

Fiscal Health and Developmental Outcomes in Brics Nations: New Answers to Old Questions

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Abstract: Insufficient and inefficient use of state resources amidst growing state budgetary expenditure has ensured that developmental outcomes in BRICS nations are kept at bay. Despite the one-time tremendous growth of the BRICS nations, stakeholders, policy makers, financial institutions and the society at large are concerned about the disruption in what has been an upward trend in growth and development activities of the BRICS nations. This paper examined the structural relationship between fiscal health and developmental outcomes of BRICS nations with the aim of coming up with the evidence-based prediction of development outcomes of BRICS nations as induced by fiscal irregularities. Findings reveal that debt to GDP ratio, government revenue, the ratio of cost of debt service to revenue, and welfare standard of the populace induces developmental outcomes in BRICS nations in the short-run. Based on the findings, we recommend concerted and prudent fiscal actions should be undertaken to ensure fiscal balance needed to guarantee sustained developmental outcomes in the BRICS nations.

Keywords: Fiscal Health; Development Outcomes; Dynamic Ordinary Least Square; BRICS

JEL Classification: E62

1. Introduction

The BRICS Club (Brazil, Russia, India, China, and South Africa), which was known for its enormous potential for growth, is now in the midst of serious economic and political problems. In addition to the increase in the interest rate that contributed to the increase in the debt burden for these economies, world commodity prices have affected these emerging markets, which are largely dependent on export-led growth (Arezki, Loungani, van der Ploeg, & Venables, 2014). China's structural transformation, which was the main engine of this group, from an export-driven economy to another based on domestic consumption, added to the current woes of BRICS (Herrerias & Orts, 2010). Among these economies,

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India is the only country that has shown signs of strong growth potential. It has benefited greatly from a net importer of gross and other products whose prices have declined and also has the advantage of being less sensitive to market volatility, as it is less dependent on exports for its growth (Medas, Poghosyan, Xu, Farah-Yacoub, & Gerling, 2018). The share of exports of goods and services in GDP in 2014 was 23.2% in India, while that of Russia was 30% and South Africa was 31.3% (BRICS, 2012).

In terms of social development, the BRICS economies showed a mixed performance. In the Social Progress Index (SPI) developed by the Social Progress Imperative, a nonprofit organization based in Washington, Brazil (70.89) surpasses all other member countries, followed by South Africa (65.64), Russia (63.64), China (59.07) and India (53.06) (Sandrey et al., 2013).

Meanwhile, Russia surpasses the rest of the economy in terms of basic human needs (nutrition and basic medical care, air, water and sanitation, shelter and personal safety), Brazil leads the group on the foundations of well-being (access Basic knowledge, access to information and communication, health and well-being, and sustainability of ecosystems and opportunities (personal rights, access to higher education, personal freedom and choice and tolerance and inclusion) dimensions of the IPS. India, which belongs to the group of countries with low social progress, is behind the other BRICS countries in basic human needs and the foundations of well-being and does not stay ahead of China in the opportunity dimension (BRICS Post, 2013).

Despite high overall economic growth rates in BRICS countries in the past two decades, policymakers around the world have become increasingly concerned by the recent unevenness in growth that is often accompanied by rising income disparity.¹ In addition, it appeared that disadvantaged groups, including members of ethnic minorities, people in remote rural locations, and women, have not benefited proportionately from rapid economic growth and subsequent development in this BRICS nations.² The possibility that growth might leave the poor and disadvantaged people behind was highly relevant in political debates concerning the BRICS nations. The question then becomes, how relevant is fiscal healthiness to government ability to ensure broad based growth in the form of development outcomes in BRICS nations?

Rising health care, education, and infrastructure costs are placing pressures on annual budgets of BRICS nations. The ways in which policymakers confront these challenges will determine the fiscal health of the BRICS nations. A government is considered fiscal healthy if her resources meet her obligation and if it does not, it

¹ See (Baldacci, Mchugh and Petrova, 2011; Kalirajan and Otsuka, 2012; Debrun & Jonung, 2018).

² See (Kahn, 2011; Vom Hau, Scott & Hulme, 2012; Carmody, 2015).

experiences fiscal stress. As times have become harder, the fiscal performance, solvency, and inclusiveness of growth in all countries and other governmental agencies under the BRICS have been attracting more attention around the world because of the enormous export potentials and home to the largest supply of consumer goods around the world (Tien, 2011). Interest in this subject in the BRICS nations have been shallow and producing dull empirical analysis with respect to how fiscal health can trigger development and not just growth in these nations.

In this paper, we attempt to measure the predictive substance of fiscal health in a number of ways that can guarantee economic development in BRICS nations with accurate data and appropriate methodology. Much of the current interest in measuring fiscal health arises from a concern with the national fiscal stress that hinders the extension of substantial government expenditures to the grassroots and most importantly has been limited to country-specific analysis. For especially gloomy views of fiscal health and development outcomes appraisals in BRICS nations, the current state of government finance and its long-run prospects which is “*go-to*” international organization has long been the International Monetary Fund (IMF), so it is not surprising that the IMF has also in recent years been paying increasing attention to such problems at the national level. All in all, the fiscal news for the nation has infrequently been well in recent years and how it leads to the development outcomes remains grossly understudied in the extant literature.

Few studies of fiscal health and development outcomes viewed from different perspectives have been produced in the literature of public sector economics in recent years. In particular, concern has recently been expressed about the fiscal health of Brazil, India and South Africa. At first glance, such concern seems a bit puzzling because most of the available evidence suggests that BRICS nations as a whole are experiencing varying fiscally stress.¹ The fundamental fiscal health of a nation has less to do with balancing its budget than with the quantity and quality of services provided and the state of basic infrastructure. In India and South Africa, there is evidence of continuing and perhaps even increased problems in terms of poverty and homelessness as well as increasing awareness that investment in the infrastructure needed to support continued economic growth. In Brazil, transit, roads, water, and sewers, for example, falls short of what seems to be required. It is against this background that this study seeks to unravel the potential development effect of effective fiscal health measures that will guarantee economic growth and development that remains ghostly in BRICS nations. Against this backdrop, this study proposes an empirical investigation on the alternative form of achieving development outcomes through adequate national fiscal health measures in the BRICS clubs.

¹ See (McHugh, Petrova & Baldacci, 2011; Neyapti, 2013; Medas et al., 2018).

2. Literature Review

Economic Development

Economic development is sometimes referred to as inclusive or broad-based growth. Inclusive growth as a strategy of economic development received attention owing to a rising concern that the benefits of economic growth have not been equitably shared (Krugman & Venables, 1995). Growth is inclusive when it creates economic opportunities along with ensuring equal access to them. Economic Development, as the literal meaning of the two words connote, refers to both the pace and pattern of the economic growth (Nafziger, 2012).

There is no universal definition of economic development, but the term development is often used interchangeably with a suite of other terms, including “broad-based growth”, “shared growth”, and “pro-poor growth”. Economic development basically means making sure everyone is included in growth, regardless of their economic class, gender, sex, disability and religion (Lei et al., 2015).

Growth is said to be of development dimension when the growth is to be sustainable in the long-run and it should be broad-based across the sectors and inclusive of the larger part of a country’s labour force. Emphasis on development, especially in terms of opportunity in terms of access to markets, resources, and unbiased regulatory environment, is an essential ingredient of successful growth (Alford, Simkins, Rembert & Hoyte, 2014). In line with the World Bank definition, (Lucas, 1988) referred to economic development as long-term sustained economic growth that is broad-based across sectors and inclusive of a large part of a country’s labour force, thereby reducing unemployment significantly. Policies that encourage inclusive growth tend to emphasise removing constraints to growth, creating opportunity, and creating a level playing field for investment.

(Annison, 1987) defined economic development as that growth which can reduce poverty and allow people to contribute to economic growth and benefit from the growth process. They pointed out that rapid pace of growth is unquestionably necessary for substantial poverty reduction but for growth to be sustainable in the long-run should be broad-based across the sectors and inclusiveness is a concept that encompasses equity, equality of opportunity and protection in market and employment transitions. Growth is inclusive and becomes economic development if it supports high levels of employment and rising wages (Mitchell, 2018).

(Deaton, 2003), argued that economic development is both an outcome and a process. On one hand, it ensures that everyone can participate in the growth process, both in terms of decision making for organising the growth progression as

well as in participating in the growth itself. On the other hand, it makes sure that everyone shares equitably the benefits of growth. (Ali, 2007) opined that the key elements in inclusive growth are employment and productivity, development in human capabilities and social safety nets and the targeted intervention. (Adler, 1959) defined economic development as gross domestic product growth that leads to significant poverty reduction.

(Fotourehchi, 2017) posited that economic development entails achieving sustainable growth that will create and expand economic opportunities and ensure broader access to these opportunities so that members of society can participate in and benefit from growth. (Dehesh, 1994) defined economic development as economic growth that results in a wider access to sustainable socio-economic opportunities for a broader number of people, regions or countries while protecting the vulnerable, all being done in an environment of fairness, equal justice and political plurality. (Anand & Sen, 2000) argued that economic development has become the government's objective, but debates have refined the meaning of the term, as creating conditions for the masses to contribute to and participate in growth. This requires pro-poor growth, access to quality public services and jobs. Examples of government initiatives that can contribute to active inclusion are improving infrastructure, financial inclusion, health, education, technology and public service delivery.

Fiscal Health

Fiscal sustainability analysis is an important component of macroeconomic health analysis of countries (Ghosh, Kim, Mendoza, Ostry & Qureshi, 2013). The sustainability of fiscal deficits is defined as the government's ability to raise the necessary funds by borrowing or as the government's budget is balanced in present value terms (Dibangoye, Buffet & Simonin, 2015; Rose, 2010). Although the sustainability of public finances has been discussed for more than a century now, it is still an imprecise concept. While it is intuitively clear that a sustainable policy must be such as to eventually prevent bankruptcy, there is no generally agreed upon definition of what precisely constitutes a sustainable debt position. The literature has proposed several methods to define and assess debt sustainability, differing in both time horizons and choice of variables. Debt sustainability can be regarded as a short, medium, or long-term concept, with the open question of how to define these horizons, and debt and deficits can be measured gross or net, including or excluding the liabilities of social security systems and other items (Chalk & Hemming, 2012). Fiscal sustainability, or public finance sustainability, is the ability of a government to sustain its current spending, tax and other policies in the long run without threatening government solvency or defaulting on some of its liabilities or promised expenditures (Checherita-Westphal, Hughes & Rother, 2014).

The structural or cyclically adjusted budgetary balance is defined as the fiscal balance that would arise provided that output was at its potential level and, therefore, not reflecting the cyclical aspects of economic activity. (Nordhaus, 2010) defines the structural fiscal balance as the residual balance after removing the balance of the estimated budgetary consequences of the business cycle. Therefore, the calculation of the structural fiscal balance is useful, as it provides a clearer picture of the underlying fiscal situation by subtracting from the impact of the business cycle. As a result, it can be used to guide fiscal policy analysis. One approach to examining the impact of discretionary fiscal policy over the cycle is to link the fiscal policy stance, generally measured as the change in the structural fiscal balance, to the cyclical conditions measured by the output gap.

Theoretical Review

We attempt a chronological review of fiscal sustainability theories and their main proposition for economic development with the aim of coming up with a threshold to gauge the empirical realities of development outcomes in BRICS nations as induced by their corresponding fiscal health.

The Domar's Theory

The most sophisticated analysis of fiscal sustainability was developed by (Domar, 1946). Domar (1946) proposed larger budget deficits, which in his view should stimulate the economy. According to him, a higher deficit generates a higher economic growth, which in turn, generates enough tax revenue to annually service the debt. If the tax generated through the higher deficit did not sufficiently service it in total, the problem does not lie with the deficit financing as such, but in its failure to raise the national income. Domar (1944) clearly placed his trust in the effect government deficits will have on economic growth through the Keynesian income multiplier. Thus, the government had to 'grow the economy out of its public debt burden'. He demonstrated that, given a large enough income multiplier, the deficit used to stimulate the economy would not cause an increase in the public debt/GDP ratio. A prerequisite for this is that the fiscal stimulus must raise the real economic growth rate above the real interest rate.

The Solow Growth Model

The neoclassical growth model of Solow (1956) provides a convenient framework for analysing economic growth and subsequent development as it seeks to understand the determinant of long-term economic growth rate through the accumulation of factor inputs such as physical capital and labour. Solow (1956) places greater emphasis on the role of technological change. The Solow model of economic growth assumes an aggregate production function which exhibits constant returns to scale in labour; reproducible capital; one composite commodity is produced; output is regarded as net output after allowance for capital

depreciation; labour and capital are paid according to their marginal physical productivities; flexibility of prices and wages; full employment of the available stock of capital; diminishing returns as capital and labour increases. It implies that economies will conditionally converge to the same level of income, given that they have the same rates of savings, depreciation, labour force growth, and productivity growth.

The model shows that with a variable technical coefficient, there will be a tendency for the capital-labour ratio to adjust itself through time in the direction of equilibrium ratio. It posits that a long run per capita growth rate depends entirely on the exogenous rate of technological progress. Increase in savings rate will lead to a temporary increase in per capital $\frac{K}{L}$ and per capita output. However, both would return to a steady-state of growth at hithe gher level of per capita output.

Increase in savings rate will lead to a temporary increase in per capital $\frac{K}{L}$ and per capita output. Savings has no impact on long-run per capita output growth rate but has an impact on the long-run level of per capita output.

Keynesian Theory of Income Determination

In response to business cycle fluctuations, the Keynesians propose government intervention in order to stabilise aggregate demand and thereby minimise the negative effects of welfare loss inherent in business cycle fluctuations and which can instigate social disequilibria. However, the major shortcoming of this school of thought is the inability of the model to incorporate dynamic effects, rational expectations and microeconomic foundation criteria to support their position. According to the Keynesians, business cycles are results of the failure of the economic system due to frictions or market imperfections. Consequently, the economy experiences depressions and fails to achieve the efficient level of output and employment. In their postulations, financial frictions, sticky prices and other adjustment failures constitute the propagation mechanism. Thus, both technology and monetary shocks are considered to be important sources fluctuations.

Keynesian propositions on the heel of the 1930's Great Depression, cyclical revenues and expenses were proposed to mimic automatic market stabilisation policies during a recessionary period when a balanced budget is favoured. This proposition is predicated on the Keynesian thought that market forces alone cannot be trusted to solely regulate the market and, thus, progressive tax rates and unemployment benefits are means through which the government regulates the market. The Keynesian's view suggests a short-term intervention to a fiscal policy where diverse policy-mix-including bail-out measures are employed during the recessionary period to sustainability (Marnefee et. al., 2011).

Empirical Review

(Belin & Guille, 2008) assessed fiscal sustainability; both in theory and practice. The study summarised the general analytical background especially those that focused on present value budget constraint; the various tests of sustainability (including sustainability indicators) and sustainability with uncertainty. They further assessed the way in which these methods have been approached on the different studies by the International Monetary Fund (IMF). In this context, various indicators such as non-increasing government debt – as an indicator of solvency, and an enduring current fiscal policy which is devoid of government solvency; were employed. The study found a discount between theoretical and empirical works on fiscal sustainability and concluded that most IMF studies in this regard were largely based on a theoretical technique with less attention paid to the present value budget constraint (PVBC) as an indicator of sustainable fiscal policy.

(Kantorowicz, 2017) examined fiscal sustainability for OECD countries. They employed panel cointegration test and observed the structural breaks for these countries over the period 1970-2010. In the study, they traced the causal relationship between government expenditures and revenues and sought to confirm the panel cointegration test with time series trend for fiscal sustainability for robustness and completeness purpose. The result showed lack of cointegration as well as absence of sustainability between government revenues and expenditures for most countries (except for Austria, Canada, France, Germany, Japan, Netherlands, Sweden and the UK) and improvements of the primary balance after previous worsening debt ratios for Australia, Belgium, Germany, Ireland, Netherlands and the UK. Causality link occurred from government debt to the primary balance for 12 countries (suggesting the existence of the Ricardian regime). Overall, fiscal policy has been less sustainable for several countries, and panel results corroborate the time series findings.

(Checherita-Westphal et al., 2014) provided estimates for the structural fiscal balance for the Romanian economy over the period 1998-2008. The calculation of the structural fiscal balance is useful since it provides a clear picture of the fiscal stance of the economy and it is essential in the context of a medium-term fiscal framework. In order to ensure the robustness of the estimation, we employed two methodologies for the computation of the elasticities of various categories of government revenues and expenditures with respect to the output gap. The two approaches issued similar results, the overall average budget sensitivity being equal to 0.285 and 0.290, respectively. The amplitude of the cyclical budget balance is around 1% of GDP. After constant improvement, the structural balance worsened in 2008, due mainly to the current crisis.

(Kalirajan & Otsuka, 2012) investigated sustainability of fiscal policy of West African Monetary Zone (WAMZ) countries using annual time series data to perform cointegration for the period 1980 to 2008, their empirical result revealed

that fiscal policy was weakly sustainable for all the countries under investigation, including Nigeria, except Sierra Leone whose fiscal policy was found to be unsustainable. However, the author's result was in doubt as they failed to provide information about the statistical significance of the β through which weak or strong sustainability can be determined Quintos (1995). They used the Johansen co-integration method instead of Engle-Granger 2-step procedure that could afford to test for statistical significance of the vector β .

(Onifade, Nyandoro, Davidson, & Campbell, 2010) investigated the sustainability of the current account balances of ten ECOWAS economies from 1980 to 2006. According to the authors, the empirical investigation was carried out with a view to providing an insight into the possibility of achieving ECOWAS's goal of a common currency in the region. The study employed Vector- Auto Regression technique of analysis. The results showed that, out of the ten countries, only Burkina Faso, Ghana and Nigeria had their current account balances sustainable. Although, Nigerian current account sustainability provided an insight into the economic relationship between Nigeria and the outside world. However, the author was not in line with the internal consistency of fiscal policies unarguably relied upon to generate stability of the economy.

(Fotourehchi, 2017) examined the position the fiscal stance for 2006-2010 in Turkey by calculating the structural budget balance and determine the extent to which budget balance is affected by cyclical movements. In this study, where the structural budget balance is calculated in three stages; firstly, the sensitivity of budget items to national income is estimated; secondly, potential national income series are obtained; and lastly, the structural budget balance is calculated. Findings of the study are briefly stated as follows: the weighted tax elasticity coefficient for the Turkish economy is estimated to be 1.07. The share of structural primary budget surplus in GDP has declined in recent years. Fiscal policy is observed to be pro-cyclical in 2007, counter-cyclical in 2009 and cyclical in 2008 and 2010. The fiscal authority gave more importance to economic stabilisation in 2009 due to global financial crises.

(Muhanji & Ojah, 2011) gauged the effect of governance infrastructures on debt sustainability in Africa reviewed a large retinue of sustainability thresholds computed by Manasse and Roubini (2009); Paltillio, Poirson and Ricci (2002) and those advanced by Highly Indebted Poor Countries (HIPC) initiatives. They employed simple Ordinary Least Square (OLS) to confirm the impact factor of debt indicators on institutional and macroeconomic variables. Specifically, they employed the external debt to GDP measure – as the solvency indicator – and short-term debt to international reserves ratios – as the liquidity indicator; both serving as dependent variables respectively while political and legal infrastructures stood for institutional variables. After deriving an appropriate threshold level, they

pointed to the failure of appropriate levels of sustainable external debt, inadequate effective governance infrastructure and ineffective management of external shocks as important reasons why Africa's external debt problems have persisted.

(Tapsoba, 2012) investigated whether national numerical fiscal rules (FRs) really shaped fiscal behaviours in 74 developing countries over the period 1990-2007 also found the same conclusion as he controlled for self-selection problem in policy evaluation. He employed a treatment effect evaluation and found that the effect of FRs on structural fiscal balance is significantly positive, robust to a variety of alternative specification and varies with the type of FRs. In terms of policy implication, the paper suggested that the introduction of rule-based fiscal policy frameworks remain a credible remedy for governments in developing countries against fiscal indiscipline.

(Pavone et al., 2016) applied the conventional linear cointegration test, tested the asymmetry relationship between revenue and expenditure i.e. making a distinction between the adjustment of positive (budget surplus) and negative (budget deficit) deviations from equilibrium. They used quarterly data on South Africa. The study found that fiscal policies were sustainable through the authorities in South Africa were more likely to react faster when the budget was in deficit than when in the surplus and that the stabilisation measures by the government were fairly neutral at low deficit levels, that is, at quarterly deficit levels of 4% of GDP and below. They submitted that the increasing tension amongst local communities complaining about poor service delivery by the government could be a recipe for fiscal unsustainability.

(Teragawa, Aso, Tadanaga, Hayashi, & Tatsumisago, 2014) examined theoretical models that underpin studies on "sustainability of budget deficits", which have been drawing interest in recent years, and also explains methods of empirical tests. The study starts with a discussion on the intertemporal government budget constraint in a certainty model and then expands the discussion to under uncertainty. Under uncertainty, the issue of whether or not Ponzi schemes are feasible in a dynamically efficient economy is theoretically important.

(Onyewotu et al., 2003) investigated fiscal sustainability in Nigeria over the period 1970 to 1990, using sustainability indicators. He found that the policy of fiscal deficit was not sustainable due to post-civil war reconstruction efforts that occasioned the protracted increase in fiscal deficit. However, it is on record that the deficit continues even a long period after the war. It should be noted also that the transition to democratic administration could definitely change the fiscal behaviour of the government which has implication for the debt profile. More importantly, a lot of events have taken place after 1990 when the study was conducted such as debt forgiveness and increasing revenue from oil exports which could have brought reduction to the fiscal deficit in Nigeria.

(Ofeimun et al., 2014) examines sustainable fiscal management in Nigeria for the period 1970- 2011. Going by the proliferation of investigation techniques in the empirical literature due to the multi-dimensional nature of fiscal sustainability, we employed a barrage of tests such as the descriptive statistics, threshold parameters, unit root and cointegration tests to, on the one hand, ascertain if fiscal sustainability holds in Nigeria and, on the other hand, cover the gap in empirical literature where these investigations were undertaken exclusively. Our results show that fiscal policy is both strongly and weakly unsustainable in Nigeria; given the disaggregated components of government expenditure. Although sustainability is attained between capital expenditure and government revenue the government has to contend with liquidity problems since the growth of capital expenditure is higher than that of its revenue counterpart. More so, the fiscal operations of government remained cyclically intoned with changing policies and regimes in Nigeria. Despite the existence of fiscal rules as enunciated in the Fiscal Responsibility Bill (FRB) and various constitutional provisions; the sustainability of fiscal policies in Nigeria still remains elusive. This suggests that the mere existence of fiscal rules does not guarantee its sustainability.

(Rutayisire, 1987) offered a theoretical perspective on how monetary policy can enhance inclusive growth in the economy through the Central Bank of Nigeria (CBN). The study constructed a theoretical model for inclusive growth in Nigeria and provides the drivers of inclusive growth in the economy. It also identified and discussed major challenges to the conduct and implementation of monetary policy in Nigeria which undermine the effectiveness of monetary policy to include non-monetized Nigerian rural sector, underdeveloped money and capital markets, and a large quantity of money outside the banking system. Others include poor data quality, the proliferation of illegal financial houses, and poor banking habits in the economy. The study, however, noted that monetary policy, when developed and conducted efficiently, has the capacity to influence the real sectors of the economy and positively influences all the key drivers of inclusive growth in Nigeria. To make monetary policy more effective and responsive to inclusive growth in

(Enright et al., 2015) explores the level of financial inclusion and its potential impact on the inclusive growth of the Nigerian economy, using relevant inclusive growth indices and indicators. The results revealed that the depth of financial inclusive is shallow even among African economies and more-so with emerging economies. It, therefore, recommends amongst others, the deployment of enhanced mobile banking and internet services by financial institutes to improve access to bank accounts and other services as well as the active participation of educational institutes in furthering financial

(Godard, Mac Aodha, & Brostow, 2017) provided an empirical analysis of the relationship between inclusive growth and its determinants as studies in this area

are limited. Against this backdrop, the study utilised annual data from 1981 till 2014 and employed both the autoregressive distributed lag model (ARDL) and the error correction method (ECM) to investigate the long-run and the short-run parameters among the variables. The findings suggest a negative relationship between government consumption, education expenditure and inclusive growth both in the short-run and the long-run. In contrast, inflation and population growth variable indicate a positive effect on inclusive growth in the short-run but turned out negative in the long-run. Finally, initial capital and FDI showed a negative relationship in the short run, but a significantly positive contribution to inclusive growth in the long-run. Based on these findings, the study recommends that policymakers should take appropriate steps to increase the inflow of foreign direct investment, reduce inflation, while they work at improving the quality of the population in order to achieve inclusive growth.

The gap in the Literature

Empirical researchers have documented macroeconomic consequences of fiscal policy unsustainability (Bi, Leeper, & Leith, 2013; D'Erasmus, Mendoza, & Zhang, 2016; J. Ghosh, 2010; Hussain, Berg, & Aiyar, 2009; Langdana, 2009; Leeper, Richter, & Walker, 2012). However, the majority of studies in BRICS countries concentrated on fiscal deficit and its implications on other macroeconomic variables (Alt & Lassen, 2006; Brück, 2001; Chalk & Hemming, 2012; Feltenstein & Iwata, 2005; Hsing, 2011; Wosowei, 2013). Apparently, studies have not examined the consequences of fiscal health on development outcomes in BRICS nations. This study is motivated to address this gap by examining fiscal health and development outcomes with a view of coming up with findings that can redefine policy and research on the subject matter.

3. Methodology

In gauging fiscal health as a barometer for development outcomes in BRICS nations, this paper adopts the Domar proposition model as in (Sato, 1964). This is because it characterizes the relationship between deficit and debt as a predictor of growth and development outcomes. Domar (1946) showed that the continuing budget deficit does not necessarily lead to the default of government when the economy grows which implies development is not at risk. The budget deficit in this context is a conventional one (the gap between government expenditure including interest payment and tax revenue), not a primary deficit. As is often confused, Domar's proposition always holds if the growth rate of the economy is positive, irrelevant to a relative magnitude between interest rate and economic growth rate.

(Domar, 1946) showed that debt-GDP ratio δ converges to a certain finite value when the growth rate of the economy is positive, and the government does not fail

if the budget deficit remains to be constant relative to GDP. This proposition is easily derived.

$$\delta_{t+j} = \sum_{i=1}^j \frac{\delta_{t+j-i}}{(1+n)^i} + \frac{\delta_t}{(1+n)^j} \tag{1}$$

Where $\delta_t = r\delta_t + g_t - T_t$

Domar considered the case where δ_t is a constant. By substituting $\delta_t = \delta$ into equation (1), and by using the formula for the sum of the geometric series, it can be easily shown n must be positive in order for δ_t to converge to a finite value. In this case, the following equation is derived from the equation above:

$$\lim_{j \rightarrow \infty} \delta_{t+j} = \frac{\delta}{n} \tag{2}$$

That is, when the growth rate of the economy is positive, the debt-GDP ratio will converge to $\frac{\delta}{n}$, and the government will never fail if the government can keep the deficit to a constant relative to GDP. Moreover, it is also important that the convergent value of δ is independent from the initial position. Debt GDP ratio becomes low as the growth rate of the economy becomes high. However, even if public deficit is kept constant relative to GDP, fiscal management is not so easy.

Nevertheless, since our focus is on the structural relationship between fiscal health and developmental outcomes in BRICS nations, we introduce key explanatory variables that are theory consistent in explaining variations in developmental outcomes in BRICS nations. We employ the most recent and extensive panel data on developmental outcomes (GDP per capita) provided by the World Bank from 1986 through 2016. The source of data on gauging fiscal health is also the World Bank, which, based on formal and objective evaluation criteria, classifies fiscal health as debt to GDP ratio ($\frac{DEBT}{GDP}$), government revenue ($GREV$), ratio of cost of debt service to revenue $\frac{INT}{REV}$, and welfare standard of the populace $\frac{POP}{WELF}$.

The empirical model in this study mainly followed the work of (Martinez-Vazquez & McNab, 2003). Hence, the model for this study is specified as follows:

$$GDPPC_{it} = f\left(\frac{DEBT_{it}}{GDP_{it}}, GREV_{it}, \frac{INT_{it}}{REV_{it}}, \frac{POP_{it}}{WELF_{it}}\right) \tag{3}$$

In order to make the regression model be in an estimation form, the model is reformulated to include the stochastic error term ample enough to make it a white noise error term.

$$GDPPC_{it} = \beta_0 + \beta_1 \frac{DEBT_{it}}{GDP_{it}} + \beta_2 GREV_{it} + \beta_3 \frac{INT_{it}}{REV_{it}} + \beta_4 \frac{POP_{it}}{WELF_{it}} + \mu_{it} \quad (4)$$

Rewriting it in growth form with a panel analysis specification such that it adjust for the disparity in units and measurement yields the following:

$$\ln GDPPC_{it} = \beta_0 + \beta_1 \frac{DEBT_{it}}{GDP_{it}} + \beta_2 \ln GREV_{it} + \beta_3 \frac{INT_{it}}{REV_{it}} + \beta_4 \frac{POP_{it}}{WELF_{it}} + \mu_{it} \quad (5)$$

The rationale for these controls which is in tandem with economic theory is as follows. Low debt to GDP ratio will result in fiscal stress since no investor will be willing to lend out their resources without an imposing repayment structure. Government revenue is expected to aid the smoothening of government intertemporal budget constraints tending towards fiscal balance. Ratio cost of debt service to revenue is expected to exhibit a positive relationship with development outcomes. Ratio welfare to population is also expected to show a positive relationship with growth and development.

From the model, $\ln GDPPC_{it}$ is the logarithm of GDP per capita, β_0 is the fixed effects and denotes heterogeneity among cross-sections; $\frac{DEBT_{it}}{GDP_{it}}$ debt to GDP ratio, $\ln GREV$ is the logarithm of government revenue. $\frac{INT}{REV}$ is the ratio of cost of debt servicing to revenue generated, $\frac{POP}{WELF}$ represent standard of welfare of the populace, subscript i and t denotes cross-sections (country) and periods (years). Assuming all data follow a panel unit root process and the error terms were a stationary process ($\mu_{it} \sim I(0)$), model (5) therefore depicts a panel cointegration model with a panel vector error correction model (PVECM) as follow:

$$\Delta \ln GDPPC_{it} = \varphi ECM_{i,t-1} + \sigma \Delta \frac{DEBT_{it}}{GDP_{it}} + \theta \Delta \ln GREV_{it} + \pi \Delta \frac{INT_{it}}{REV_{it}} + \omega \Delta \frac{POP_{it}}{WELF_{it}} + \varepsilon_{it} \quad (6)$$

where $ECM_{i,t-1}$ is the error term of the cointegration model in a panel setting; φ is the short-term adjustment effect. $\varphi < 0$ implies that long term relationship does not inhibit changes in economic development in the short term while a greater

than sign implies the opposite. $\varphi, \sigma, \theta, \pi,$ and ω are parameter estimate of the dynamic panel ordinary least square model.

The model is estimated using a balanced panel. The estimation of the above model calls for several cautions. First, we employ the panel unit root test to reveal whether a co-integration relationship exists between the variables. Analysis using panel unit root test have higher precision than unit root tests based on individual time series data. Panel unit root test is developed from a time-series unit root test. This development emphasized to combine the asymptotic characteristics of the time-series dimension T and cross-sectional dimension N . There are several procedures to analyze the panel unit root tests. Among them, we use the Levin–Lin–Chu test (LLC) and Im–Pesaran–Shin test (IPS) test. Secondly, we estimate the Dynamic Panel Ordinary Least Square to account for the dynamic relationship between the variables.

4. Results

Table 1. Summary Statistics

	<i>GDPPC</i>	<i>DEBT GDP</i>	<i>GREV</i>	<i>INT REV</i>	<i>POP WELF</i>
<i>Mean</i>	5.366004	2.62E+10	2.14E+09	3.54E+09	8.81E+09
<i>Median</i>	4.411065	2.90E+10	1.49E+09	2.43E+08	4.96E+08
<i>Maximum</i>	33.73578	9.99E+10	8.81E+09	4.45E+09	9.67E+08
<i>Minimum</i>	-0.617851	3.62E+09	4.96E+08	1.23E+07	3.45E+06
<i>Std. Dev.</i>	6.422722	8.22E+09	1.88E+09	2.45E+08	4.82E+07
<i>Skewness</i>	3.370708	-0.522757	2.330129	1.482934	3.542363
<i>Kurtosis</i>	1.642764	2.115936	7.939672	1.744158	2.362006
<i>Jarque-Bera</i>	1886.010	17.57501	267.7623	432.3596	142.5492
<i>Probability</i>	0.280899	0.149289	0.436254	0.314157	0.293987
<i>Observations</i>	160	160	160	160	160

Source: Authors computation (E-views), 2018

Table I shows the mean and median values of the variables in the panel dataset lie within the maximum and minimum values indicating a high tendency of the normal distribution. All the variables are positively skewed. The kurtosis statistics showed that all the variables were platykurtic, suggesting that their distributions were flat relative to a normal distribution (values are less than 3). The Jarque-Bera statistics shows that the series is normally distributed since the p-values of all the series are not statistically significant at 5% level. Thus, informing the acceptance of the alternate hypothesis that says each variable is normally distributed.

Levin–Lin–Chu (LLC) Test

One of the first-panel unit root tests formulated by (Levin, Lin, & Chu, 2002) suggests the following hypotheses for testing stationarity in panel data. Under the null hypothesis, LLC test shows that each time series contains a unit root, i.e., $H_0 : \rho_i = 0 \forall i$, and for the alternative hypothesis, each time series is stationary, i.e., $H_A : \rho_i = \rho < 0 \forall i$. Like other unit root tests in the literature, LLC assume that the individual processes in each cross section are independent. The LLC test is mainly based on the estimation of the following equation;

$$\Delta Y_{it} = \alpha_i + \delta_{it} + \theta_t + \rho_i Y_{it-1} + \zeta_{it} \quad (7)$$

where $i=1, 2, \dots, N$, $t=1, 2, \dots, T$

This test might be treated as a pooled Dickey-Fuller or augmented Dickey-Fuller test potentially with different time lags across the units of the panel.

Im-Pesaran-Shin (IPS) test

The IPS test formulated by (Im, Pesaran, & Shin, 2003) is the extension of LLC test incorporating heterogeneity in the dataset under the alternative hypothesis. Here, IPS test estimation is also based on Eq. (6). The null hypothesis is stated as $H_0 : \rho_i = 0 \forall i$ against the alternative hypothesis of $H_A : \rho_i < 0$ where $i = 1, 2, 3, \dots, N_1; \rho_i = 0, i = N_1 + 1, N_1 + 2, \dots, N$.

In the IPS test, it is presumed that all series is non-stationary under the null hypothesis and a fraction of the series is stationary under the alternative hypothesis. It is the difference with LLC test, in which all series are supposed to be stationary under the alternative hypothesis.

Table 2. Panel Unit Root Test

Variables	GDPPC	DEBT_GDP	GREV	INT_REV	POP_WELF
Levin-Lin-Chu (LLC)	1.16852*	2.81667*	0.40493**	2.85117**	-2.46882*
Im-Pesaran-Shin (IPS)	-1.74269*	0.83097**	-0.77889*	-0.04328**	2.30854**

Source: Authors computation (E-views), 2018

*Significant at 1%; ** significant at 5%

The outcomes of Levin-Lin (LL) and the Im-Pesaran-Shin (IPS) test are shown in Table II above. All test confirmed that variables were non-stationary at levels and are stationary after first difference. It is hereby inferred that variables are first differenced stationary. These empirical outcomes did not only uncover the non-stationary properties of all the variables but also established a solid foundation for panel cointegration analysis. This is indispensable in this research because applying regressions on non-stationary variables can give misleading parameter estimates in the economic relationship among variables

Dynamic OLS (DOLS) and Cointegration test

A synopsis for panel dynamic ordinary least square for equation (6) is presented as follows and for the sake of clarity, let $y_{it} = (\ln GDP_{it})$ be a scalar and

$(x_{it} = \frac{DEBT_{it}}{GDP_{it}}, \ln GREV_{it}, \frac{INT_{it}}{REV_{it}}, \frac{POP_{it}}{WELF_{it}})$ be a k dimensional factor, then $(y_{it}, x'_{it})'$ is a $(k + 1)$ dimensional vector of observations that satisfies the following:

$$y_{it} = \alpha_i + \delta t + \Phi_t + y' x_{it} + u_{it}^* \tag{8}$$

where $(1, -y')$ is a vector of co-integration between y_{it} and x_{it} , $y_{it} - y' x_{it}$ is a composite equilibrium error that comprises of α_i (individual specific effect), δt (individual specific linear trend) and Φ_t (time specific factor). u_{it}^* is the idiosyncratic error term that is independent across i with a possibility of dependence across t .

Setting $\delta t = 0$ and $\Phi_t = 0 \forall i$ and t in (8) yields

$$y_{it} = \alpha_i + y' x_{it} + u_{it}^* \tag{9}$$

To control for any endogeneity that might arise assuming that μ_{it} is correlated with at most ρ_i leads and lags of $v_{it} = \Delta x_{it}$, we projected μ_{it} on the leads and lags and obtained the following $u_{it}^* = \sum_{s=-\rho_i}^{\rho_i} \delta'_i S^{v_{it-s}} + \mu_{it} = \sum_{s=-\rho_i}^{\rho_i} \delta'_i S^{x_{it-s}} + \mu_{it} = \delta'_i Z_{it} + \mu_{it}$ (10)

where δ_i, S is the projection coefficients that is a $k \times 1$ vector. Substituting the orthogonal projection of μ_{it} in (9) into (9) yields

$$y_{it} = \alpha_i + y' x_{it} + \delta'_i Z_{it} + u_{it}^* \tag{11}$$

Equation (11) gives the panel dynamic OLS estimator.

In estimating the dynamic OLS with a residual $\widehat{\mu}_{it}$, we assumed that

$$\varepsilon_{it} = \left\{ \left(\Delta \frac{DEBT_{it}}{GDP_{it}}, \Delta \ln GREV_{it}, \Delta \frac{INT_{it}}{REV_{it}}, \Delta \frac{POP_{it}}{WELF_{it}} \right) \right\}$$

Secondly, for $\widehat{\mu}_{it}$ and ε_{it} , the long run covariance matrix was adjusted by adopting Barlett kernel function with a bandwidth of three in order to get a consistency estimator. All explanatory variable was adjusted accordingly and using equation (11), the DOLS that estimates the regression equation (6) is a consistent estimator and the results are shown in the tables below.

Table 3. Panel Cointegration Test

Method		Statistics
Pedroni Residual Co-Integration Test	Within Dimension	
	Panel v-Statistics	-1.888277
	Panel rho-Statistics	0.408393
	Panel PP-Statistics	-2.187596
	Panel ADF-Statistics	-1.972961
	Between Dimension	
	Group rho-Statistics	1.596688
Kao Residual Cointegration Test	Group PP-Statistics	-3.802426
	Group ADF-Statistics	-3.031206
	ADF t-Statistics	-5.688362

Source: Author's Computation from Eviews 9.5, 2018

Table III affirms that cointegration relationship exists using Pedroni and Kao residual cointegration test. Therefore, it is concluded that the dynamic panel regression model reveals the long-term relationship among economic variables for BRICS nations. Hence, we proceed to estimate the dynamic panel ordinary least square regression to gradually adjust back to short-run equilibrium from their long-run convergence.

Table 4. Panel Vector Error Correction Model (PVECM)

Variable	Coefficient	t-Statistics	Prob
$\Delta \ln GDP$	-0.2354	-3.1039	0.0423**
$\Delta \ln GREV$	0.2357	2.7101	0.0077*
$\Delta \ln WELF$	0.0111	1.099	0.0889***
$\Delta \ln INT$	0.0924	0.8804	0.0933***
$\Delta \ln DEBT$	0.0101	1.3011	0.5105
F-test		6.6452	

Source: Authors computation (E-views), 2018

*Significant at 1 %; ** significant at 5 %; *** significant at 10 %

Table IV shows that the coefficient of the error correction term was negative and statistically significant confirming the existence of panel cointegration relationship and implying that the speed of adjustments of economic development is 24% towards long-run equilibrium. Short-run dynamics revealed that fiscal health indices debt to GDP ratio ($\frac{DEBT}{GDP}$), government revenue ($GREV$), ratio of the st of debt service to revenue $\frac{INT}{REV}$, and welfare standard of the populace $\frac{POP}{WELF}$ induces developmental outcomes in BRICS nations. The significance of the F-test also corroborates the short run dynamics in model.

5. Conclusions

This paper examines the fiscal health of BRICS nations as a prerequisite for their developmental outcomes from 1986 through 2017. In evaluating its objectives, the paper adopts the dynamic panel ordinary least square regression techniques to account for the short-run dynamics of the model. The empirical result reveals that fiscal health indices debt to GDP ratio, government revenue, the ratio of cost of debt service to revenue, and welfare standard of the populace induces developmental outcomes in BRICS nations. The findings of this study are in consonance with the findings of (Atale, 2011; Mauro, Romeu, Binder, & Zaman, 2015; Nayyar, 2016; Pant, 2013). It is therefore recommended that short-run policies should be tailored towards the stability of fiscal expenditure such that the objective of fiscal policy which is to maintain the condition of full employment, economic stability and to stabilize the rate of growth can be optimized and sustained.

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