and relative advantages over each other, however, they all consider the long-run equilibrium and the heterogeneity of the dynamic adjustment process (Demetriades & Law, 2006). The PMG assumes that the short-run coefficients, intercepts, the speed of adjustment to long-run equilibrium and the error variance are heterogeneous among countries or groups but the long-run slope coefficients are assumed to be homogeneous among countries.

On the other hand, the MG estimator is less restrictive than the PMG estimator. It assumes all coefficients to change and be heterogeneous across countries in the short and long-run. This model seems to produce efficient and consistent parameters when the cross-sectional and time units are sufficiently large. The DFE is closely related to the PMG estimator except that it imposes restrictions on the slope coefficients and error variances to be equal across all countries in the long-run. It further restricts the speed of adjustment coefficient and the short-run coefficients.

From the foregoing model discussions, it could be deduced that the best model to be used depends on the research objective and behaviour of data. Therefore, since this study assumes that there is a long-run relationship among the countries because they are all emerging economies and belong to the same economic block and the cross-sectional identity is small ($N = 5$) as well, the PMG seems to be the best estimator for this study. However, the Hausman test was used to select the best model estimator.

5. Model specification

From the theoretical model, we express current account deficit as a function of fiscal deficit, lending rate, exchange rate and the real gross domestic product growth rate thus:

$$td_{it} = f(FD, FD^2, lr, er, gdpg,) \quad (1.6)$$

where: td is trade deficit/current account balance, FD stands for fiscal deficit, FD^2 is the squared value of fiscal deficit which is a threshold effect, lr represents lending rate, er is exchange rate, and $gdpg$ is the growth rate of real gross domestic product. The model is a multivariate model. The use of a multivariate rather than a bivariate model, especially with the inclusion of real GDP growth rate can make for co-integration between the two deficits (Vamvoukas, 1999). Moreover, testing for causality between the fiscal and trade deficits requires a multivariate rather than a bivariate model in order to avoid distortions arising from the omission of relevant variables (Tallman & Jeffrey, 1991). Therefore, following Pesaran et al. (1999) that dynamic heterogeneous panel regression can be incorporated into an error correction model using the Autoregressive Distributed lag (ARDL) (p, q) approach, a nonlinear panel ARDL model is modelled thus:

$$\Delta y_{it} = \beta_{i0} + \sum_{j=1}^{p-1} \eta_{ij} \Delta y_{it-j} + \sum_{j=1}^{p-1} \beta_{ij} \Delta X_{it-j} + \sum_{j=1}^{p-1} (1 - \beta_{ij}) \Delta X_{it-j}^2 + \sum_{j=1}^{p-1} \lambda_{ij} Z_{it-j} + \delta_i [y_{it-1} - \alpha_i X_{it}] + \varepsilon_{it} \quad (1.7)$$

Where: y_{it} = vector of dependent variables (trade deficit and fiscal deficit);

X_{it} = vector of the explanatory variables, fiscal deficit/trade deficit;

X_{it}^2 = vector of the threshold variable effect of fiscal deficit/trade deficit;

$p-1$ = vector of the optimal lag length reduced by one;

θ_{i0} = vector of the constant terms;

$\eta_j, \theta_{ij}, \lambda_i$ = vector of the short-run dynamic coefficients of the model;

α_i = vector of the long-run coefficients;

Z_{it} = vector of other explanatory variables in the model ($lr, er, gdpg$);

δ_i = vector of the error correction terms/speed of adjustment terms to long-run equilibrium;

Δ = is the difference operators;

i and t = are subscripts representing country's and time identities

respectively;

ε_{it} = vector of the residuals of the equations.

The inclusion of the squared term is necessary to capture the impact of a threshold effect. The significance of the linear and/or the non-linear indicators of the fiscal deficit on trade deficit (and vice versa) will be used to examine whether beyond a certain threshold, fiscal deficit will significantly impact the trade deficit negatively in the long-run and vice versa.

In order to infer the violation of the twin-deficit hypothesis among the BRICS economies, the coefficients of the linear and/or the non-linear coefficient(s) of the explanatory terms of the fiscal deficit/trade deficit (as the case may be) is expected to be negative and/or not significant at 5 per cent. If the probability values of the betas (i.e. θ_{ij}) are NOT significant at 5 per cent, it implies that the twin-deficit hypothesis is violated for BRICS economies. Otherwise, the hypothesis holds

among the BRICS economies. However, if the threshold term $(1 - \theta_{ij})$ becomes significantly negative at 5 per cent, it therefore suggests that though the twin-deficit hypothesis is violated, however, beyond a certain point in the future it will hold. Again, the term in the bracket represents the long-run equation with an error correction term (δ_i) . If the error correction term (δ_i) is not significant at 5 per cent significance level, it follows that long-run relationship does not exist between the two deficits and the variables do not move together in the long-run. In other words, there is no cointegration between trade deficit and fiscal deficit among the BRICS economies. Long-run relationships exist only in the context of cointegration among variables with the same order of integration (Johansen, 1995; Philipps & Bruce, 1990).

6. Empirical results

Following the standard panel ARDL data analysis procedure, we commence with the panel unit root test of all variables used in the model to ascertain that all the series are integrated of order zero and one, and no series integrated of order two as a requirement for the adoption of ARDL model. Then, we proceed to the optimal lag length selection test, after which we conduct the bound testing approach to co-integration test. The panel ARDL model is then employed to investigate the short-run and long-run between the two deficits and other regressors through 2000 first quarter to 2019 last quarter for the BRICS economies. Finally, we test the second-order Lind and Mehlum (2010) U-shaped tests.

6.1. Unit root test

We applied and presented the Unit root test for panel data in Table 1. Two econometric tests as Im, Pesaran and Shin (IPS) and Levin, Lin and Chu (LLC) were utilized. The null hypothesis (H_0) for these tests assumed that all variables are non-stationary and the alternative hypothesis (H_1) supposed that all variables are stationary. The two tests make up for the weakness of each other. For instance, the IPS approach assumes that the slopes are heterogeneous while the LLC unit root test assumes that the slopes are homogeneous. If the probability values for the tests are less than 1 per cent or 5 per cent level of significance then the variables are stationary either at order zero or one.

Table 1. Unit root tests

DATA	IMP TEST			LLC TEST		
	Level	1st diff.	Condition	Level	1 st diff.	Condition
Current Account Balance (CAD)	-4.1888**	NA	I(0)	-2.6790**	NA	I(0)
CAD Squared (CAD ²)	-6.9769**	NA	I(0)	-6.0327**	NA	I(0)
Fiscal Deficit (FD)	-6.9349**	NA	I(0)	-5.4198**	NA	I(0)
FD Squared (FD ²)	-11.3612**	NA	I(0)	-9.1995**	NA	I(0)
GDP Growth (GDPG)	-19.7659**	NA	I(0)	-13.5295**	NA	I(0)
Lending Rate (LRATE)	NA	-3.9427**	I(1)	-4.2870**	NA	I(0)
Exchange Rate (ER)	NA	-11.8537**	I(1)	NA	-11.3282**	I(1)

** means stationary at 1%, * means stationary at 5%

Source: Estimation

We summarized the results of the unit root tests in Table 1. The results as presented in Table 1 reveal a consistent output between the two different unit root tests (the IPS and the LLC). Based on this result, most of the variables are statistically stationary in level. With the exception of exchange rate that became stationary after first difference, all the other series are integrated of order one [I(0)] with constant and trend. Therefore, since the series are a combination of I(1) and I(0), an ARDL technique can be applied to estimate the model.

6.2. Optimal lag length selection

The optimal lag selection criteria were carried out using different information criterion. The most common lag for a variable is chosen for that particular variable. Based on the Schwartz Bayesian criterion, this study imposes lag one (1, 1, 1, 1, 1, 1, 1)⁵ for fiscal deficit/trade deficit, lending rate, exchange rate, GDPG, and the log of the squared value of fiscal/trade deficits respectively.

In ARDL model technique, the lag length selection order must not be uniform across all the variables as it is the case under the VECM model, however, the lag selection order in this study suggested that the most common lag across all the variables is one. Besides, the Schwartz Bayesian and the Hannan-Quinn information criteria also accentuate to this fact as presented in Table 2.

6.3. The Panel ARDL results

The Panel ARDL result was estimated using three different estimators as the pooled mean group (PMG), the mean group (MG) and the dynamic fixed effect (DFE). The Hausman test accepts the null hypothesis of the homogeneity restriction on the regressors in the long-run; hence, the PMG is a more efficient estimator than the MG and the DFE for all the models. The results are presented under Tables 3 and Tables 4. The level and threshold result with current account deficits as the explained variable are presented under Table 3, while that of the level and threshold result when Fiscal Deficit is the explained variable are presented under Table 4.

The analyses began with the presentation and discussion of the results with trade deficit/current account balance (CAD) as the dependent variable while Fiscal deficit and other regressors are the explanatory variables under. The results indicate that twin-deficit hypothesis is violated among the BRICS economies for the period under consideration. This is because the effect of fiscal deficit on trade deficit is significantly negative long-run, hence a twin divergence holds among the BRICS markets. This supports the Ricardian equivalence hypothesis that increases in fiscal deficits arising from tax cut cannot transmit to increases in current account deficit by increasing total absorption over domestic output because the extra income from tax cut will be saved in anticipation of future higher tax obligations. Although the MG and the DFE estimators report a consistent conclusion, however, this study argues that the Ricardian hypothesis could be violated in support of the Keynesian twin-deficit proposition if the deficits in the fiscal deficits exceed a particular threshold.

Table 2. Selection-order criteria

Number of obs = 256								
lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-9207.9				4.3e+22	71.9914	72.0304	72.0883
1	-7720.91	2974	49	0.000	5.7e+17	60.7571	61.069*	61.5326*
2	-7656.57	128.69	49	0.000	5.1e+17	60.6372	61.2221	62.0913
3	-7612.4	88.323	49	0.000	5.3e+17	60.675	61.5328	62.8077
4	-7491.99	240.82*	49	0.000	3.0e+17*	60.1171*	61.2478	62.9283

Endogenous: CAD FD FDSQ CASQ GDPG LRATE ER Exogenous: _cons

Source: Estimation

Table 3. Panel ARDL threshold results with trade-deficit as the dependent variable

	PMG Estimator	MG Estimator	DFE Estimator
Long-Run Coefficients	ΔCAD	ΔCAD	ΔCAD
First lag Fiscal Deficit (FD_{it-1})	-0.048 (2.79)***	-0.035 (0.70)	0.002 (0.48)
First lag Fiscal Deficit Squared (FD^2_{it-1})	0.00003 (1.64)*	0.000001 (1.05)	0.00002 (0.81)
First lag Lending Rate (LR_{it-1})	534.9 (3.64)***	-677.7 (1.10)	276.5 (1.27)
First lag GDP Growth ($GDPG_{it-1}$)	757.5 (4.52)***	-82.5 (0.65)	121.2 (0.40)
First lag Exchange Rate (ER_{it-1})	218.7 (1.40)	-1,308.9 (0.45)	111.3 (0.75)
First lag Trade Openness (TOP_{it-1})	-1.258 (0.02)	-51.1 (0.10)	-134.5 (0.55)
Error Correction Term	-0.274 (2.31)**	-0.666 (3.47)***	-0.242 (5.69)***
Short-Run Coefficients			
Constant	-264.72 (2.34)**	392.73 (1.68)*	316.2 (0.13)
Δ Fiscal Deficit (ΔFD_{it})	0.045 (0.91)	-0.017 (0.74)	0.0003 (0.28)
Δ Fiscal Deficit Squared (ΔFD^2_{it})	-0.00001 (1.11)	-0.000003 (1.93)	0.000001 (0.25)
Δ Lending Rate (ΔLR_{it})	-708.8 (2.02)**	-291.4 (1.33)	118.1 (0.63)
Δ GDP Growth ($\Delta GDPG_{it}$)	126.1 (0.85)	0.061 (0.00)	-42.2 (0.87)
Δ Exchange Rate (ΔER_{it})	-109.57 (0.80)	-1,678.3 (0.86)	-322.7 (1.96)**
Δ Trade Openness (ΔTOP_{it})	-427 (1.93)*	-665.8 (1.64)	-144.9 (1.09)
Hausman Test: H0 PMG is a better estimator than MG P-Value: 0.1532 Hausman Test: H0 PMG is a better estimator than DFE P-Value: 0.7104			
Observations/Groups	313/5	313/5	313/5
Absolute value of z statistics in parentheses			
*** significant at 1%; ** significant at 5%; * significant at 10%			

Source: Estimation

This proposition was affirmed that a significant positive relationship exists between the two deficits after a threshold point is reached. This was evident from the positive significant impact of the squared fiscal deficit on current account deficit in the long-run at 10 per cent significance level. Therefore, although twin-deficit divergence holds between the two deficits, if the fiscal deficit persists, it will reach a threshold point where its impact on trade balance becomes significantly positive. The implication of this is that whether or not the rational consumer saves or spends the extra income from tax cut, aggregate domestic output still exceeds total absorption so that there is no pressure on total import to exceed total export; hence, a twin divergence exists at lower levels of fiscal deficits. Furthermore, as aggregate output exceeds absorption, export rises, leading

Table 4. Panel ARDL threshold results with fiscal-deficit as the dependent variable

Long-Run Coefficients	PMG Estimator	MG Estimator	DFE Estimator
	Δ FD	Δ FD	Δ FD
First lag Current Acc. Balance (CAD_{it-1})	-2.725	-11.025	12.21
	(1.60)	(1.25)	(3.26)***
First lag Current Acc. Balance Squared (CAD^2_{it-1})	0.0005	0.00002	0.0003
	(4.51)***	(0.04)	(2.93)***
First lag Lending Rate (LR_{it-1})	392.23	276.63	-280.38
	(2.49)**	(0.74)	(0.63)
First lag GDP Growth ($GDPG_{it-1}$)	547.06	721.99	748
	(2.46)**	(0.96)	(1.35)
First lag Exchange Rate (ER_{it-1})	-329.75	-949.8	-434.64
	(2.76)***	(1.53)	(1.59)
First lag Trade Openness (TOP_{it-1})	-1,351.3	1,616.9	-2075.4
	(2.05)**	(0.25)	(0.43)
Error Correction Term	-0.525	-0.866	-0.864
Short-Run Coefficients	(2.35)**	(7.23)***	(15.27)***
Constant	-206.68	-476.93	-626.27
	(1.17)	(0.72)	(0.38)
Δ Current Acc. Balance (ΔCAD_{it})	-4.276	-7.793	0.833
	(0.22)	(0.38)	(0.19)***
Δ Current Acc. Balance Squared (ΔCAD^2_{it})	0.00003	0.00002	0.00004
	(0.52)	(0.14)	(0.52)
Δ Lending Rate (ΔLR_{it})	127.06	454.26	-332.79
	(0.66)	(0.13)	(0.26)
Δ GDP Growth ($\Delta GDPG_{it}$)	944.4	167.15	372.36
	(0.87)	(0.87)	(1.13)
Δ Exchange Rate (ΔER_{it})	-233.80	-181.80	-392.31
	(1.49)	(1.35)	(3.53)***
Δ Trade Openness (ΔTOP_{it})	3,424.75	4,874.1	784.58
	(1.43)	(1.33)	(0.38)
Hausman Test: H0 PMG is a better estimator than MG P-Value: 0.7214			
Hausman Test: H0 PMG is a better estimator than DFE P-Value: 0.1096			
Observations/Group	313/5	313/5	313/5
Absolute value of z statistics in parentheses			
*** significant at 1%; ** significant at 5%; * significant at 10%			

Source: Estimation

to a decrease in current account deficits, hence, a negative relationship between the two deficits. However, the reverse becomes the case as fiscal deficits rise above a certain threshold with persistent tax cut and/or increases in government expenditure.

This result is consistent with Ahmad et al. (2015) observation that the direction of impact of fiscal balance depends on its size. In other words, the impact of fiscal expansion differs according to the size of the deficit and it can change when the deficit exceeds a critical threshold level (Ahmad et al., 2015). Therefore, a negative impact can change to positive significant impact in the long-run if the deficit continuously increases and vice versa. The same condition holds when fiscal deficit is the dependent variable as represented under Table 4. This means that although the twin-deficit hypothesis is violated among the BRICS economies for the period under consideration, however, as government deficit increases beyond a certain threshold, it can translate into a potential twin-deficit problem. Moreover, the PMG estimator further reveals that lending interest rate and economic growth rates widen trade deficits during the long-run while trade openness and interest rates reduce it in the short-run. This long-run positive impact of interest rate on current account deficit is consistent with theory because an increase in interest rate leads to capital inflows, leading to the appreciation of currency. As currency appreciates, it can then worsen the current account deficit.

Again, the result shows that a long-run relationship/co-integration exists among the variables of the model. This is inferred from the negative significance of the speed of adjustment term (δ_i) for the three estimators (PMG, MG, and DFE) at 27.4, 66.6 and 24.2 per cents per annum per annum 5 per cent significance respectively when current account deficit is used as the dependent variable. In other words, short-run disequilibrium can be corrected in the long-run at an average speed of 27.4, 66.6 and 24.2 per cents per annum. This means that BRICS economies can reach convergence in the long-run after contemporaneous shocks from fiscal deficit hit the economy. Therefore, as a long-run model, it supports the aforementioned assertion that though a short-run twin-deficit hypothesis could not hold among the BRICS economies, it can eventually hold sometimes in the very long-run when government expenditure reaches a certain threshold. This suggests that government expenditure induced fiscal deficit can have greater multiplier effect than tax cut induced especially as the latter is susceptible to the Ricardian equivalent hypothesis.

The full option result of the PMG estimator was necessary due to its assumption of heterogeneity of the short-run variables and the speed of adjustment term among the countries in the panel. The result reveals that stability within the system is mostly driven by Russia at 66.4 per cent, South Africa at 39.7 per cent, Brazil at 22.7 per cent, and China at 7.8 per cent at 1 per cent significance level. This means that these economies will reach a long-run steady state after experiencing a short-run disequilibrium arising from fiscal and/or trade deficits. India is the only country among the BRICS economic group that could not reach convergence in the long-run after a short-run disequilibrium under the current account deficit model. This is because its speed of adjustment to steady state is not significant even at 10 per cent level. This implies that the twin-deficits problem in India could be explosive.

On the other hand, the results were consistent when fiscal deficit is the dependent variable as presented under Table 4. With emphasis on the PMG model based on the Hausman test, the result shows that trade deficit could not significantly detract from fiscal deficit. However, after a certain threshold is reached, trade deficit then had though a weak but positive significant impact on fiscal deficit at 1 per cent significance. The twin-deficit hypothesis is violated until a threshold point is reached, therefore, persistent and increasing negative balances in current account can positively impact the fiscal deficit.

This can happen through two channels; first, through a reduction in tax revenue and second through increases in government expenditure. A negative current account balance reduces tax revenue because of possible loss of jobs and withdraws from the domestic income stream to foreign economies. While this alone might not generate fiscal deficits, a threshold point can be reached as government expenditure also increases to pay for unemployment benefits on account of a fall in output following the excess of import over export. This shows that the twin-deficit hypothesis among the BRICS economies can hold if deficits in the current account balance persists and increases overtime into the long-run.

The result suggests that government's Fiscal Deficit is greatly influenced by the volume of its trade with the rest of the world. This is because, the threshold effect reveals that negative current account balance has to be sufficiently large to trigger a meaningful shortfall in tax revenue; otherwise government can reduce its expenditure to counteract the effect of falling tax revenue, thereby violating the twin-deficit hypothesis. This further explains why the result reveals that exchange rate significantly dampens the Fiscal Deficit during the long-run. This is because with an appreciating exchange rate, current account deficit will deteriorate and a deteriorating current account balance reduces tax revenue thereby worsening the Fiscal Deficit. Hence, a bi-directional causal relationship between trade deficit and fiscal deficit is found in this study among the BRICS economies. Therefore, proper management of fiscal and trade balances is a top prioritized recommendation in this study.

The result further reveals that the growth rate of the economy significantly raises Fiscal Deficit while trade openness significantly reduces it in the long-run. Greater economic growth raises the tax revenue accruing to the government; a negative impact on Fiscal Deficit is expected. This reverse effect could be blamed on the way fiscal balance is managed among countries. Also, with greater trade openness, barriers to trade are removed and economies can freely trade. The extent of trade openness on Fiscal Deficit depends on its impact on current account balance. If the economy is a net importer, then greater trade openness deteriorates its current account balance, and a deteriorating current account balance will as well worsen the Fiscal Deficit. Furthermore, the speed of adjustment to the long-run steady state was negatively significant at an average rate of 52.5 per cent per annum signifying that short-run disequilibrium can be corrected at an average speed of 52.5 per cent per annum at 5 per cent significance level. The speed of adjustment for the MG and the DFE estimators stood at an average of 86.6 per cent and 86.4 per cent respectively.

The result reveals that the model reaches convergence faster when fiscal deficit is the dependent variable than when trade deficit is the dependent variable. This simply suggests that fiscal deficit is more responsive to changes in trade deficit than otherwise. Moreover, the full option was estimated using the PMG estimator for all the countries that make up the panel to account for its (PMG estimator) heterogeneous assumption. The result shows that with the exception of Brazil all the other countries were able to reach convergence in the long-run at an average speed of 12.6, 84.7, 78.7 and 100.3 per cents for Russia, India, China and South Africa respectively at 5 per cent significance level. Therefore, possible disturbances in the model are attributed to Brazil when fiscal deficit is used as the dependent variable but India when Current account deficit is the dependent variable. This assertion further strengthens the view of Ahmad et al. (2015) that the direction of causality between the two deficits depends on the way Fiscal Deficits are managed in the country.

6.4. Robustness check: the static results and the u-shaped tests

The dynamic analysis of the panel ARDL, PMG estimator in this study so far, supports the Keynesian hypothesis on twin-deficit hypothesis only when a threshold point is reached. That is, the relationship between the two deficits is significantly negative; however, as these deficits increase beyond a certain threshold, the relationship becomes positive. To test for its sufficient condition, the static fixed effect, random effect, pooled regressions as well as Lind and Mehlum (2010) U-shaped tests were conducted. The U-shaped test was used to verify the direction of movements between the two deficits.⁶ Ahmad et al. (2015) and Çatik et al. (2015) found a non-linear relationship between current account deficit and fiscal deficit in a panel of nine African countries and Turkey economy respectively. However, their studies could not explain whether the nonlinear relationship is U-shaped or monotonic. This study therefore examines this relationship further by first estimating equation 2 thus:

$$CAD_{it} = \delta_{i0} + \delta_{i1}X_{it} + \delta_{i2}FD_{it} + \delta_{i3}FD_{it}^2 + \lambda_i + e_{it} \quad (1.8)$$

Where CAD_{it} is current account balance/deficit for country i in period t ; δ_{ij} are the parameters to be estimated; X_{it} is a vector of all the macroeconomic variables in the model as were defined earlier; FD_{it} is fiscal deficit for country i in period t ; whereas FD_{it}^2 is the squared/quadratic term of fiscal deficit variable, a measure of its threshold effect; λ_i is the country's specific fixed effect while e_{it} is the error

term. The second-order sufficient condition for the threshold relationship between the two deficits holds if the coefficient of FD_{it} is significantly negative while the coefficient of FD_{it}^2 is significantly positive. On the other hand, the U-shaped sufficient condition holds if at the lower bound of the interval, the relationship is decreasing but increases at the upper bound, otherwise the relationship is to be monotonic. Therefore, the Lind and Mehlum (2010) U-test was conducted by taking the first derivative of equation (1.8), and setting the null and the alternative hypotheses thus:

$$H_0: (\delta_{i2} + 2 \delta_{i3}FD_{lower\ bound}) \geq 0 \text{ and/or } (\delta_{i2} + 2 \delta_{i3}FD_{upper\ bound}) \leq 0 \quad (1.9)$$

This can be rejected in favour of the alternative hypothesis thus:

$$H_1: (\delta_{i2} + 2 \delta_{i3}FD_{lower\ bound}) < 0 \text{ and/or } (\delta_{i3} + 2\delta_{i3}FD_{upper\ bound}) > 0 \quad (1.10)$$

Where $FD_{lower\ bound}$ and $FD_{upper\ bound}$ represent the minimum and maximum values of fiscal deficit, respectively. Rejection of the null confirms the existence of a U shape relationship between the two deficits. The results as presented in [Tables 5](#) and [Tables 6](#) reveal that the Hausman test supports the use of the fixed effect model as the most efficient static estimator. Moreover, the results report a consistent conclusion with that of the dynamic ARDL results. It shows that the impact of the threshold or nonlinear relationship between current account deficit and fiscal deficit is significantly positive at 1 per cent and 10 per cent significance levels respectively. However, higher effect growth shock and extensive fluctuation in exchange rate could not explain the variability in the two deficits under the static fixed effect model. Again, variations in interest rate lead to divergence of the deficits. This is consistent with the findings of Banday and Aneja (2019) who investigated this nexus in China and found that interest rate and exchange rate were among the policy target variables to ensure that the hypothesis holds.

However, the Pooled OLS and the random effect model revealed that fiscal deficits will significantly raise current account deficits at all time and at all levels of its management. Current account balance could only significantly raise fiscal deficits after a threshold point is reached. These mixed results could be attributed to the unrealistic assumptions of the random effect and the pooled OLS estimators such as common intercept, common slope and time-invariant assumption of the estimators.⁷ All the countries were treated as the same group; therefore, the impact of fiscal deficits on current account deficits becomes time invariant. These assumptions are very unlikely in real life (Samargandi et al., 2015). The Hausman test validates this assertion that the pooled OLS and the random effect models were less efficient than the fixed effect model. Hence, the impact of fiscal deficits on current account deficits has a stronger asymmetric impact than that of current account deficits on fiscal deficits.

On the other hand, the U-shaped second-order test results validate the conclusions made under the panel nonlinear ARDL estimators and the static estimators. The results are significantly negative at the lower bound of the interval while at the upper bound, it became significantly positive at 1%. This suggests that the null hypothesis of inverse U shape/monotonicity is rejected in favour of the alternative. Consequently, it confirms the U-shaped relationship between fiscal deficits and current account deficits among BRICS economies.

The summary result is presented in [Table 7](#). It is the concise output of the models of interests (the ARDL PMG estimator and the U-shaped test) based on the Hausman test. The PMG estimator presents the long-run and the short-run results of the panel ARDL in models 1 and 2. The results reveal that the twin-deficit hypothesis holds in the long-run after a threshold effect is reached. As a result, the Ricardian equivalence hypothesis is debunked for BRICS economies in the long-run. To be more specific, a one unit increase in fiscal deficit will trigger about 4.8% reduction in trade deficit; however, as the fiscal deficit increases beyond a certain threshold, a one unit increase in

Table 5. The static and U-test results with trade deficit as the dependent variable

	Fixed Effect		Random Effect		Pooled Regression	
	CAD		CAD		CAD	
Fiscal Deficit (FD_{it})	0.009 (6.47)***		0.016 (9.74)***		0.016 (9.74)***	
Fiscal Deficit Squared (FD^2_{it})	2.78e-09 (3.96)***		3.25e-09 (3.46)***		3.25e-09 (3.46)***	
Lending Rate (LR_{it})	233.639 (3.09)***		-323.243 (7.42)***		-323.243 (7.42)***	
GDP Growth ($GDP_{G_{it}}$)	23.840 (0.35)		15.735 (0.17)		15.735 (0.17)	
Exchange Rate (ER_{it})	57.988 (1.16)		-95.898 (2.43)**		-95.898 (2.43)**	
Trade Openness (TOP_{it})	-104.879 (1.24)		-570.012 (15.10)***		-570.012 (15.10)***	
Constant	271.20 (0.79)		3403.02 (13.59)***		3403.02 (13.59)***	
No of Obs/Groups	315/5		315/5		315/5	
R-squared (Overall)	0.2822		0.6723		0.6723	
Hausman Test: H_0 : Random Effect model is better than the Fixed Effect Model. χ^2 Value = 393.56; P-Value = 0.0000						
Absolute value of t statistics in parentheses						
*** significant at 1%; ** significant at 5%; * significant at 10%						
Second order U shaped test based on the fixed effect Result						
Particulars	Lower Bound		Upper Bound			
Slope	-0.0072		0.0181			
t-value	-2.0841		5.4614			
P-Values	0.0190		4.92e-08			

(Continued)

Table 5. (Continued)

	Fixed Effect	Random Effect	Pooled Regression
	CAD	CAD	CAD
-			

Overall test of presence of α U shape:

t-Value = 2.08 P-Values = 0.019 Extreme Point: -1,544,553

Sources: Estimation

Table 6. The static and U-test results with fiscal deficit as the dependent variable

	Fixed Effect		Random Effect		Pooled Regression	
	FD		FD		FD	
Current Acc. Balance (CAD _{it})	10.304 (3.35)***		16.386 (8.04)***		16.386 (8.04)***	
Current Acc. Balance Squared (CAD ² _{it})	0.0001 (1.91)*		0.00004 (0.67)		0.00004 (0.67)	
Lending Rate (LR _{it})	-300.50 (0.76)		-258.12 (1.48)		-258.12 (1.48)	
GDP Growth (GDPG _{it})	774.569 (0.23)		-120.25 (0.36)		-120.25 (0.36)	
Exchange Rate (ER _{it})	-471.52 (1.92)		-1,269.58 (8.56)***		-1,269.58 (8.56)***	
Trade Openness (TOP _{it})	-323.35 (0.76)		-660.081 (0.36)		-660.081 (0.36)	
Constant	3,097.86 (0.18)		11,707.87 (1.00)		11,707.87 (1.00)	
No of Obs/Groups	315/5		315/5		315/5	
R-squared (Overall)	0.3804		0.5361		0.5361	
Hausman Test: H ₀ : Random Effect model is better than the Fixed Effect Model. Chi2 Value = 19.98; P-Value = 0.0013						
Absolute value of t statistics in parentheses						
*** significant at 1%; ** significant at 5%; * significant at 10%						
Second order test for a threshold effect based on the fixed effect Result						
Particulars	Lower Bound		Upper Bound			
Slope	-1.8634		23.6056			
t-value	-0.2224		3.9293			
P-Values	0.4121		0.00005			

(Continued)

Table 6. (Continued)

	Fixed Effect		Random Effect		Pooled Regression	
		FD		FD		FD
-						

Overall test of presence of α U shape:

t-Value = 0.22 P-Values = 0.412 Extreme Point: -39,109.38

Sources: Estimation

Table 7. Summary table: showing results of the PMG estimators & the U-shaped test

Particulars	PMG (Δ CAD)	Particulars	PMG (Δ FD)	U-Shaped Tests		
				Particulars	Lower Bound	Upper Bound
Long-Run Coefficients	Model 1	Long-Run Coefficients	Model 2			
FD_{it-1}	-0.048(2.79)***	CAD_{it-1}	-2.725(1.60)	Slope	-0.0072	0.0181
FD^2_{it-1}	0.00003(1.64)*	CAD^2_{it-1}	0.0005(4.51)***	t-value	-2.0841	5.4614
LR_{it-1}	534.9(3.64)***	LR_{it-1}	392.23(2.49)**	P-Values	0.0190	4.92e-08
$GDPG_{it-1}$	757.5(4.52)***	$GDPG_{it-1}$	547.06(2.46)**			
ER_{it-1}	218.7(1.40)	ER_{it-1}	-329.75(2.76)***			
TOP_{it-1}	-1.258(0.02)	TOP_{it-1}	-1,351.3(2.05)**			
Error Correctn Term	-0.274(2.31)**	Error Correctn Term	-0.525(2.35)**			
Short-Run Coefficients		Short-Run Coefficients				
Constant	-264.72(2.34)**	Constant	-206.68(1.17)			
ΔFD_{it}	0.045(0.91)	ΔCAD_{it}	-4.276(0.22)			
ΔFD^2_{it}	-0.00001(1.11)	ΔCAD^2_{it}	0.00003(0.52)			
ΔLR_{it}	-708.8(2.02)**	ΔLR_{it}	127.06(0.66)			
$\Delta GDPG_{it}$	126.1(0.85)	$\Delta GDPG_{it}$	944.4(0.87)			
ΔER_{it}	-109.57(0.80)	ΔER_{it}	-233.80(1.49)			
ΔTOP_{it}	-427(1.93)*	ΔTOP_{it}	3,424.75(1.43)			
Obs/Groups	313/5	Obs/Groups	313/5			
Absolute value of z statistics in parentheses						
*** significant at 1%; ** significant at 5%; * significant at 10%						
Source: Authors' Estimation						

lead to about 0.003% increase in trade deficit at 10% level of significance. The same conclusion holds when fiscal deficit becomes the dependent variable.

The coefficients of the other regressors and the speed of adjustment coefficients follow the prior expectation. Take for instance, an increase in fiscal deficit will raise the interest rate (LR) thereby leading to foreign inflow of capital. As capital flows into the country, exchange rate (ER) appreciation will be inevitable. With the appreciation in exchange rate, import will increase beyond export; as a result, current account deficit will arise. The threshold effect suggests that for fiscal deficit to trigger these effects among the macroeconomic variables among the BRICS economies, it has to be sufficiently large. The same condition is obtainable when trade deficit increases beyond a certain threshold. On the other hand, error in the short-run will be corrected in the long-run at the speed of 27.4% and 52.5% in models 1 and 2 respectively.

7. Conclusion and policy implications

This study is motivated by the mixed evidence from the existing literature on the nexus between trade deficit and fiscal deficit, particularly among the BRICS economies. The relationship was found to be negative in some studies and non-significant or even positive in others. The mixed results have been attributed to country-specific characteristics and different econometric techniques employed for the same country data (Shastri et al., 2017). It is on this background that this study examines possible threshold effect between the two deficits among the BRICS economies over the period 2000q1 to 2019q4. The panel ARDL (1, 1) technique, with emphasis on the pooled mean group estimator has been applied to test the existence of short and long-run threshold relationships among trade and fiscal deficits. Further, the Lind and Mehlum (2010) U-shaped tests were conducted to affirm or debunk the existence of this threshold effect. The results refute the existence of twin-deficit in the short-run; but a long-run relationship exists between trade deficit and fiscal deficit. It was found that in the long-run, trade deficit and fiscal deficit were negatively related, but after a threshold effect is reached, the relationship became positive. This suggests that huge fiscal deficit and/or huge trade deficit have great multiplier effect on the economy. Therefore, the Ricardian equivalence assumption is violated in the long-run among the BRICS economies for the period under consideration. The implication of this is that aggregate savings position will not be sustained as rational households will more likely to invest the extra income arising from government tax cut than save it. As a result, total absorption will go beyond aggregate output. This explains why lending rate and gross output positively impacted on the two deficits. Therefore, the extra spending will then come from foreign economies through increased import. An increase in import beyond export leads to current account deficit. Moreover, the Lind and Mehlum (2010) U-shaped tests reveal a consistent result that in the long-run fiscal deficit will negatively impact the trade deficit until a threshold point is reached, after which the relationship becomes positive. The implication of this is that too many fiscal deficits can be very detrimental to trade balance and could spill-over to the rest of the world if it happens in big economies like China, thereby raising the world interest rate. This conclusion was supported by Kumhof and Laxton (2013).

Moreover, the short-run disequilibrium in the model can be corrected at the speed of 27.4 and 52.5 per cents per annum at 5 per cent significance levels when the current account deficit and fiscal deficits were used as dependent variables respectively. This implies that in a small open economy, external and internal disequilibrium might not pose serious economic threats as long as government fiscal deficits and total absorption remain within a target horizon.

Finally, as good as these results may look; this study suffers from two major drawbacks. First, the BRICS economies are more likely to be hit by supply shocks than demand shocks because they have a more diversified economy when compared to developing countries, with a wide range of production and export industries. As a result, it is less clear how fiscal deficit can transmit into trade deficit without a transmission mechanism. Therefore, further studies in this area should

investigate this area. Second, the estimation method used here may be subject to the problems of endogeneity of some regressors such as fiscal deficit, wrong data measurement and omitted variable bias and. Therefore, further studies in this area can seek to circumvent these challenges by making the fiscal deficit more exogenous in nature in order to reflect government policies and derive policy conclusions. Again, other strictly exogenous variables and more countries can be included in the model such that trade deficit, output and fiscal deficit are also determined by other economic variables. This can create a transmission channels through which fiscal deficit and trade deficit nexus can occur.

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Notes

1. The simultaneous occurrence of these two deficits is often referred to as the 'twin deficit hypotheses in economic literature. Whereas fiscal deficit refers to an economic condition when government spending exceeds its tax revenue, current account deficit/trade deficit explains a situation when an economy's total payment for its imports is greater than its total receipts from export.
2. Keynes (1973a) believes that government expenditure has greater multiplier effect than the tax cut because it impacts more on the poor with higher propensity to consume than the rich. Ogbnna (2014) also affirms that the impact is stronger with government spending than for tax cuts.
3. This comprises of Brazil, Russia, India, China and South Africa.
4. This study places more emphasis on the pooled mean group estimator above the mean group and the dynamic fixed effect estimators of the panel ARDL because of the assumption of a homogeneous long-run equilibrium among the BRICS countries but a heterogeneous short-run equilibrium.
5. Lag length can be imposed on variables depending on the data limitation. Take for instance, if the time dimension is not long enough, the researcher can impose a common lag across the series (Loayza and Ranciere, 2006; Demetriades & Law, 2006).
6. The Lind and Mehlum (2010) U shaped test extends the threshold relationship between the two deficits by ascertaining whether the relationship will be negative at the lower bound and positive at the upper bound after reaching the threshold point or vice versa.
7. The pooled OLS assumes a common intercept and slope for all the cross-sectional identity while the random effect model assumes a common intercept and that the model is time invariant. This means that the

error at any period is uncorrelated with its past, present and future values (Arellano, 2003).

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