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TRILEMMA OF MACROECONOMIC POLICY AND STRUCTURAL REFORMS IN NIGERIA

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ABSTRACT: *Motivated by lack of consensus on the empirical validity of the Mundell-Fleming trilemma and its development effects, this paper examines the relationship between the trilemma indexes (monetary autonomy, exchange rate stability and capital mobility) and structural reforms with a focus on manufacturing and service value added in Nigeria. The ADRL was applied in addition to other econometrics tools in analyzing the data sourced from various documentary sources. The ARDL bounds test results revealed that the variables are cointegrated. This necessitated the rejection of the null hypothesis of no long run relationship. The short run result shows that lag two of monetary autonomy and contemporaneous value of exchange rate stability have significant positive relationship with manufacturing value added. Manufacturing value added increases by 7.289 percent following a unit increase in monetary autonomy index. Similarly, a unit increase in exchange rate stability triggers 1.372 percent in manufacturing value added in the short run. The long run result revealed that monetary independence exerts significant positive influence on manufacturing whereas capital mobility is negatively related to manufacturing valued added in the long run. The result further indicates the long term effects of the trilemma indexes are statistically insignificant while that of foreign reserve accumulation is found to exert significant positive impact on service value added in the long run. This is a pointer that the policy makers in Nigeria have leveraged on external reserve build-up to buffer shocks in the service sector. On the basis of the findings, it is concluded that the manufacturing sector is the channel through which the policy trilemma drives the process of structural reforms in the Nigeria. Thus, policy makers in Nigeria should allow for more managed floating exchange rate regime and ensure appreciable independence in the monetary policy operation with a view to fostering the process of structural reforms in Nigeria.*

KEYWORDS: Trilemma indexes, manufacturing value added, service value added, ARDL, Nigeria.

INTRODUCTION

Policy trilemma is a Mundell-Fleming framework credited to Mundell (1961, 1963) and Fleming (1962). It is based on the hypothesis that two out of the three desirable macroeconomic policy objectives of exchange rate stability, monetary autonomy and capital mobility are mutually consistent in small open economies. Aizemman (2010) argued that it is an extension of the IS-LM Neo-Keynesian model following the introduction of the Balance of Payments (BoP) component. The trust of the macroeconomic trilemma is that policy makers in small open economies cannot simultaneously choose to implement fixed exchange rate system, run an independent monetary

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policy and allow full cross-border capital integration. For this reason, policy makers are compelled to face trade-off of choosing two, not all, of the three desirable macroeconomic objectives.

Ogbuagu & Ewubare (2015) observe that different international financial systems such as the Gold Standard System and Bretton Woods System attempt to combine two out of the three policy choices. Hsing (2012) describes the choice of two policy objectives as an important source of reducing exchange rate volatility, promoting monetary easing to buffer growth or monetary tightening to stabilize an overheated economy. Notably, the successful combination of any two out of the three policy objectives is believed to provide opportunities for intended and desired structural reforms. Cimoli, Ocampo & Porcile (2017) opine that economic development largely depicts a process of structural transformation that facilitates the shifting of workers from low-productive sectors to high productive sectors.

In accordance with the trilemma hypothesis, policy makers in an open economy setting have the choice of combining fixed exchange rate system and operating monetary autonomy or allowing full capital mobility in addition to monetary independency or a blend of cross-border capital mobility and fixed exchange rate regime. A country that desires to achieve full capital mobility can regain its monetary independence by forgoing fixed exchange rate (Aizenman, 2011). The possible configuration of any of the pair of the policy trilemma depends on key priorities and different challenges confronting an economy in a particular period. For instance, higher monetary autonomy has been linked to dampened output volatility while great exchange rate stability is associated with output volatility (Aizenman, 2011). However, external reserve build-up can serve as a source of mitigation for the latter. Additionally, greater cross-border capital mobility associated with well-developed financial system can be helpful in reducing output volatility.

With the growing popularity of the unholy trinity in international economics literature, some cross-country and single country studies (Asogwa *et al.*, 2016; Hsing, 2012; Ajogbeje *et al.*, 2018; Bluedorn & Bowdler, 2010; Miniane & Rogers, 2007; Aizenman & Ito, 2012; Ihnatov & Căpraru, 2012, 2014; Obstfeld *et al.*, 2005) found evidence to support the claim of the trilemma hypothesis. However, other studies such as Flood & Rose (1995); Hausann *et. al.* (1999), Calvo & Reinhart (2002); Fratzscher (2002) amongst others are testimonies that contrasted or show no evidence of the trilemma hypothesis. The varying empirical outcomes have given the trilemma hypothesis a more prominent position in the contemporary debate in macroeconomic landscape. For instance, debate on cross-border capital mobility has been driven largely by growing importance of financial globalization.

Cozzi & Nissane C (2009) attributed the growing recognition accorded to capital mobility in emerging market economies to the considerable benefits it unfolds for the countries or the unavoidable movement of capital amongst countries due to the growing changes in the market structure or global technology. Again, inter temporal borrowing/lending provides the theoretical basis for cross-border capital mobility as capital move to developing economies in search of high reward while providing them with resources for higher investment and soothing of household consumption (Obsfied & Rogoff, 1996). This is expected to provide platform for structural reforms by allowing the shifting of resources form low productive to high productive sectors.

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Following the growing complexity and integrated nature of the global financial system, Nigeria like other emerging market economies has continued to make policy choices in order to achieve the goal of structural reforms. Essentially, structural reform is at the forefront of economic development (Anyanwu, 2017) and provides platform for economic diversification and building resilience to external shocks ((United Nations Conference on Trade and Development, 2013). The need for structural reforms in Nigeria arises from the fact that high and sustained manufacturing and service led growth is essential in ensuring that significant progress is made in terms of generating increased productive and quality employment for the population and addressing the challenges of poverty and income inequality.

Ajogbeje *et al.* (2018) observe that, in recent time, policy makers in Nigeria have combined free cross-border capital mobility and appreciable monetary autonomy while allowing for diverse forms of managed float exchange rate system. This is expected to buffer structural reforms by shifting production activities to sectors with high technological intensities that offer more and sustainable opportunities for inclusive growth. As the apex monetary authority in Nigeria, the Central Bank of Nigeria (CBN) is saddled with the mandate of choosing appropriate mutually consistent policy objectives in accordance with the trilemma hypothesis in order to drive the process of structural reform. Available statistics show that Nigeria's achievements in the trilemma indexes of monetary autonomy, exchange rate stability and cross-border capital mobility has varied between 2008 and 2017 as reported in figure 1.

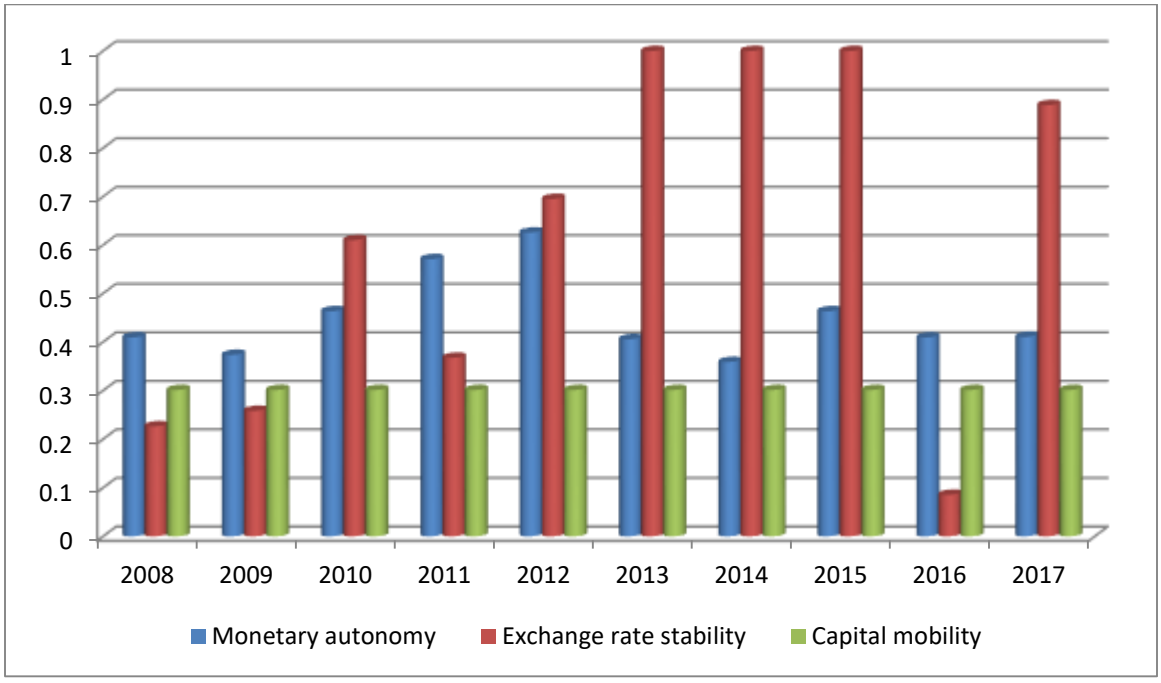

Figure 1: Trajectory of trilemma indexes, 2008-2017.

Source: Author's compilation with data computed based on Aizenman *et al.* (2010) configuration

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Figure 1 indicates that Nigeria maintained substantial levels of monetary independence and exchange rate stability between 2008 and 2017. The exchange rate stability index reached a maximum value of 1 in 2013, 2014 and 2015 and surpassed the monetary autonomy index in most of the period except in 2008, 2009, 2011 and 2016. Its all-time low value of 0.08546 in 2016 could be attributed to the economic recession that engulfed the Nigerian economic which could be partly attributed to the shock in global oil price. The low value of financial openness index over the selected period is an indication that Nigeria's achievement in terms of free capital mobility has not been very impressive.

The fluctuation in the trilemma indexes is a pointer that the macroeconomic policy environment in Nigeria has been characterized by widespread volatility. For this reason, appropriate choice of mutually consistent policy goals by the CBN in line with the trilemma hypothesis can be helpful in shaping the expected structural reforms in the country. Although theory and empirical evidence demonstrate the high interconnectivity of financial globalization and output growth, Nigeria's experience reveals that the country is yet to optimize the benefits associated with this, especially as it concerns with fostering structural reforms to successfully shift economic activities from traditional low productive sectors to modern high productive sectors.

Jayasooiya (2017) argue that many emerging markets and developing economies are yet to take advantage of the benefits that globalization creates in the structural reform process as most home grown policies or policy choices remain a notable barrier. Although the proponents of the trilemma hypothesis claim that policy choice and implementation can be helpful for mitigating financial fragility and boosting economic prosperity, policy makers are split on the effectiveness of the possible policy options following the experiences of many countries, especially emerging markets and developing economies. Thus, the questions that constantly draw the attention of policy makers and other key players in Nigeria are: how has policy makers in Nigeria leveraged on the possible policy options in the Mundell-Fleming framework in shaping the desired structural transformation process? Which of the mutually consistent policy goals is most appropriate for effective structural reforms in Nigeria? Motivated by these questions and unending controversy on the Mundell-Fleming trilemma amidst structural trajectories, this study examines the empirical validity of the trilemma hypothesis and its effectiveness in shaping the process of structural reforms in Nigeria during 1986 – 2017.

LITERTAURE REVIEW

Theoretical Literature

Mundell-Fleming Hypothesis

The Mundell-Fleming model is an open economy version of the IS-LM framework proposed by Mundell (1963) and Fleming (1962) as it introduces the BoP component. The model assumes that a small open economy cannot simultaneously implement the macroeconomic policies of monetary independence, fixed exchange rate system and free mobility of capital across the national boundaries. Thus, the three macroeconomic goals are mutually exclusively as only two out of the three policy objectives can be achieved at a time. Cozzi & Nissanke (2009) argue that in practice,

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small open economies are compared to forgo one policy objective, since only two out of the three desirable macroeconomic objectives can be simultaneously achieved. It therefore, implies that policy makers must face a trade-off in their policy choice in accordance with the Mundell-Fleming trilemma.

Traditionally, the Mundell-Fleming model focuses on the relationship between the nominal exchange rate regime and the productivity of an economy in the short run. It assumes the existence of a small open economy. This implies that the economy in question is too small that it cannot affect global interest rates and it engages in trade with other countries. The model further assumes that perfect capital mobility is a typical feature of a small open economy. Thus, the economy allows for free flow of trade and financial resources and there exists only risk neutral investors in the economy and investment depends on the interest rate. Both domestic interest rate and international interest rate are considered to be equal.

Other assumptions of the Mundell-Fleming model include homogeneity of spot and forward exchange rates, wages and inflation are unchanged, taxes and savings are directly correlated with income and trade balance depends solely on income and the prevalent exchange rate. Thus, the behavior of the economy is dependent on the exchange rate system adopted by the country through its central bank (Ajogbeje, *et al.* 2018). On the policy aspect of the Mundell-Fleming model, Asogwa *et al.* (2016) posit that in a fixed exchange rate system, monetary policy typically focuses on maintaining the exchange rate, so that it cannot target domestic demand. They further explain that a fiscal expansion, by comparison, will raise interest rate, encourage capital inflows, and tend to appreciate the exchange rate.

The assumption of this on foreign exchange rate is based on the policy pursed by an economy. The model shows that, under a flexible exchange rate regime, fiscal policy does not have any power to affect output, while monetary policy is very effective. The opposite is true if the exchange rate is fixed. The assumption that international capital markets are completely integrated plays a crucial role in determining these results. On the issue of fiscal expansion, the theory assumes that the initial increase in domestic government spending creates an excess demand for goods and tends to raise output, employment, and income. This, in turn, raises the demand for money and the level of the interest rate. The fact that the domestic interest rate is now higher than the world interest rate causes an inflow of capital, which causes an appreciation of the domestic exchange rate In this case, therefore, domestic goods become more expensive compared to foreign goods, and the trade balance deteriorates, depressing domestic output, employment, and income. A new equilibrium is reached in which the trade balance is worsened while output and the interest rate are restored to their original levels.

The Mundell-Fleming model is, to a large extent, more appropriate for describing the global economy as it developed after the collapse of the Bretton Woods system, which is characterized by high financial integration and floating exchange rates, than the economic reality of the times in which the model was originally developed. Besides its contributions to the development of international economics literature, the Mundell-Fleming model has suffered many criticisms overtime. For instance, Branson & Buiter (1982) criticize the Mundell-Fleming framework for overlooking the asset market dynamics in their analysis. Similarly, Obstfeld & Rogoff (1988)

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observe that the dominant shortcoming of this hypothesis lies in its silence on welfare issues and neglect of the current account balance of the BoP. The model is equally criticized for its assumption of perfect mobility of capital which is unrealistic in real world scenario. In imperfect capital mobility, fiscal expansion is considered to play a role in affecting output under a flexible exchange rate and monetary policy can have a role under a fixed exchange rate.

Conceptual Framework

Conceptualization of Policy Trilemma

The concept of policy trilemma defines the impossibility of simultaneously achieving three policy goals of fixed rate regime, operating monetary independence and allowing for free flow of financial resources across the national borders. Ihnatova & Capraru (2014) describes it as the impossibility of adopting pegged exchange rates, local monetary independence and open capital markets all at once. Ajogbeje *et al.* (2018) argue that the trilemma policy is one of the popular issues in international macroeconomics. It is also known as the impossible trinity because it is impossible for an economy to have perfect capital mobility, independent monetary policy and at the same time operate a fixed exchange rate system. It must choose two out of the three and give up one. A trade-off must occur, which serves as a constraint to monetary policy makers. The trilemma paradigm is further elaborated in Figure 2.

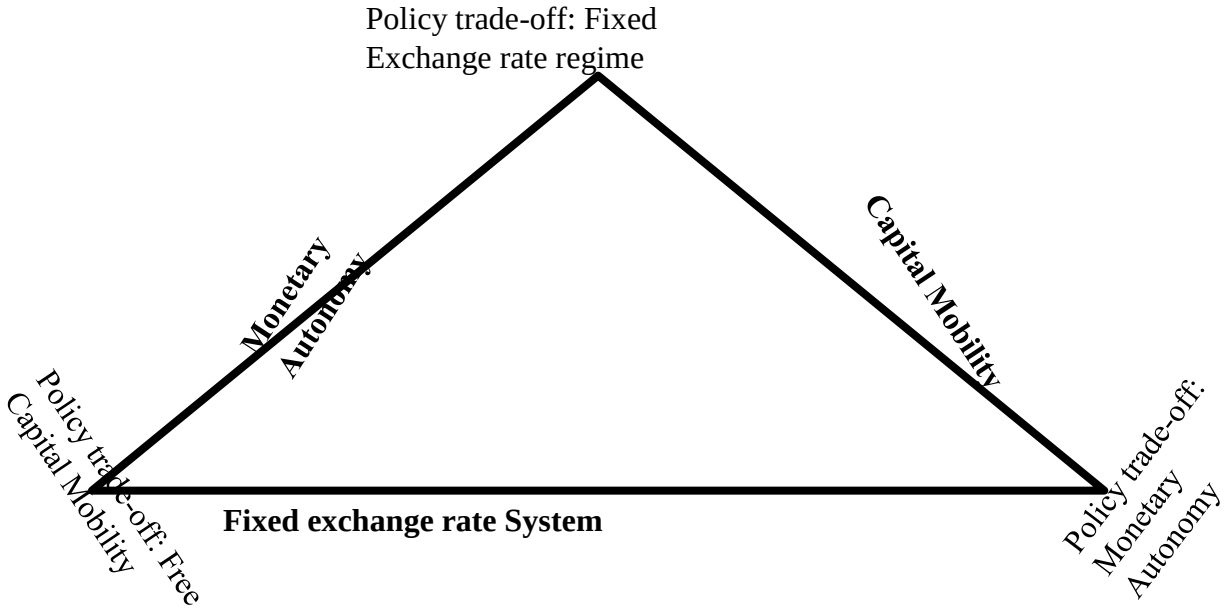

Figure 2: Trilemma framework

Source: Adapted from the Economist (2016)

As observed from Figure 2, the three sides of the triangle show the three policy goals that are considered as mutually exclusive given that only two out the three policy objectives can be

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achieved at a time. The vertex of the triangle determined by the intersection of the two sides of the triangle represents the policy trade-off (policy forgone) while choosing any of the two mutually consistent policy objectives. In accordance with the trilemma hypothesis, the policy trade-off and mutually consistent policy objectives achieved in the trilemma triangle in figure 2.1 are summarized as follows:

i. At the top vertex, fixed exchange rate regime is the policy forgone in order to achieve the two mutually consistent policies of monetary autonomy and free capital movement depicted in the sides of the triangle. Thus, for an economy to operate monetary independence and ensure capital account integration to allow for inflows and outflows of financial resources, it must allow for free flow of her domestic country.

ii. The intersection of the triangle's two sides at the left vertex shows that policy trade-off is free capital mobility while monetary autonomy and fixed exchange rate system shown at the two sides of the triangle can be simultaneously achieved. Thus, for the open economy to effectively exercise monetary control and peg its domestic currency to international currency, it has to restrict free of capital (give up financial openness).

iii. Lastly, the intersection of the two sides of the triangle at the right vertex reveals that monetary autonomy is the policy objective forgone in order to accomplish the objectives of fixed exchange rate and free cross-border mobility of capital. There, accomplishing the two mutually consistent policies of allowing for capital account openness and pegging the domestic currency against the dollar, for instance, implies that the country must give up the monetary policy control of fixing interest rate.

Accordingly, Aizenman (2018) opines that an important feature of the Mundell-Fleming's trilemma is the impossibility of accomplishing these three policy goals simultaneously. Traditionally, the trilemma derives its source from the Mundell-Fleming framework that links the significance of exchange rate regime as well as the capital mobility to the monetary policy effectiveness. Davis (2015) describes trilemma of international finance as the most important concept in international macroeconomics which has remained a constraint on monetary policymaking in an open economic setting. He further explained that by the logic of the trilemma, if a central bank allows its exchange rate to float, it should have complete monetary autonomy. While this is certainly true in theory, some have begun to question whether it is actually true in practice. In a recent paper, Rey (2013) discusses the "global financial cycle," which is the fact that large swings in capital flows into many emerging-market economies are driven by global factors such as risk and risk aversion in major developed markets.

These swings in capital flows are exogenous from the point of view of the emerging market receiving the capital, the author argues. For many emerging-market economies, swings in the global financial cycle make the trilemma more of a dilemma. Without restrictions on international capital flows, monetary independence is not possible, even for a country with a floating exchange rate. The fact that a country with open capital markets loses monetary policy autonomy when it adopts a fixed exchange rate is purely mechanical. As discussed in Rey's article, swings in trade and capital flows increase or decrease demand for a currency, and a central bank that tries to

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maintain a stable exchange rate must adjust currency supply to ensure the exchange rate stays constant as demand fluctuates. Adjusting the supply of the currency means adjusting the size of the central bank's balance sheet and, thus, actions to hold down the value of the currency are indistinguishable from accommodative open-market operations.

Empirical Literature

For many years, several studies have examined the empirical validity of the trilemma hypothesis both within and across countries. The findings from these studies varied overtime, thus, adding to the unending controversies on the Mundell-Fleming framework. . Below is a brief review of some of the country-specific and cross country/regional studies.

Asogwa *et al.* (2016) investigated whether the trilemma hypothesis is actually valid and whether it is applicable to the Nigerian economy with the sample period ranging from 1970 to 2012. The study was carried out using data obtained adapted from the CBN. In the course of the study, Vector Autoregressive (VAR) Model and the Granger causality test were applied as the analytical technique. The result of the impulse response function using VAR shows there is enough evidence to support the prediction of the Mundell-Fleming theory and its policy prescriptions can be effective in the Nigerian economy. However, the results of the Granger causality test showed that net exports granger-causes FDI without a feedback, and no causality in other variables. The study, therefore, concluded that the Nigerian is a clear evidence of the validity of the Mundell-Fleming predictions.

Hsing (2012) examined the validity of the trilemma prediction with particular reference to the Bulgarian economy. The empirical analysis followed multiple regressions using secondary time series data. It was found from the result that the trilemma prediction holds true for Bulgaria, suggesting that exchange rate stability, monetary independence and free capital mobility are binding and constrained. The policy combination of exchange rate stability and monetary independence was found to be very prevalent in the Bulgarian economy. Specifically, the result shows that more exchange rate stability increases the growth rate of real GDP whereas more monetary independence or free capital mobility reduces the growth rate. The inflation rate, inflation volatility and output volatility are not affected by either one of the three trilemma policies. On the basis of the findings, the study recommended for the evaluation of monetary policy given that more monetary autonomy reduces the growth rate.

Using quarterly data spanning from 1997:Q1 to 2017:Q3, Ajogbeje *et al.* (2018) examined how the Nigeria's trilemma policy path shapes the level of interest rate. The study equally introduced the role of external reserves in buffering these effects. The stationarity for each of the time series were ascertained with Zivot-Andrew (ZA) structural break unit roots test technique, while the bounds test cointegration approach was used to confirm the cointegrating properties of the variables. The result revealed that capital mobility has significant effect on interest rate in the long run baseline model and could also be successfully buffered with external reserves to reduce interest rate. Additionally, our results show that although exchange rate stability and monetary independence do not independently affect interest rate, but their interactions with external reserves exert significant effects on interest rate. This implies that external reserve serves as an effective

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buffer if appropriately employed by the monetary authorities. The study therefote, concludes that the trilemma policy can be beneficial as an effective tool for reducing the rate of interest.

Cimoli, Ocampo & Porcile (2017) estimated the impact of international financial cycles on structural change in developing economies with particular reference on the specific combination of macroeconomic and industrial policies prevalent in the study countries. Econometrics methodology of multiple regressions was applied as data analysis tools. The results revealed that the coordination of macroeconomic policy and industrial policy is an important enabler of diversification of production and capabilities in the Asian economies. On the contrarily, the result show that the Latin American countries with long periods of real exchange rate (RER) appreciation, combined with the weaknesses of industrial policies, suffered loss of capabilities and as such lagged behind. Tests of structural break in times series of indexes of technological intensity of the production structure confirm the long run effects of financial shocks in the Latin American case. In the case of Korea, a high RER was initially required to export and diversity the economy. The study concludes that industrial policy is more capable of determining the ability of Korea to resist international shocks.

Ihnatov & Căpraru (2014) offered some insights into the empirical implications of the trilemma policies on the volatility of macroeconomic variables in selected countries in Central and Eastern Europe (CEE), members of the European Union. The metrics used for the study is the trilemma indexes built by Aizenman, Chinn & Ito (2011). They are applied in a multiple regression framework to test the consequences of the policies on the inflation and output volatility. It was observed from the results that capital mobility has a positive impact on reducing the macroeconomic volatility in Central and Eastern Europe. The study therefore, concluded that the trilemma hypothesis offers opportunities stable output growth.

Chow (2014) examined the validity of the "impossible trinity" in the Asian economies. Specifically, the study focused on the interest rate transmission from the US to the region before and after the onset of the global financial crisis. The study applied the bounds test approach in order to clearly differentiate between long run and short run transmission of interest rates. The findings reveal that interest rate pass-through are closely linked to each country's trilemma configuration. Thus, the study concludes that the Asian economies are still constrained by the open economy trilemma.

MATERIALS AND METHOD

Nature and Source of Data

Annual country-specific time series data were utilized in this paper. The components of the data include the trilemma indexes and indices of structural reforms. Specifically, data on the trilemma indexes comprising monetary autonomy index, exchange rate stability index and financial openness index were adapted from documentary sources based on Aizenman *et al.* (2010) configuration. On the other hand, data on the indices of structural reforms such as manufacturing and service value added were collected from the World Bank (2017) while data foreign reserve holding were extracted from the IMF International Financial Statistics and data files.

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Model Specification

Drawing support from the Mundell-Fleming framework and following previous (Cimoli, Ocampo & Porcile, 2017; Asogwa *et al.*, 2016; Hsing, 2012; Ajogbeje *et al.*,2018; Adedoyin *et al.*, 2016; Niranjan, 2017), this paper modified the relationship between policy trilemma and structural reforms by adopting two ARDL models. The models set up allow for the inclusion of lag of the dependent variable as well as other predictor variables as explanatory variables. The indices of structural reforms comprising manufacturing value added (MAV) and service value added (SAV) were introduced as dependent variables. On the other hand, the trilemma indexes such as monetary autonomy (MOA), exchange rate stability (ERS) and capital mobility (CAM) served as the explanatory variables. In addition to the trilemma indexes, foreign reserve accumulation (FRA) was be included as part of the explanatory variables. This motivation for introducing the external reserve is based on claim that it is a source of dynamics in the trilemma (Aizenman *et al.*, 2008) and can be relied upon by the central bank addressing the issue of financial fragility associated with financial integration (Aizenman, 2018). Additionally, Ajogbeje *et al.* (2018) describes external reserve serves as an effective buffer to monetary autonomy and exchange rate stability at the disposal of the monetary authorities. Based on the notations of each of the series, the ARDL models for this study are formally specified as:

$$MAV_t = C_1 + \sum_{i=1}^{p} \alpha_1 \Delta MAV_{t-1} + \sum_{i=1}^{p} \alpha_2 \Delta MAO_{t-1} + \sum_{i=1}^{p} \alpha_3 \Delta ERS_{t-1} + \sum_{i=1}^{p} \alpha_4 \Delta CAM_{t-1} + \sum_{i=1}^{p} \alpha_5 \Delta FRA_{t-1} + \theta_1 MAV_{t-1} + \theta_2 MAO_{t-1} + \theta_3 ERS_{t-1} + \theta_4 CAM_{t-1} + \theta_5 FRA_{t-1} + e_{1t} \quad (1)$$

$$SAV_t = C_2 + \sum_{i=1}^{p} \alpha_1 \Delta SAV_{t-1} + \sum_{i=1}^{p} \alpha_2 \Delta MAO_{t-1} + \sum_{i=1}^{p} \alpha_3 \Delta ERS_{t-1} + \sum_{i=1}^{p} \alpha_4 \Delta CAM_{t-1} + \sum_{i=1}^{p} \alpha_5 \Delta FRA_{t-1} + \theta_1 SAV_{t-1} + \theta_2 MAO_{t-1} + \theta_3 ERS_{t-1} + \theta_4 CAM_{t-1} + \theta_5 FRA_{t-1} + e_{2t} \quad (2)$$

Where: MAV, SAV, AGV, MAO, ERS, CAM and FRA are as defined above, c_1- c_3 = vector of intercepts or constant parameters, α_1 - α_5 = short-run coefficient of the predictor variables, θ_1-θ_5 = the long-run multipliers, e_{1t} - e_{3t} = stochastic terms, which are assumed to be serially independent with zero mean and constant variance, Δ = first difference notation, P = optimal lag order to be selected automatically using Schwarz Information Criterion (SIC).

Method of Data Analysis

Following the dynamics of economic and financial time series which has remained very problematic in econometrics modelling and analysis, this paper employed the Autoregressive Distributed Lag (ARDL) model developed by Pesaran & Shin (1999). The ARDL model has been used overtime to estimate the relationship between variables in a single-equation time series set up (Kripfganz & Schneider, 2018). It has, in the recent time, received widespread recognition in both theoretical and empirical econometrics due to its built-in properties. . The choice of the ARDL in

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this study is justified by the relatively small size and its capacity to produces robust estimates while integrating the short run and long run behaviours in a single equation set up. This paper also applies the augmented Dickey-Fuller (ADF) test proposed by Dickey & Fuller (1981). The ADF test makes significant improvement to the Dickey & Fuller (1979) stationarity test as it addresses the problem autoregressive process and applies the same procedure as the Dickey-Fuller test. The general specification of the ADF model in a drift and deterministic trend is of the form.

$$\Delta Y_t = \propto_0 + \propto_{1t} + \sum_{i=1}^{K} \beta_i \Delta Y_{t-i} + u_t \quad (3)$$

Where = Y_t = underlying economic time series under investigation, Y_{t-1} = one period lag of the underlying economic under investigation, β_i = regression estimate, $\propto_0$ = drift or constant term $\propto_{1t}$ = deterministic or linear trend, K = maximum lag length, u_t = stochastic term, which is serially uncorrelated with zero mean and constant variance. Additionally, the bounds test approach to cointegration proposed by Pesaran & Shin (1999) is applied in this paper for testing for evidence of long run relationship amongst the underlying variables. Essentially, it is considered appropriate for handling times series data with fractional or mixed order of integration.

RESULTS AND DISCUSSION

Descriptive Statistics

The descriptive statistics for the variables are presented in Table 1.

Table 1: Summary of descriptive statistics

	MVA	SVA	MAO	ERS	CAM	FRA
Mean	5.745020	32.05281	0.571107	0.505430	0.203237	105.4216
Median	5.470776	26.32406	0.577219	0.404990	0.268065	29.26500
Maximum	9.754130	60.42000	0.799518	1.000000	0.301250	444.3600
Minimum	2.410130	19.73632	0.359008	0.024970	0.000000	3.150000
Std. Dev.	2.355862	13.57252	0.139044	0.359608	0.128550	134.7645
Observations	32	32	32	32	32	32

Source: Author's computation with data from World Bank, IMF and Aizenman *et al.* (2010)

The results in table 1 show that between 1986 and 2017, manufacturing and service value added averaged 5.745 percent and 32.053 percent respectively. This is very revealing as it indicates that the manufacturing share of the GDP is below 10 percent and far less than the service sector. The results further indicate that monetary autonomy, exchange rate stability, financial openness index averaged 0.571, 0.505 and 0.203 respectively. This implies that Nigeria have, on the averaged, enjoyed appreciable level of monetary independence and managed exchanged rate system in the past two decades. The average value of external reserve shows that it accounted for 105.42 percent of the total external debt during 1986-2017. This suggests that Nigeria has continuously borrowed from both bilateral and multilateral sources in order to bridge the increasing fiscal gap. As observed from the respective standard deviation, the observations for all the variables converged around their respective mean values.

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Unit root Test Results

The unit root test was conducted at 5 percent level using ADF method. The results are summarized in Table 2.

Table 2: ADF unit root test results

Levels test results			
Series in the model	t-statistic	Probability value	Stationarity status
MVA	-1.656	0.746	Nonstationary
SVA	-1.926	0.617	Non-stationary
MAO	-4.188	0.013	Stationary
ERS	-3.472	0.060	Non-stationary
CAM	-2.552	0.303	Non-stationary
FRA	-2.345	0.398	Non-stationary
First difference test results			
Series in the model	t-statistic	Probability value	Stationarity status
MVA	-6.354	0.001	Stationary
SVA	-5.802	0.000	Stationary
ERS	-6.576	0.000	Stationary
CAM	-4.978	0.002	Stationary
FRA	-4.213	0.012	Stationary

Source: Author's computation with data from World Bank, IMF and Aizenman *et al.* (2010)

The results in Table 2 show only monetary autonomy index is stationary at levels given that its associated probability value is less than 0.05. Thus, it is integrated of order zero [I(0)]. Following the non-stationarity of most of the variables, they were subjected to first difference test as showed in the lower part of table 2. It was evidence from the results the variables became stationary upon first differencing. Therefore, they are all I(1). The unit root test results indicate that the variables under investigation are mixed integrated and as such provides empirical justification for the application of the ARDL estimation method.

Bounds Test Cointegration

The test for cointegration among the variables in each of the models was conducted using ARDL bounds test method. The results are reported in Tables 3 and 4.

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Table 3: Cointegration test result for model 1

Series: MVA MAO ERS CAM FRA		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	5.096352	4
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	3.03	4.06
5%	3.47	4.57
1%	4.4	5.72

Source: Author's computation with data from World Bank, IMF and Aizenman *et al.* (2010)

Table 4: Cointegration test result for model 2

Series: MVA MAO ERS CAM FRA		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	4.723662	4
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
1%	3.74	5.06

Source: Author's computation with data from World Bank, IMF and Aizenman *et al.* (2010)

The results in tables 3 and 4 are very revealing as they show that the variables in each of the models are cointegrated. This is gleaned from their respective f-statistics (5.096 and 4.72) which are greater than their corresponding upper bound critical values (4.57 and 401). Hence, the null hypothesis of no long run relationship is rejected at 5 percent significance level. The results of the cointegration provide the empirical support for estimating the ARDL model.

Estimation of ARDL Model

In order to capture the short run and long run dynamic relationship between the trilemma indexes and indicators of structural reforms, two ARDL models were estimated and the results are presented in tables 5 and 6.

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Table 5: ARDL Estimates for Model 1

Dependent Variable: MVA				
Short run result				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MAO)	1.143743	1.854860	0.616619	0.5452
D(MAO(-1))	-3.605852	1.772663	-2.034144	0.0569
D(MAO(-2))	7.289274	2.403805	3.032390	0.0072
D(ERS)	1.372741	0.450371	3.048020	0.0069
D(CAM)	-8.292692	3.876740	-2.139089	0.0464
D(FRA)	-0.008993	0.002524	-3.563082	0.0022
CointEq(-1)	-0.518737	0.225937	-2.295933	0.0339
Long run result				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
MAO	4.096592	0.774039	5.292985	0.0001
ERS	2.646315	1.324772	1.997562	0.0611
CAM	-15.986322	5.142675	-3.108561	0.0061
FRA	-0.002060	0.002427	-0.849060	0.4070
C	3.839255	4.792889	0.801032	0.4336

Diagnostics Tests Results			
P-value of Breusch-Godfrey autocorrelation LM test	0.085	Prob(F-statistic)	0.000
P-value of ARCH test	0.135	R-squared	0.913
P-value of Jarque-Bera test	0.482		

Source: Author's computation with data from World Bank, IMF and Aizenman *et al.* (2010).

The short run result shows that two period lag of monetary autonomy and contemporaneous value of exchange rate stability have significant positive relationship with manufacturing value added. Manufacturing value added increases by 7.289 percent following a unit increase in monetary autonomy index. Similarly, a unit increase in exchange rate stability triggers 1.372 percent in manufacturing value added in the short run. These findings are very insightful as they indicate that allowing independence in the monetary policy operations and ensuring proper management of the exchange rate system are helpful in facilitating the process of structural reforms in Nigeria. On the contrary, current values of capital mobility and foreign reserve accumulation induce significant negative impact on manufacturing value added in the short run. This finding suggests that allowing for cross-border capital movement and external reserve accumulation seem not to drive manufacturing value added. This could be linked underdeveloped nature of the Nigerian financial system and unstable stable of the external reserve holding. The error correction coefficient (-0.518737) shows the convergent with an appreciable speed to the tune of 51.87 percent. The long run result revealed that monetary independence exerts significant positive influence on manufacturing whereas capital mobility is negatively related to manufacturing valued added in the long run. However, exchange rate stability and foreign reserve accumulation are statistically insignificant in influencing manufacturing value added. The diagnostics tests reveal that the

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regressors are jointly significant in influencing changes in manufacturing value added and they equally account for 91.3 percent of the total variations in manufacturing value added. Again, the residuals are serial independent, homoscedastic and normally distributed over the study period. These findings suggest that the model has a robust forecasting ability and can equally serve the purpose of policy prediction.

Table 6: ARDL Estimates for Model 2

Dependent Variable: SVA				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MAO)	-6.160111	11.713007	-0.525921	0.6054
D(ERS)	2.432054	2.872814	0.846575	0.4083
D(CAM)	6.365493	8.540396	0.745339	0.4657
D(FRA)	-0.003202	0.013376	-0.239361	0.8135
D(FRA(-1))	-0.005049	0.018721	-0.269681	0.7905
D(FRA(-2))	-0.001186	0.018644	-0.063624	0.9500
D(FRA(-3))	-0.033400	0.016451	-2.030272	0.0574
CointEq(-1)	-0.363342	0.116507	-3.118625	0.0059
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
MAO	-16.954031	29.687085	-0.571091	0.5750
ERS	6.693567	8.537322	0.784036	0.4432
CAM	17.519289	23.126573	0.757539	0.4585
FRA	0.086277	0.037258	2.315673	0.0326
C	28.582940	23.881595	1.196861	0.2469
Diagnostics Tests Results				
p-value of Breusch-Godfrey autocorrelation LM test		0.353	Prob(F-statistic)	0.000
p-value of ARCH test		0.094	R-squared	0.943
P-value of Jarque-Bera test		0.674		

Source: Author's computation with data from World Bank, IMF and Aizenman *et al.* (2010).

The results in table 6 reveal that all the trilemma indexes and external reserve holding are statistically insignificant in influencing service value added in the short run. This indicates that trilemma hypothesis in terms of promoting service value added does not seem to hold sway in the short run. However, the model has an adjustment speed of 36.33 percent. This indicates that adjustment to long run equilibrium position is possible overtime. The result further indicates the long term effects of the trilemma indexes are statistically insignificant while that of foreign reserve accumulation is found to exert significant positive impact on service value added in the long run. This is a pointer that the policy makers in Nigeria have leveraged on external reserve build-up to buffer shocks in the service sector. More importantly, the coefficient of determination and f-statistic reveal that the explanatory variables are collectively significant and are associated with high explanatory power up to 94.3 percent. Additionally, autocorrelation, heteroscedastic and

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normality tests are very revealing as they indicate the stochastic term is well-behaved and as such authenticates the usefulness of the model for policy and long term predictions.

CONCLUSION

The crux of this paper lies on providing more insights into the dynamics of the policy trilemma and the associated impacts on structural reforms in Nigeria. With data from documentary sources, the ARDL method was applied in estimating the models and the results reveal that monetary autonomy and exchange rate stability bolstered manufacturing value added in the short run. The significant positive impact of monetary autonomy also manifests in the long run. This could be traced to the prioritization of these two policy objectives by the CBN in its monetary policy design and implementation. The result further shows that policy trilemma does significantly impact on the service value added over the study period. On the basis of the findings, it is concluded that the manufacturing sector is the channel through which the policy trilemma drives the process of structural reforms in the Nigeria. This is consistent with the conventional path of structural reform that supports the shift of economic activities from low productive agriculture sector to a modern economy driven by manufacturing growth. Thus, policy makers in Nigeria should allow for more managed floating exchange rate regime and ensure appreciable independence in the monetary policy operation with a view to fostering the process of structural reforms in Nigeria.

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