External Shocks and Economic Growth in Nigeria

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Abstract: The study investigates the effects of external shocks on economic growth dynamics in Nigeria. We employ structural vector autoregression (SVAR) technique. We consider six external shocks- external debt, foreign interest rate, foreign output, oil price, foreign input price and real interest rate shocks. Our findings indicate that external shocks impact economic growth in Nigeria. Among the external shocks, we find that foreign interest rate shocks, foreign input price shocks and external debt shocks are the most important shocks impacting economic growth in Nigeria. The importance of foreign interest rate shocks and foreign input price shocks suggest the significance of external financial shocks and foreign supply shocks on economic growth in Nigeria. The findings, however, show that oil price shocks, foreign output shocks and real exchange rate shocks have limited impact on economic growth in Nigeria.

Keywords: External shocks; economic growth; Nigeria; SVAR

JEL Classification: F43; O40

1. Introduction

Sustained economic growth is one of the most important policy issues in developing countries. Hence, economist and policymakers have over the years formulated different policies to accelerate the process of economic growth in developing countries. However, growth performance in developing countries has been very disappointing. While a number of studies have attributed the poor growth and economic instability in developing countries to external factors, others conclude that internal factors are largely responsible. For example, Kose (2002) and Hammed (2003) find that external shocks significantly influence output fluctuations and growth in developing countries. Similarly, Kose and Riezman (2001) and Rasaki and Malikane (2015) find that external shocks are largely responsible for economic fluctuations in African countries. In contrast, Hoffmaister and Roldós (2001) and

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Raddatz, (2007) conclude that macroeconomic fluctuations in developing countries are caused by internal shocks.

This paper evaluates the effects of external shocks on economic growth in Nigeria. Given the dependence of Nigeria on export of oil whose is price is very volatile, the economy is vulnerable to terms of trade shocks and foreign demand shocks. For instance, Dibooğlu and Aleisa (2004) find that Saudi Arabia is vulnerable to terms of trade shocks due to its dependence on oil exports. Furthermore, the increasing global financial integration has made Nigeria prone to external financial shocks, such as the US monetary policy shocks and foreign interest rate shocks. Uribe and Yue (2006) find that the US interest rate shocks explain significant variation in economic activity in emerging market economies. Kamin (2010) and Feldkircher and Huber (2016) find that financial globalization has amplified the transmission of the impact of external financial shocks from the developed economies to the emerging market economies. Moreover, the reliance of Nigerian firms on foreign intermediate inputs to produce final domestic output may make the economy susceptible to foreign input price shocks.

The gap that this study seeks to fill is to quantitatively assess the impact of external shocks on economic growth in Nigeria. Specifically, we investigate the effects of foreign interest rate shocks, foreign input price shocks which represent foreign supply shocks, foreign output shocks which denote foreign demand shocks, oil price shocks, real exchange rate shocks and external debt shocks on growth in Nigeria. A number of previous studies examining the impact of external shocks on Nigerian economy have largely focused on the role of oil prices shocks either on the exchange rate, economic fluctuations, growth, stock prices, or fiscal operations. For instance, Adeniyi et al. (2012) examine the impact of oil price shocks on real exchange rate. Olomola and Adejumo (2006) and Iwayemi and Fowowe (2011) investigate the impact of oil price shocks on the Nigerian economy. Babatunde et al. (2012) evaluate the impact of oil price shocks on stock market in Nigeria. Notable exception is the study by Oyelami and Olomola (2016) who consider the effects of oil price shocks, foreign output shocks and foreign interest rate shocks on economic fluctuations in Nigeria. Our paper, however, differs from the above studies as we examine effects of a broader range of external shocks which include not only the trade shocks and financial shocks but also foreign demand and foreign supply shocks on economic growth in Nigeria.

The study is significant in many aspects. With increasing trade openness in Nigeria, it is important for policy makers to understand how the terms of trade shocks could impact economic growth. For example, Zahonogo (2016) find that trade openness influence economic growth in Nigeria. Similarly, due to the increasing financial integration and financial openness in Nigeria, it is imperative for policy makers to identify the influence of external financial shocks on growth in Nigeria. Anaya et al.

(2017) show that global financial shocks influence real economic conditions in emerging economies. Understanding these will assist policy makers to formulate policies that will mitigate the adverse effects of external shocks on the Nigerian economy. Moreover, it will assist policymakers to design policies that will deepen the domestic capital markets so as to reduce the dependence on foreign debt to finance economic growth.

Our study contributes to the existing literature on external shocks and economic growth in developing countries. First, using quarterly data we investigate the impact of external shocks on growth in Nigeria. Second, we consider the impact of terms of trade shocks and global financial shocks on economic growth in Nigeria using structural VAR. To examine the contribution of each external variable, we estimate the variance decomposition.

2. Stylised Facts

Table 1 shows the average growth rate of the Nigerian economy for the period 1995-2016. From the table, growth increased from 0.86% in the 1990-1994 to 2.33 % in 1995-1999. The positive growth rate reached its peak of 8.89% in the period 2000-2004. Since then, the growth rate has been declining reaching 7.06% and 5.96 % in 2005-2009 and 2010-2014 respectively. The growth rate further declined to 0.57% in 2015-2016 moving the Nigerian economy close to recession. Nigeria recorded the highest growth rate of 8.89% for the period 2000 2004 and the second highest growth rate of 7.06% in 2005-2009. These periods coincided with the time of the increasing global oil price indicating the contributions of oil export to the Nigerian economy. Moreover, the Nigerian government during these periods also got external debt relief and cancellation reducing the huge cost of servicing external debt. This demonstrates the importance of trade shocks and external financial shocks to growth dynamics in Nigeria.

Table 1. Average growth rate in Nigeria for the period 1990-2016

Year	Mean growth	Standard Deviation	Minimum	Maximum
1990-1994	0.86	1.23	-0.55	2.17
1995-1999	2.33	1.27	0.52	3.97
2000-2004	8.89	3.24	5.37	13.63
2005-2009	7.06	0.58	6.51	8.02
2010-2014	5.96	1.89	4.12	9.11
2015-2016	0.57	3.07	-1.60	2.75

Table 2 shows the correlation between some external variables and economic growth in Nigeria. The results show a negative relation between real exchange rate and growth. This implies that an increase in real exchange rate (depreciation) will lead to decline in economic growth. This suggests that exchange rate depreciation is contractionary. This is line with the findings by An et al. (2014) for a group of Latin American countries. The results indicate a positive relation between oil price and economic growth. This implies that a rise in oil price increases economic growth and vice versa. This is similar to the results by Sadeghi (2017). Moreover, the estimates show an inverse relation between external debt and growth indicating that high external debt is growth-retarding. This reinforces the findings by Al Kharusi and Ada (2018).

Furthermore, the results indicate negative relation between foreign interest rate and economic growth in Nigeria. This implies that a rise in the foreign interest rate reduces growth in Nigeria. This suggests that a rise in the foreign interest rate increases the cost of debt servicing, reduces government investment and output. This is similar to the findings by di Giovanni and Shambaugh (2008). The results show positive relations between foreign input price and growth suggesting that rise in foreign input price increases economic growth. This suggests the trade channel effect where a rise in foreign input price worsens the terms of trade, improves the balance of trade and increases output. Lastly, the results reveal positive relation between foreign demand shocks and output in Nigeria. This implies that increase in foreign income will lead to a rise in foreign demand and output. This is similar to the conclusion by Berument and Kilinc (2004).

Table 2. Correlation results between growth and external variables

Variables	Growth	RER	Oil price	Ext debt	For int rate	For. Input price	For. output
Growth	1	-0.01	0.29	-0.31	-0.31	0.27	0.26
RER		1	0.01	0.15	0.12	-0.17	-0.05
Oil price			1	-0.88	-0.60	0.87	0.74
Ext. debt				1	0.77	-0.98	-0.89
For int rate					1	-0.84	-0.83
For.Input price						1	0.92
For. output							1

3. Literature Review

Empirical literature on the sources of economic fluctuations in developing countries has been quite divergent. While a number of studies posit that external shocks are largely responsible for economic fluctuations in developing countries, other studies conclude that internal factors are responsible. For instance, Mendoza (1995) and Agénor et al. (1999) examine the effects of terms of trade shocks on output variations in developing countries. They find that output fluctuations in developing countries are significantly driven by the terms of trade shocks. Similarly, Mehrara and Oskoui (2007) find that oil price shocks affect economic fluctuations in Iran and Saudi Arabia. Related studies focusing on African countries have also shown that external shocks significantly influence their economic fluctuations. For example, Kose and Riezman (2001), Bleaney and Greenaway (2001) and Rasaki and Malikane (2015) find that trade shocks and external financial shocks significantly account for output fluctuations in African countries.

In contrast, other studies find that internal but not external shocks are responsible for macroeconomic fluctuations in developing countries. For example, using VAR. Hoffmaister and Roldós (2001), and Raddatz (2007) investigate the effects of terms of trade shocks in developing countries. The findings show that terms of trade shocks have limited impact on output fluctuations in developing countries. Simlarly, Hoffmaister et al. (1997) and Sissoko and Dibooğlu (2006) find that trade shocks have insignificant effects on output variations in African countries. Iwayemi and Fowowe (2011) and Adeniyi et al. (2011) find that oil price shocks do not have significant effect macroeconomic aggregates in Nigeria.

Given the dependence of developing countries on the revenue from export of primary commodity for their fiscal operations, a number of studies have examined the contribution of commodity price shocks to output growth in developing countries.

For instance, Combes and Guillaumont (2002) find that commodity price volatility impact economic growth in developing countries through instabilities in investment rate and relative prices. Using GMM and dynamic common correlated effects mean polled group, Cavalcanti et al. (2015) conclude that commodity terms of trade growth enhances per capita output while commodity terms of trade volatility exerts strong negative effects on output growth through lower accumulation of physical and human capital. Aslam et al. (2016) examine the impact of commodity price booms on commodity exporters. The findings reveal that commodity terms of trade strongly influence actual and potential output in commodity exporting countries. Alimi and Aflouk (2017) investigate commodity price and output growth in a panel of 58 developing countries using a panel smooth transition regression model. The results indicate that terms of trade volatility has statistically strong impact on output growth in developing countries.

Similarly, studies have examined the impact of external shocks on exchange rate and external debt in commodity exporting countries. For instance, Cashin et al. (2004) find that commodity prices impact the real exchange rate in commodity exporting countries through change in wages in the commodity sector. Frankel (2007) concludes that price of minerals influence the real exchange rate movements in South Africa. Koranchelian (2005) shows that positive oil price shocks appreciate the exchange rate in Algeria. Adeniyi et al. (2012) find that oil price shocks influence exchange rate movements in Nigeria. Muhanji and Ojah (2011) examine the influence of commodity price shocks on external debt accumulation in African countries. The findings suggest that positive commodity price shocks lead to external debt accumulation in African countries through increased expenditure and over-borrowing during the boom.

A number of studies have investigated the impact of developed economies' monetary policies and foreign interest rate shocks on output in emerging market economies and developing countries. For instance, Canova (2005) finds that the US monetary policy shocks significantly affect output in Latin American economies through its influence on their domestic interest rates and capital flows. Uribe and Yue (2006) find that foreign interest rate shocks affect output fluctuations in emerging economies through the country's spread. Maćkowiak (2007) finds that the US monetary policy shocks influence the price level and output in emerging market economies through its effects on the exchange rates. Sosa (2008) also underlines that the US output shocks are the main factors driving economic fluctuations in Mexico. Anaya et al. (2017) find among others that the U.S. unconventional monetary policy affects financial conditions and real output growth in emerging economies.

Furthermore, many studies have investigated the impact of exchange rate and external debt shocks on output growth in emerging economies. For instance, Carranza et al. (2003) find that exchange rate volatility negatively impacts level of investment in emerging economies through the balance sheet effects of liability dollarization. Kamin and Rodgers (2000) show that exchange rate depreciations lead to high inflation and economic contraction in Mexico. Bastos and Divino (2009), however, conclude that exchange rate volatility has limited impact on output fluctuations in Mauritius. Regarding external debt, Patillo et al. (2002) find that increasing external debt lowers growth in developing countries through reduction in efficiency of investment. Similarly, Hsing (2003) finds that external debt shocks negatively affect output in Brazil.

4. Data and Empirical Method

4.1. Data

We use quarterly data for the study. Data for the study were sourced from the IFS, FRED database and the Central Bank of Nigeria database. The data cover the period 1990q1 to 2016q4. We collect data on seven variables which include the GDP, oil price, foreign output, foreign input price, external debt, exchange rate, and foreign interest rate. Foreign output is proxied by the US output (GDP); the foreign interest rate is proxied by LIBOR; and the foreign input price is proxied by the US producer price index (PPI) The US GDP, LIBOR, and the US PPI are from the FRED database. The US output represents foreign demand shocks while foreign input price represents the foreign supply shocks.

4.2. Empirical Methodology

To examine the impact of external shocks on economic growth in Nigeria, the study employs the structural vector autoregression (SVAR) model with block exogeneity. This is in line with previous studies on the impact of external shocks on emerging and developing economies.[1] The SVAR model allows the division of the dynamic systems into internal and external blocks and hence excluding the lag coefficient of internal variables from external block equations. The exogeneity assumptions also imply that the Nigeria is a small economy who cannot influence the world price either with lags or contemporaneously. Also, the block exogeneity assumption removes the impacts of spurious terms of trade and external financial shocks, thus we are able to examine the impact of external shocks on economic growth in Nigeria. Furthermore, the assumption reduces the number of estimated parameters and enhances the efficiency of the estimation.[2]

[1] See (Mackowiak, 2007; Yildrim, 2016).
[2] See (Yildrim, 2017).

4.3. The SVAR Model

Similar to Mackowiak (2007) and Yildrim (2016), we employ the following SVAR model with block exogeneity

$$\sum_{p=0}^{n}\begin{bmatrix} B_{11}(s) & B_{12}(s) \\ B_{21}(s) & B_{22}(s) \end{bmatrix}\begin{bmatrix} y_t^d \\ y_t^f \end{bmatrix} = \begin{bmatrix} \varepsilon_t^d \\ \varepsilon_t^f \end{bmatrix}$$

Where B_{ij} represents a coefficient matrix, $y_{t=}\left[y_t^d,\quad y_t^f\right]^t$ is a vector of variables. $\varepsilon_t = \left[\varepsilon_t^d,\quad \varepsilon_t^f\right]^t$ denotes a vector of structural disturbances that satisfies $E\left[\varepsilon_t | y_{t-s,} s > 0\right] = 0$ and $E\left[\varepsilon_t \varepsilon_t^d | y_{t-s,} s > 0\right] = I$. The vector of structural shocks of the domestic origin is represented by ε_t^d while that of external origin is represented by ε_t^f . y_t^d is a vector of domestic variable in Nigeria and y_t^f is the vector of shocks exogenous to Nigeria. Our vector of domestic variables is economic growth. The vector of external variables include external debt, foreign interest rate, oil price, foreign input price, foreign output and real exchange rate.

5. Estimation Results and Discussion

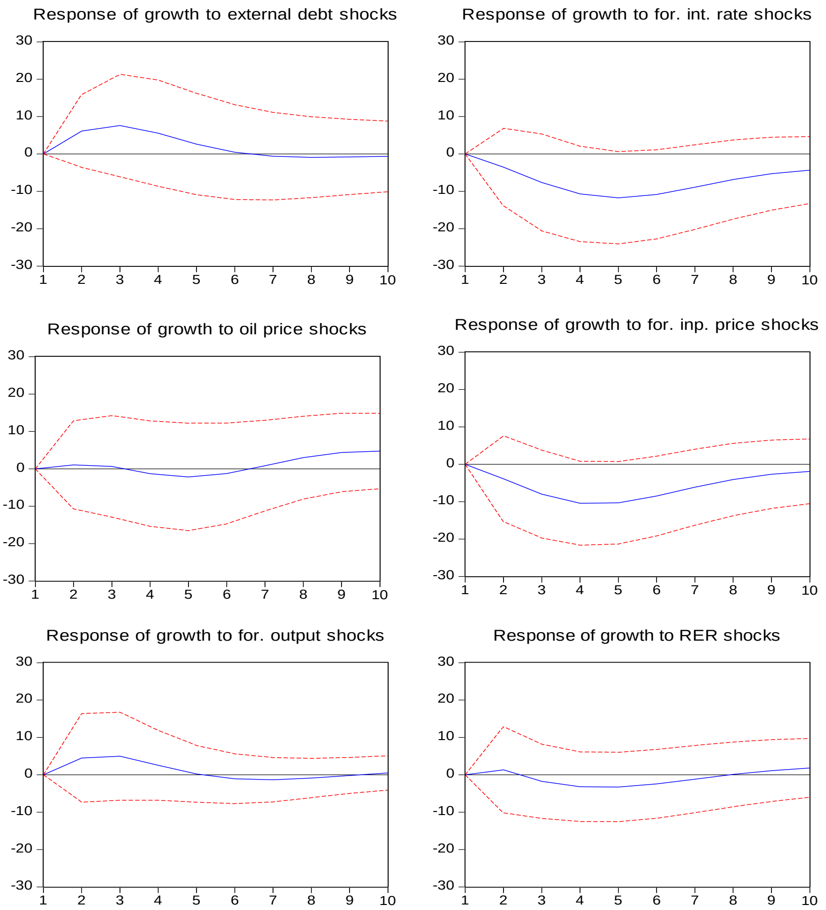
5.1. Impulse Response Functions

Figure 1 illustrates the responses of economic growth in Nigeria to different external shocks. The figure shows that positive shocks to external debt initially lead to a rise in economic growth up till 6th quarters but growth declines after the 6th quarter. This implies that low external debt is growth-enhancing while high external debt is growth-retarding. This indicates that there is a threshold above which the impact of external debt will be negative on growth. This is similar to the findings by Patillo et al. (2002) for developing countries and by Ndoricimpa (2017) for the African countries. Moreover, the results show that a positive shock to the foreign interest rate lowers growth on impact and continue till the 10th quarter. This suggests that an increase in the foreign interest rate increases the cost of debt servicing, reduces the level of government investment and hence declines economic growth. This reinforces the results by di Giovanni and Shambaugh (2007).

Furthermore, the results indicate that a positive shock to oil price only has marginal short-lived positive effect on growth. Following the positive shocks, growth increases marginally on impact but declines after the 3rd quarter and later rises. This implies that positive oil price shocks have limited impact on economic growth in Nigeria. This is similar to the conclusion by Iwayemi and Fowowe (2011). Moreover, positive shocks to foreign input price lead to significant decline in output growth. This suggests that a positive shock to foreign input price which represents a negative supply shock reduces economic growth in Nigeria. On the other hand, positive shocks to foreign output lead to a rise in growth up to the 5th quarter. This implies that a positive foreign demand shock will increase economic growth in Nigeria. This is line with the findings by Sousa (2008).

Lastly, the results show that a positive shock to the exchange rate leads to a rise in output growth on the spot up the 3rd quarter before it declines. This shows that exchange rate depreciation will initially stimulate growth up till the 3rd quarter. This earlier rise in growth can be attributed to the trade channel effects where exchange rate depreciation results in increase in demand for exports and hence a rise in output growth. The decline in growth after the 3rd quarter may be due to the balance sheet effects where the exchange rate depreciation leads to an increase in the debt service payments, a decrease in investment and growth.

Fig. 1. Response of economic growth to external shocks



5.2. Forecast Error Decomposition

Table 1 presents the contributions of external shocks to economic growth in Nigeria. The results show that external shocks significantly influence output growth in Nigeria. Generally, external shocks account for about 15% variation in growth in Nigeria. Disaggregating the shocks show that the most important external shocks influencing growth in Nigeria are the foreign interest rate and foreign input shocks. The two shocks account for about 13% variation in output growth in Nigeria. Shocks to foreign interest rate contribute about 2.63% and 7.7% to variation in growth in the 4th and 10th quarters respectively. This demonstrates the significant impact of the cost of servicing debt on the Nigerian economy. A rise in the foreign interest rate increases the cost of debt service, reduces government investment and output. Moreover, the estimates indicate that an increase in foreign input price significantly reduces output in Nigeria. Shocks to foreign input price represent about 2.66% and 5.34% variation in growth in the 4th and 8th quarters respectively. Since Nigeria depends on foreign intermediate inputs to produce domestic output, increase in foreign input price represents a negative supply shocks. This negative supply shocks leads to significant reduction in output.

Furthermore, the results show that external debt shock is the next important shock after the foreign input price shocks. The estimates show that the contribution of external debt shocks to economic growth decreases over the periods. Shocks to external debt contribute about 1.79% in the 4th quarter but this decrease to 1.71% and 1.70% in the 8th and 10th quarters respectively. This is line with the literature on external debt threshold which posits that increasing external debt diminishes growth (see Patillo et al. (2002). The results also reveal that contribution of oil price shocks to growth is insignificant. Oil price shocks contribute less than 1% to economic growth in all the quarters. Similarly, foreign output shocks which represent foreign demand shocks account for less than 1% of the variation in economic growth in Nigeria. This reflects lower grade integration between the US and Nigerian economies. Lastly, real exchange rate shocks also contribute less than 1% of the variation in growth in Nigeria.

Table 3. The variance decomposition of growth due to external shocks

Variable	Horizon	External debt	Foreign interest rate	Oil price	Foreign input price	Foreign output	Real exchange rate
Growth	2	0.69	0.22	0.02	0.28	0.37	0.03
	4	1.79	2.63	0.05	2.66	0.73	0.21
	6	1.74	5.77	0.13	4.79	0.69	0.42
	8	1.71	7.21	0.24	5.34	0.70	0.42
	10	1.70	7.70	0.76	5.41	0.69	0.47

6. Conclusion and Recommendation

A number of studies have investigated the effects of oil price shocks on economic fluctuations and growth in Nigeria.[1] Oil price shocks are transmitted to the Nigerian economy through the fiscal policy. However, there has been scarcity of empirical research that examine the impact of a broader range of external shocks which include trade shocks, external financial shocks, foreign demand shocks and foreign supply shocks. This study fills this gap by empirically examining the contributions of these shocks to economic growth in Nigeria.

The paper investigates the role of external shocks in growth dynamics for the Nigerian economy. We employ the structural VAR to examine the contributions of six external variables to economic growth in Nigeria. The findings indicate that external shocks explain significant variations in economic growth for Nigeria. More importantly, foreign interest rate, foreign input price shocks and external debt shocks are the most important shocks accounting for significant change in economic growth in Nigeria. We find that oil price shocks, foreign output shocks and exchange rate shocks account for limited contribution to economic growth in Nigeria. Given the significant contributions of foreign interest rate shocks and foreign input price shocks, the study recommends that the government should reduce the country exposure to foreign debt. The domestic capital market should be deepened to borrow domestically. Moreover, the government should formulate relevant policies to promote local sourcing of raw material for the production of final output.

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[1] See (Olomola & Adejumo; 2006; Iwayemi & Fowowe; 2011).

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