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EFFECT OF ABNORMAL INCREASE IN CREDIT SUPPLY ON ECONOMIC GROWTH IN NIGERIA

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Abstract

We investigate the effect of abnormal increase in credit supply on economic growth in Nigeria after controlling for the quality of the legal system, size of central bank asset, banking sector cost efficiency and bank insolvency risk. The abnormal increase in credit supply has a significant effect on economic growth. The abnormal increase in credit supply increases real GDP growth. The abnormal increase in credit supply decreases real GDP per capita during the global financial crisis. The abnormal increase in domestic credit to private sector has a significant positive effect on GDP per capita when there is strong legal system quality in Nigeria. In contrast, the abnormal increase in domestic credit to private sector has a significant negative effect on real GDP growth when there is strong legal system quality in Nigeria. The abnormal increase in credit supply is ineffective in increasing GDP per capita during crisis years. Policymakers should be cautious in pressuring financial institutions to release an abnormally large amount of credit into the economy particularly during financial crises. Rather, policymakers should encourage financial institutions to supply credit in a sustained manner- not in an abnormal manner-and in a way that supports growth.

Keywords: *Economic growth, Nigeria, credit supply, GDP growth rate, GDP per capita, abnormal credit supply, rule of law, ZSCORE, profitability, domestic credit to private sector, central bank asset.*

INTRODUCTION

In this paper, we investigate the impact of abnormal increase in credit supply on economic growth in Nigeria. Credit is important for growth in an economy. Credit supply to the private sector helps to support investment and productive activities in the domestic economy (Colombo and Paccagnini, 2020), and it leads to an increase in economic output (Levine, 2005). Credit supply may increase or decrease in response to market incentives and general changes in the economy. When these changes are predictable, it allows economic agents to plan and adjust their business activities in anticipation of changes in external financing conditions. However, when credit supply increases or decreases in an unpredictable, unexpected or abnormal manner, it creates shocks that give rise to irrational behaviour among affected economic agents, and their behaviour lead to outcomes that affect economic output and growth (Ozili et al, 2022). In this paper, we consider the case of abnormal increase in credit supply. This refers to an unexpected increase in credit supply which is measured as unexpected or abnormal increase in domestic credit to the private sector.

In Nigeria, low domestic credit to the private sector has remained a long standing issue. The ratio of domestic credit to the private sector to gross domestic product (GDP) in Nigeria was 12.1 percent in 2020, which is very low when compared to the 50 percent

global benchmark. This is due to the high cost of doing business which translates to high market interest rate at 25 per cent in 2021 coupled with the unwillingness of formal lenders to lend to high-risk businesses and the central bank's on-lending to various sectors of the economy through financial institutions. Such on-lending crowds out private sector lending and further worsen the share of domestic credit to the private sector relative to GDP. More importantly, several events occurring in Nigeria have made the abnormal increase in credit supply more likely to occur. These events include the fear of regulatory sanctions for violating the regulatory loan-to-deposit ratio (LDR), fluctuating oil price, declining oil export revenue, the difficulty in recovering non-performing loans from politically-connected debtors, the frequent use of unconventional monetary policy by the Central Bank and rising economic policy uncertainty, among others (Ozili and Ndah, 2021). These events have increased the episodes of abnormal increase in credit supply in Nigeria, and the effect of such abnormal increase in credit supply on economic growth in Nigeria have not been investigated in the literature. Therefore, it is important to investigate how the abnormal increase in credit supply affects economic growth in Nigeria.

In Nigeria, empirical studies on the impact of credit supply on economic growth are not abundant in the literature. Some studies examine different aspects of credit supply and its effect on growth. Such studies include Akpansung and Babalola (2011), Olowofeso, Adeleke and Udoji (2015), Mamman and Hashim (2014), Odeniran and Udeaja (2010) and Amoo, Eboreime, Adamu, and Belonwu (2017). Our study is different from previous studies in three ways. First, Akpansung and Babalola (2011) investigate the relationship between banking sector credit and economic growth in Nigeria from 1970 to 2008. They used GDP at current prices as the indicator of economic growth. This measure of economic growth is an unreliable indicator of economic growth because current prices are not a reliable indicator of real GDP growth. Our study is different from Akpansung and Babalola (2011)'s study because we use a more reliable indicator of economic growth, which is real GDP growth rate and the GDP per capita. Second, previous Nigerian studies such as Olowofeso et al (2015), Okafor et al (2016), Odeniran and Udeaja (2010) and Amoo et al (2017) did not control for the role of institutions in influencing economic growth. Third, robust regression methods were not used in these studies, and they did not examine the link between credit supply and economic growth in recessionary times, such as during a financial crisis, to determine whether the credit-growth relationship still holds true during recessionary times. Our paper addresses the weaknesses in previous studies by using the generalised method of moments (GMM) method to estimate the impact of abnormal increase in credit supply on economic growth while controlling for institutional factors and other macro-financial characteristics.

Using data for Nigeria from 1993 to 2021, our findings reveal that the abnormal increase in credit supply increases real GDP growth and decreases real GDP per capita particularly during the global financial crisis. We also find evidence that the abnormal increase in domestic credit to the private sector has a significant positive effect on GDP per capita when there is strong legal system quality in Nigeria. In contrast, the abnormal increase in domestic credit to the private sector has a significant negative effect on real GDP growth when there is strong legal system quality in Nigeria.

Our study contributes to the economic literature that assesses the role of credit for macroeconomic stability. Existing studies in this literature include Hahn (2015), Stiglitz (2016) and Levine (2005). The present study contributes to this literature by analysing the

potential effect of abnormal increase in credit supply on economic growth, which is an indicator of macroeconomic stability with particular focus on Nigeria.

The rest of the paper is structured as follows. Section 2 presents the theoretical background and literature review. Section 3 presents the research methodology. Section 4 presents the empirical results. Section 5 presents the conclusion of the study.

LITERATURE REVIEW

Theoretical Literature

Early theoretical studies suggest some channels through which finance (or credit) affects economic growth. Hahn (2015) presents a monetarist view on the linkage between finance and economic growth. Hahn (2015) argued that changes in the monetary policy rate matters for growth because changes in the monetary policy rate will lead to changes in the level of credit supply, and changes in the level of credit supply will affect aggregate demand in the economy and lead to significant changes in the level of production and investment, thereby affecting economic output and growth. This idea, although rational and logical, has been contested by some economists. For instance, Stiglitz (2016) argued that monetary policy is ineffective in influencing the level of credit supply because what matters most is not so much the money supply or the T-bill interest rate, but what matters most is the availability of credit and the terms at which credit is made available (Stiglitz, 2016).

Another theory that proposes a channel through which finance (or credit) affects economic growth is the theory of finance and growth. Proponents of the theory of finance and growth such as McKinnon (1973) and Miller (1998) argue that debt instruments raised in financial markets are the channels through which finance or credit support the productive activities of firms which then leads to increase in economic output and therefore higher economic growth. Levine (2005) argued that better functioning financial systems can ease the external financing constraints that impede firm and industrial expansion, and that this is one mechanism through which finance matters for growth. He also argued that financial instruments, financial markets and financial institutions may arise to mitigate the effects of information and transaction costs (Levine, 2005). In doing so, financial arrangements will change the incentives and constraints facing economic agents (Levine, 2005). The change in incentives and constraints facing economic agents will influence saving rates, interest rates, investment decisions, technological innovation and this will ultimately affect long-run growth rates (Levine, 2005).

Empirical Literature

The impact of credit supply on economic growth has received much attention in Africa and in the recent literature. So far, the results have been mixed in the literature. For instance, Ibrahim and Alagidede (2018) investigate the finance-growth nexus in 29 sub-Saharan Africa countries from 1980 to 2014. They use a sample splitting and threshold estimation technique. They find a significant positive association between financial development and economic growth. However, they find that below a certain estimated threshold, finance is insensitive to growth. Bist (2018) investigates the long-run relationship between financial development and economic growth from 1995 to 2014. They conduct a panel unit root and panel cointegration analysis using data from 16 selected low-income countries. They use the fully modified and dynamic ordinary least squares (OLS) techniques. They find that there is a long-run co-integrating relationship between financial development and economic growth which indicates that financial development has a positive and significant impact on economic growth. Anyanwu (2014) investigates the determinants of

economic growth in Africa and draws implications for China. The study period covers 1996 to 2010 for the African sample and 1980 to 2010 for the China sample. The study finds that the factors driving economic growth in Africa include: domestic investment, net oversees development assistance (ODA) inflows, education, government effectiveness, urban population and metal prices. Meanwhile, the factors driving economic growth in China include inflation rate, domestic credit to the private sector, net ODA inflows, population growth, telephone density, and oil and agricultural/raw materials prices. Mbate (2013) investigates the impact of domestic debt on economic growth and private sector credit for 21 sub-Saharan African (SSA) countries from 1985 to 2010. The study finds a non-linear relationship between domestic debt and economic growth. The study also finds that domestic debt crowds out private sector credit, thereby deterring capital accumulation and private sector growth. Ozili et al (2022a) investigate the effect of abnormal credit expansion and contraction on the GDP per capita of ten Economic Community of West African States (ECOWAS) countries and find evidence that abnormal credit contraction and expansion reduces the GDP per capita of ECOWAS countries. Their findings confirm that 'too little' or 'too much' credit does not improve growth per person in immature financial systems such as those in ECOWAS countries.

Few Nigerian studies have investigated the link between credit supply and economic growth. Some studies find a positive relationship between credit supply and economic growth in Nigeria. For example, Akpansung and Babalola (2011) investigate the relationship between banking sector credit and economic growth in Nigeria from 1970 to 2008. They used Granger causality test to determine the causality between the two variables. They also used the two-stage least squares regression technique. They use GDP at current prices as the indicator of economic growth. Their result shows that private sector credit has a positive effect on economic growth. They also find a unidirectional causal relationship from GDP to private sector credit and from industrial production index to GDP. Olowofeso, Adeleke and Udoji (2015) examine the impact of private sector credit on economic growth in Nigeria from 2000 to 2014. They use the Gregory and Hansen co-integration test that accounts for structural breaks and endogeneity problems. They find a significant and positive relationship between private sector credit and economic growth in Nigeria. Mamman and Hashim (2014) examine the impact of bank lending on economic growth in Nigeria from 1987 to 2012. They used the OLS regression methodology and find that bank lending accounts for about 82.6% of the variation in economic growth in Nigeria for the period. They conclude that bank lending has a significant and positive impact on economic growth in Nigeria.

Other Nigerian studies focus on the causality between credit supply and growth. For example, Okafor, Ezeaku, and Ugwuegbe (2016) investigate the causal relationship between deposit money bank credit and economic growth in Nigeria from 1981 to 2014. They use the vector autoregressive Granger causality test. Economic growth was measured using real gross domestic product while deposit money bank credit was measured using private sector credit and broad money supply. They find a unidirectional causality running from private sector credit and broad money supply to economic growth. Odeniran and Udeaja (2010) investigate the relationship between financial sector development and economic growth in Nigeria from 1960 to 2009. They use Granger causality test and find a bi-directional causality between some financial development indicators and economic growth. Amoo, Eboreime, Adamu, and Belonwu (2017) find that private sector credit increased economic

growth when domestic or local conditions are favourable. The authors emphasize the need for growth-enhancing credit expansion in Nigeria.

Overall, previous Nigerian studies that examined the link between credit supply and growth used narrow measures of economic growth. They also did not control for the role of institutions in influencing economic growth. Moreover, robust regression methods were not used, and these studies did not assess the link between credit supply and growth in recessionary times, such as during the 2007 to 2009 global financial crisis of 2007, in order to assess whether the credit-growth relationship holds true in recessionary times. Having identified this gap in the literature, the present paper fills this gap in the literature.

RESEARCH METHODOLOGY

Data

Data for Nigeria were extracted from the World Development Indicators and the Global Financial Development Indicators in the World Bank database. The data frequency is annual. The sample period is from 1993 to 2021. The sample period covers a 29-year period. The extended sample period was chosen to ensure that the sample period is long enough to capture at least two full economic cycles. A full economic cycle is a 10-year interval. In total, eight variables were used in the empirical analyses. The eight variables used in the analyses have been used in previous studies such as Owusu (2012), Matei (2020), Ozili et al (2022a); Ruiz (2018), Mian et al (2017), Beck et al (2000), Poshakwale and Qian (2011), Ayadi et al (2015), Ozili et al (2022b), Haggard and Tiede (2011) and Haidar (2012). The dependent variables are the logarithm of the GDP per capita (LogCGDP) variable and the GDP growth rate (RGDP) variable. The CGDP data are skewed, therefore, we take the logarithm of the CGDP variable to reduce the skewness in the CGDP data. This gives us the LogCGDP variable. The explanatory variables are: domestic credit to the private sector to GDP ratio (CS), two binary variables (CSH1 and CSH2) that capture the period where there are abnormal increases in credit supply, central bank assets to GDP ratio (CG), banking sector insolvency risk (ZSCORE), cost to income ratio (CI) and the rule of law index (LAW).

Table 1: Variable description

Variable	Description	Measurement	Data source
RGDP	Real GDP growth rate	Year-on-year change in real gross domestic product	World Development Indicators
LogCGDP	Logarithm of GDP per capita	Logarithm of gross domestic product divided by population	World Development Indicators
CS	Ratio of domestic credit to private sector to GDP	Domestic credit to the private sector refers to the financial resources provided to the private sector by other depository corporations (except central banks) as a proportion of GDP	Global Financial Development Indicators
CSH1	Abnormal credit shock variable	CSH1 is a binary variable that captures the period where there are abnormal increases in credit supply. The binary variable equals T if the CS variable is above-the-mean of the CS time series data, and zero otherwise	Authors' construct
CSH2	An alternative measure of abnormal credit shock variable	CSH2 is an alternative binary variable that captures the period where there are abnormal increases in credit supply. The CSH2 binary variable equals T if the CS variable is equal and above the upper 5% percentile, and zero otherwise.	Authors' construct

CS*CSH1	Abnormal increase in credit supply	Derived by interacting the CS variable and the CSH1 variable	Authors' construct
CS*CSH2	Alternative measure of abnormal increase in credit supply	Derived by interacting the CS variable and the CSH2 variable	Authors' construct
CG	Ratio of central bank assets to GDP (%)	Measures the ability of the central bank to intervene to stimulate economic growth and to resolve financial and economic crises using the assets in the central bank balance sheet. The higher the ratio, the better	Global Financial Development Indicators
ZSCORE	Banking sector insolvency risk	The ZSCORE measures the distance-to-default of the banking sector. The higher the ZSCORE, the better	Global Financial Development Indicators
CI	Banking sector cost efficiency	It measures the cost efficiency of the banking sector. It is measured as total cost (or non-interest expenses) divided by net income of the banking sector. The lower, the better	Global Financial Development Indicators
LAW	Rule of Law index -a measure of legal system quality	The index captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	World Governance Indicators

Model Specification

The dependent variables used in the study are two measures of economic growth. The first dependent variable is the logarithm of the GDP per capita variable (LogCGDP). The second dependent variable is the real GDP growth rate variable (RGDP).

We estimate four models. The first model estimates the effect of abnormal increase in credit supply (CS*CSH1) on the logarithm of the GDP per capita variable (LogCGDP). The second model estimates the effect of abnormal increase in credit supply (CS*CSH1) on real GDP growth (RGDP). The third model estimates the effect of the alternative measure of abnormal increase in credit supply (CS*CSH2) on the logarithm of the GDP per capita variable (LogCGDP). The fourth model estimates the effect of the alternative measure of abnormal increase in credit supply (CS*CSH2) on real GDP growth (RGDP).

For each of the models, we estimate the GMM regression estimation. We applied the GMM approach because the ordinary least squares (OLS) regression methodology does not address the problem of endogeneity that occurs when the independent variables are correlated with the error term. To address this problem and obtain reliable estimates, we use the Generalized Method of Moments (GMM) introduced by Hansen (1982). The GMM model also controls for autocorrelation and heteroskedasticity of unknown form (Musa et al, 2021). GMM makes use of the orthogonality conditions to allow for efficient estimation in the presence of heteroskedasticity (Baum, Schaffer and Stillman, 2003). Furthermore, the application of GMM is suitable in this study because it addresses the problem of simultaneity inherent in the explanatory variables through the use of adequate time-invariant instruments. The baseline models for the study are specified below.

$$LogCGDP_t = \alpha_0 + \alpha_1 LogCGDP_{t-1} + \alpha_2 CS_t + \alpha_3 CSH1_t + \alpha_4 (CS * CSH1)_t + \alpha_5 CG_t + \alpha_6 ZSCORE_t + \alpha_7 CI_t + \alpha_8 LAW_t + e_t \text{ -------(1)}$$

$$RGDP_t = \beta_0 + \beta_1 RGDP_{t-1} + \beta_2 CS_t + \beta_3 CSH1_t + \beta_4 (CS * CSH1)_t + \beta_5 CG_t + \beta_6 ZSCORE_t + \beta_7 CI_t + \beta_8 LAW_t + e_t \text{ --------(2)}$$

$$LogCGDP_t = \varphi_0 + \varphi_1 LogCGDP_{t-1} + \varphi_2 CS_t + \varphi_3 CSH2_t + \varphi_4 (CS * CSH2)_t + \varphi_5 CG_t + \alpha_6 ZSCORE_t + \varphi_7 CI_t + \varphi_8 LAW_t + e_t \text{ --------(3)}$$

$$RGDP_t = \theta_0 + \theta_1 RGDP_{t-1} + \theta_2 CS_t + \theta_3 CSH2_t + \theta_4 (CS * CSH2)_t + \theta_5 CG_t + \theta_6 ZSCORE_t + \theta_7 CI_t + \theta_8 LAW_t + e_t \text{ ---------(4)}$$

Where,

t	=	year.
LogCGDP	=	logarithm of GDP per capita.
RGDP	=	real GDP growth rate.
CS	=	domestic credit to private sector (percentage of GDP).
CSH1	=	a binary variable representing abnormal credit shock.
CSH2	=	alternative binary variable representing abnormal credit shock, as described in table 1
CG	=	central bank assets to GDP ratio (%).
ZSCORE	=	banking sector insolvency risk.
Cl	=	banking sector cost efficiency ratio.
LAW	=	rule of law variable. e = error term.

The apriori expectation for the relevant variables is reported in table 2 below. The models are estimated using the GMM regression methods. The GMM regression technique we use in this paper has been used in previous studies such as Rachdi and Mbarek (2011), Ozili et al (2022a), Ibrahim and Alagidede (2018), Ozili (2021) and Ustarz and Fanta (2021). The GMM model has one lag while the instruments are the first-difference of the variables.

We interact the CS variable with the CSH1 and CSH2 variables to ensure that the CS data capture the abnormal period effect. The interaction of the CS variable and the CSH1 variable yields the CS*CSH1 variable. The CS*CSH1 variable captures above-the-mean credit supply level, which is indicative of abnormal high credit supply. This approach is consistent with the approach used in the study of Ozili et al (2022a). We also interact the CS variable and the CSH2 variable, which yields the CS*CSH2 variable. The CS*CSH2 variable captures the 95 percentile credit supply level, which is indicative of abnormal high credit supply.

Regarding the control variables, the CG variable is the ratio of central bank assets to GDP. The CG control variable measures the ability of the central bank to intervene to stimulate economic growth and to resolve financial and economic crises using the assets in

the central bank balance sheet (Beck et al, 2000; Ozili et al, 2022a). A large central bank balance sheet enables the central bank to intervene more quickly in the economy to avert economic and financial crises and to stimulate economic growth. Therefore, we expect a positive relationship between the CG variable and the two measures of economic growth (LogCGDP and RGDP).

The ZSCORE variable is a measure of banking sector insolvency risk. It measures the distance-to-default of the banking sector. A high ZSCORE means the banking sector is far away from defaulting and indicates a low insolvency risk. Therefore, a high ZSCORE means that the banking sector is more stable. A high ZSCORE will lead to higher economic growth because a stable banking sector will enable the persistent and efficient allocation of credit to firms for production and investment activities that lead to higher economic output (Poshakwale and Qian, 2011). Therefore, we expect a positive relationship between the ZSCORE variable and the two measures of economic growth (LogCGDP and RGDP).

The CI variable measures the cost efficiency of the banking sector. It is measured as total cost (or non-interest expenses) divided by net income of the banking sector. Several studies show that greater banking sector cost efficiency will lead to higher economic growth because cost-efficient banks will generate higher profit which would enable banks to expand their operations and employ more workers, which ultimately contributes to greater economic growth and better welfare of citizens. This expectation is supported by Ayadi et al (2015) and Ozili et al (2022a). Therefore, we expect a negative relationship between the CI variable and the two measures of economic growth (LogCGDP and RGDP).

The LAW variable is a measure of legal system quality. Several studies show that high legal system quality contributes positively to economic growth because a strong legal system protects property rights and contractual rights in a country so that markets can work effectively and efficiently to support economic growth and welfare (Haggard and Tiede, 2011; Haidar, 2012). Therefore, we expect a positive relationship between the LAW variable and the two measures of economic growth (LogCGDP and RGDP).

Table 2: Apriori Expectations

Variable	Short description	Apriori signs	Apriori prediction / expectation	Previous studies that support this prediction
CSH1	Binary variable representing abnormal credit shock	+/-	Positive or negative	Authors' construct
CSH2	Alternative binary variable representing abnormal credit shock	+/-	Positive or negative	Authors' construct
CS	The ratio of domestic credit to private sector (% of GDP)	+	Higher domestic credit to private sector should lead to higher economic growth	This expectation is supported by Matei (2020) and Ruiz(2018)
CS*CSH1	Abnormal increase in credit supply		Abnormal credit expansion is likely to hinder economic growth	This expectation is supported by Mian et al (2017)
CS*CSH2	Alternative measure of abnormal increase in credit supply		Abnormal credit expansion is likely to hinder economic growth	This expectation is supported by Mian et al (2017)

CG	Ratio of central bank assets to GDP (%)	+	Central banks that have a large asset size can intervene in the economy to spur growth. They can also use their assets to intervene in order to avert a financial or economic crisis	This expectation is supported by Beck et al (2000)
ZSCORE	Banking sector insolvency risk	+	A high ZSCORE will lead to higher economic growth	This expectation is supported by Poshakwale and Qian (2011)
CI	Banking sector cost efficiency ratio i.e. cost-to-income ratio (%)		Greater banking sector efficiency will lead to higher economic growth	This expectation is supported by Ayadi, Arbak, Naceur and Groen (2015)
LAW	Rule of Law index	+	Higher legal system quality contributes positively to economic growth	This expectation is supported by Haggard and Tiede (2011) and Haidar(2012)

Descriptive Statistics

Table 3 reports the average values for the data. Real GDP growth variable (RGDP) is 4.14 percent on average over the period. Credit supply to the private sector (CDGP) variable is low at 11.69 percent on average. The average cost to income ratio (CI) over the period is 61.59 percent which exceeds the 50-percent mark. This indicates that there is high cost inefficiency in the Nigerian banking sector during the period. Central bank assets to GDP ratio is 5.59 percent on average. Some variables such as the CGDP, CSH, DFC and LAW variables have a very low standard deviation which indicates that there is little variation between the observed values of the variables and their respective means. Meanwhile, the CI, CG, RGDP, CS, CS*CSH1, CS*CSH2 and ZSCORE variables have a high standard deviation which indicates that there is much variation between the observed values of the variables and their respective means.

Table 3: Descriptive statistics

Statistics	LogCGDP	RGDP(%)	CS(%)	CSH1	CSH2	CS*CSH1	CS*CSH2	DFC	CG(%)	CI(%)	LAW	ZSCORE
Mean	3.28	4.14	11.69	0.21	0.14	3.59	2.56	0.10	5.59	61.59	-1.11	14.89
Median	3.29	4.23	11.84	0.00	0.00	0.00	0.00	0.00	5.43	61.42	-1.09	15.41
Maximum	3.41	15.32	22.28	1.00	1.00	22.28	22.29	1.00	15.26	81.37	-0.87	20.07
Minimum	3.12	-2.04	6.17	0.00	0.00	0.00	0.00	0.00	0.92	49.17	-1.42	7.08
Standard deviation	0.11	3.92	4.27	0.41	0.35	7.30	6.63	0.31	4.30	7.74	0.17	3.16
Skewness	-0.24	0.44	0.64	1.45	2.10	1.58	2.23	2.60	0.86	0.42	-0.34	-0.52
Kurtosis	1.39	3.56	2.72	3.09	5.41	3.77	6.18	7.78	2.81	2.85	2.07	3.03
Observations	29	29	29	29	29	29	29	29	29	26	23	26

Pearson Correlation Analysis

Table 4 presents the Pearson correlation matrix for the variables used in the study. Table 4 shows that the CS variable is significant and positively correlated with the GDP per capita variable. This indicates that the increase in credit supply is correlated with higher GDP per capita in Nigeria. The CS*CSH1 variable is not significantly correlated with GDP per capita or GDP growth rate. Likewise, the CS*CSH2 variable is not significantly correlated with GDP per capita or GDP growth rate. This implies that the abnormal increase in credit supply is not significantly correlated with economic growth in Nigeria. The LAW variable is significant and positively correlated with LogCGDP and suggests that strong legal system

quality is correlated with higher GDP per capita in Nigeria while the LAW variable is negatively correlated with RGDP.

Table 4: Pearson correlation for all the variables

Variables	LogCGDP	RGDP	CS	CS*CSH1	CS*CSH2	CG	CI	LAW	ZSCORE
LogCGDP	1.000								
RGDP	-0.426** (0.04)	1.000							
CS	0.663*** (0.00)	-0.197 (0.36)	1.000						
CS*CSH1	0.181 (0.41)	0.141 (0.52)	0.734*** (0.00)	1.000					
CS*CSH2	0.127 (0.56)	0.080 (0.71)	0.701*** (0.00)	0.844*** (0.00)	1.000				
CG	-0.543** (0.01)	-0.280 (0.19)	-0.426** (0.04)	-0.369* (0.08)	-0.271 (0.21)	1.000			
CI	-0.272 (0.21)	0.608*** (0.00)	-0.044 (0.83)	0.246 (0.25)	0.254 (0.24)	-0.432** (0.03)	1.000		
LAW	0.713*** (0.00)	-0.699*** (0.00)	0.580*** (0.00)	0.112 (0.61)	0.059 (0.78)	-0.019 (0.93)	-0.595*** (0.00)	1.000	
ZSCORE	0.512** (0.01)	-0.078 (0.72)	0.649*** (0.00)	0.478** (0.02)	0.411* (0.05)	-0.524** (0.01)	-0.011 (0.95)	0.375* (0.07)	1.000

P-values are in parenthesis. ***, **, * represent statistical significance at the 1%, 5% and 10% level.

EMPIRICAL RESULTS

In the regression analysis, we first estimate the effect of abnormal increase in credit supply on the two measures of economic growth (LogCGDP and RGDP). Thereafter, we estimate the effect of the 2007-2009 global financial crisis on this relationship. In the regression analysis, we used the GMM regression estimation, which addresses potential endogeneity problems in the data.

The effect of abnormal credit supply (based on above-average credit supply) on economic growth

We use above-average credit supply as an indicator of abnormal increase in credit supply which is represented by the CS*CSH1 variable. The results are reported in columns (i) and (iii) of table 5. The regression results in table 5 show that the CS*CSH1 coefficient is negative and statistically significant at the 1% level in column (i) of table 5. This indicates that an abnormal increase in domestic credit to private sector (CS*CSH1) has a significant negative effect on the GDP per capita (CGDP) of Nigeria. This result is consistent with the findings of Mian, Sufi and Verner (2017) who find that abnormal credit expansions lead to a significant decrease in GDP per capita in the USA. Meanwhile, the CS*CSH1 coefficient is positive and statistically significant at the 5% level in column (iii) of table 5. This indicates

that an abnormal increase in domestic credit to private sector (CS*CSH1) has a significant positive effect on real GDP growth in Nigeria.

For the control variables, the CS coefficient is positive and significant in column (i) of table 5. This suggests that an increase in the domestic credit to the private sector variable (CS) leads to a significant increase in the GDP per capita of Nigeria. This result supports the findings of Akpansung and Babalola (2011) who find a positive relationship between credit supply and GDP per capita in Nigeria. Meanwhile, the CS coefficient is negative and significant in column (iii) of table 5. This suggests that an increase in the domestic credit to the private sector variable (CS) leads to a significant decrease in real GDP growth in Nigeria. The CG coefficient is negative and significant in column (i). This indicates that the larger the size of central bank assets, the lower the GDP per capita in Nigeria. The remaining control variables i.e. the Cl, LAW and ZSCORE coefficients are statistically insignificant in columns (i) and (iii). This means that banking sector cost efficiency, the quality of the legal system and banking sector insolvency risk do not have a significant effect on the GDP per capita of Nigeria during the period examined. The CSH1 coefficient is positive and statistically significant. This indicates that abnormal credit had a positive shock effect.

The effect of abnormal credit supply (based on upper 5% percentile) on economic growth

In this section, we use credit supply at the upper 5% percentile as an alternative indicator of the abnormal increase in credit supply. To determine the percentile, we rearranged the time series of the CS variable in ascending order (from the smallest to the largest value). The upper 5% percentile is the corresponding value of CS at the point of N multiplied by 0.95 (or 95 percent) where N is the total number of observations in the CS time series data (N = 29). The corresponding value of CS at the upper 5% percentile is 15.66%. Therefore, the CSH2 variable is a binary variable that equals '!' when the CS variable is at least 15.66%, and zero otherwise. We interact the CSH2 binary variable with the CS variable to derive the CS*CSH2 interaction variable; thus, the alternative abnormal credit supply variable is represented by the CS*CSH2 variable.

The result is reported in columns (ii) and (iv) of table 5. It shows that the CS*CSH2 coefficient is insignificant in column (ii) of table 5. This indicates that the abnormal increase in domestic credit to private sector (CS*CSH1) has an insignificant effect on the GDP per capita (CGDP) of Nigeria. This result is not consistent with the findings of Mian, Sufi and Verner (2017) who find that abnormal credit expansions lead to a significant decrease in GDP per capita in the USA. Meanwhile, the CS*CSH2 coefficient is insignificant in column (iv) of table 5. This indicates that an abnormal increase in domestic credit to the private sector (CS*CSH1) has an insignificant effect on real GDP growth in Nigeria.

For the control variables, the CS coefficient is positive and significant in column (ii) of table 5. This suggests that an increase in domestic credit to private sector variable (CS) leads to a significant increase in the GDP per capita of Nigeria. This result supports the findings of Akpansung and Babalola (2011) who find a positive relationship between credit supply and GDP per capita in Nigeria. Meanwhile, the CS coefficient is negative and insignificant in column (iv) of table 5. Also, the CSH2, Cl and ZSCORE coefficients are statistically insignificant in columns (ii) and (iv).

Table 5: GMM results for the effect of abnormal increase in credit supply on economic growth measures

	Dependent variable:		***Dependent variable:***	
	LogCGDP **GMM (i) Coefficient (t-statistic)**	***LogCGDP*** **GMM (ii) Coefficient (t-statistic)**	***RGDP*** **GMM (iii) Coefficient (t-statistic)**	***RGDP*** **GMM (iv) Coefficient (t-statistic)**
c	3.091*** (15.56)	3.533*** (20.97)	2.394 (0.21)	-7.972 (-0.73)
CS	0.026*** (3.68)	0.010* (1.88)	-0.584* (-1-75)	-0.354 (-1.03)
CSH1	0.252*** (3.12)		-9.975 (-1.49)	
CS*CSH1	**-0.026*** (-5.64)**		**0.799** (2.12)**	
CSH2		0.269 (0.97)		-5.380 (-0.92)
CS*CSH2		-0.019 (-1.38)		0.368 (1.02)
CG	-0.018*** (-3.81)	-0.013 (-1.50)	-0.312 (-0.67)	-0.270 (-0.75)
ZSCORE	0.004 (0.93)	0.001 (0.13)	0.179 (0.55)	0.257 (1.66)
CI	-0.0004 (-0.30)	-0.0004 (-0.01)	0.058 (0.31)	0.159 (1.54)
LAW	0.039 (0.52)	0.251* (1.89)	-3.376 (-0.42)	-3.552 (-0.94)
R^2	68.08	74.65	69.49	71.45
Adjusted R^2	47.76	58.51	50.08	53.29
J-statistic	2.38	2.79	1.13	1.001
P(J-statistic)	0.304	0.247	0.569	0.606

The GMM instruments for the LogCGDP and RGDP dependent variables are the lagged variables. The GMM instruments for the LogCGDP estimation in column 1 are: LogCGDP(-l), LogCGDP(-2), CS(-l), CSHl(-l), CS*CSH1(-1), CG(-l), ZSCORE(-l), Cl(-l) and LAW(-l). The GMM instruments for the LogCGDP estimation in column 2 are: LogCGDP(-l), LogCGDP(-2), CS(-l), CSH2(-1), CS*CSH2(-1), CG(-l), ZSCORE(-l), Cl(-l) and LAW(-l).The GMM instruments for the RGDP estimation in column 3 are: RGDP(-l), RGDP(-2), CS(-l), CSH1(-1), CS*CSH1(-1), CG(-l), ZSCORE(-l), Cl(-l) and LAW(-l). The GMM instruments for the RGDP estimation in column 4 are: RGDP(-l), RGDP(-2), CS(-l), CSH2(-1), CS*CSH2(-1), CG(-l), ZSCORE(-l), Cl(-l) and LAW(-l). ***, * represent statistical significance at 1% and 10% respectively. CGDP = GDP per capita. RGDP = real GDP growth. CSH1 and CSH2 variables = abnormal credit shock variables. CS*CSH1 = binary variable representing abnormal increase in credit supply based on above-average mean of CS. CS*CSH2 = binary variable representing abnormal increase in credit supply based on upper 5% percentile of CS. CS = domestic credit to private sector as a percentage of GDP. CG = central bank assets to GDP in percentage. ZSCORE = banking sector stability. Cl = banking efficiency. LAW = rule of law variable.

The Effect of 2007-2009 Global Financial Crises

Additional analysis was conducted to determine the impact of abnormal increase in credit supply on economic growth in Nigeria during the 2007 to 2009 global financial crisis. During financial crisis, there is likely to be fewer abnormal increases in credit supply because lenders in Nigeria will refrain from lending during a financial crisis, and this can negatively affect economic growth. To test this argument, the DFC binary variable was introduced into the model. The 'DFC' binary variable takes the value of 1 for the year 2007, 2008 and 2009[1] and zero otherwise. The DFC variable captures the global financial crisis period. The DFC binary variable is interacted with the CS*CSH1 and CS*CSH2 variables to determine the impact of abnormal increase in credit supply on economic growth during the global financial crisis. The interaction procedure yields the DFC*CS*CSH1 variable and the DFC*CS*CSH2 variable. The GMM result is reported in table 6. The DFC*CS*CSH1 coefficient is negative and significant in column (i) to table 6. This indicates that an abnormal increase in domestic credit to the private sector has a significant negative effect on GDP per capita during financial crisis. This implies that an abnormal increase in credit supply during the financial crisis led to a significant decrease in economic growth. This result also implies that abnormal increase in credit supply is ineffective in increasing GDP per capita during crisis years. Meanwhile, the DFC*CS*CSH1 coefficient in column (ii) and the DFC*CS*CSH2 coefficient in columns (iii) and (iv) are not significant, hence, no meaningful conclusion can be drawn for these results.

Table 6: GMM results for the effect of abnormal increase in credit supply on economic growth indicators during financial crisis

Variable	(ii) *Dependent variable: LogCGDP*	(ii) *Dependent variable: LogCGDP*	(iii) *Dependent variable: RGDP*	(iv) *Dependent variable: RGDP*
	LogCGDP **GMM** **(i)** **Coefficient (t-statistic)**	***LogCGDP*** **GMM** **(ii)** **Coefficient (t-statistic)**	***RGDP*** **GMM** **(iii)** **Coefficient (t-statistic)**	***RGDP*** **GMM** **(iv)** **Coefficient (t-statistic)**
c	3.332*** (27.65)	3.284*** (51.39)	-6.514 (-0.33)	3.136 (0.36)
CS	0.020*** (27.65)	0.018*** (5.72)	-0.555 (-0.99)	-0.544 (-1.43)
CSH1	-0.058* (-1.81)		2.189 (0.64)	
CSH2		-0.072** (-2.68)		3.815 (1.11)
DFC	0.155 (0.13)	-0.125*** (-8.77)	-2.090 (-0.10)	3.348 (1.66)
DFC*CS*CSH1	-0.015** (-2.62)		0.252 (0.25)	
DFC*CS*CSH2		-0.001 (-0.97)		0.024 (0.12)
CG	-0.017*** (-3.95)	-0.013*** (-6.42)	0.025 (0.05)	-0.236 (-0.38)
ZSCORE	0.001 (0.27)	0.003* (2.00)	0.279 (0.78)	0.090 (0.26)
CI	-0.002	-0.001	0.201	0.028

	(-1-57)	(-1.03)	(0.72)	(0.19)
LAW	0.073*	0114*	-0.782	-4.858
	(1.83)	(2.13)	(-0.08)	(-0.72)
R^2	95.06	94.14	73.35	58.15
Adjusted R^2	91.11	89.45	52.04	24.66
J-statistic	4.41	2.66	2.46	1.30
P(J-statistic)	0.110	0.265	0.292	0.522

The GMM Instruments for the LogCGDP and RGDP estimations are the lagged variables. The GMM instruments for the LogCGDP and RGDP dependent variables are the lagged variables. The GMM instruments for the LogCGDP estimation in column 1 are: LogCGDP(-l), LogCGDP(-2), CS(-l), CSHl(-l), DFC(-l), DFC*CS*CSH1(-1), CG(-l), ZSCORE(-l), Cl(-l) and LAW(-l). The GMM instruments for the LogCGDP estimation in column 2 are: LogCGDP(-l), LogCGDP(-2), CS(-l), CSH2(-1), DFC(-l), DFC*CS*CSH2(-1), CG(-1), ZSCORE(-l), Cl(-l) and LAW(-l). The GMM instruments for the RGDP estimation in column 3 are: RGDP(-1), RGDP(-2), CS(-l), CSHl(-l), DFC(-l), DFC*CS*CSH1(-1), CG(-l), ZSCORE(-l), Cl(-l) and LAW(-l). The GMM instruments for the RGDP estimation in column 4 are: RGDP(-l), RGDP(-2), CS(-l), CSH2(-1), DFC(-1), DFC*CS*CSH2(-1), CG(-l), ZSCORE(-l), Cl(-l) and LAW(-l). ***, **, * represent statistical significance at 1%, 5% and 10% respectively. LogCGDP = logarithm of GDP per capita. RGDP = GDP growth rate. CSH1&CSH2 = abnormal credit shock variable. CS = domestic credit to private sector as a percentage of GDP. CS*CSH1 & CS*CSH2 = binary variable representing abnormal increase in credit supply. DFC = binary variable representing the period of the 2007-2009 global financial crisis. CG = central bank assets to GDP in percentage. ZSCORE = banking sector stability. Cl = banking efficiency. LAW = rule of law variable.

The Joint Effect of Legal System Quality and Abnormal Increase in Credit Supply

Finally, we perform another analysis to determine the joint impact of legal system quality and abnormal increase in credit supply on economic growth in Nigeria. Our expectation is that a strong legal system will support lending to the economy. We argue that the courts can compel debtors to repay loans owed to financial institutions. When loan repayments are made, financial institutions will be encouraged to increase lending to economic agents because the courts can be used to assist financial institutions during the loan recovery process; therefore, loan default risk is reduced and financial institutions will be encouraged to increase lending to the economy. Accordingly, we expect that abnormal increase in credit supply will have a positive effect on economic growth when the legal system in Nigeria is strong. In the analysis, the coefficients of interest are the coefficient of the LAW*CS*CSH1 and LAW*CS*CSH2 variables. The result is reported in table 7.

The LAW*CS*CSH1 coefficient is significant and positively related to LogCGDP in column (i) of table 7. This indicates that an abnormal increase in domestic credit to the private sector has a significant positive effect on GDP per capita when there is strong legal system quality in Nigeria. In contrast, the LAW*CS*CSH1 coefficient is significant and negatively related to RGDP in column (iii) of table 7. This indicates that an abnormal increase in domestic credit to the private sector has a significant negative effect on real GDP growth when there is strong legal system quality in Nigeria. Meanwhile, the DFC*CS*CSH2 coefficient in column (ii) and (iv) are not significant, hence, no meaningful conclusion can be drawn.

Table 7: GMM results Joint effect of legal system quality and abnormal increase in credit supply on economic growth indicators

	Dependent variable: LogCGDP		***Dependent variable: RGDP***	
	LogCGDP **GMM (i) Coefficient (t-statistic)**	***LogCGDP*** **GMM (ii) Coefficient (t-statistic)**	***RGDP*** **GMM (iii) Coefficient (t-statistic)**	***RGDP*** **GMM (iv) Coefficient (t-statistic)**
c	2.705*** (6.37)	3.449*** (14.92)	13.731 (0.85)	-7.928 (-0.50)
CS	0.032** (2.46)	0.010 (1.52)	-0.815* (-1.96)	-0.337 (-0.81)
CSH1	0.326*** (3.77)		-12.267 (-1.60)	
LAW*CS*CSH1	0.031*** (3.39)		-0.969* (-2.07)	
CSH2		0.227 (1.10)		-3.910 (-0.38)
LAW*CS*CSH		0.016 (1.51)		-0.243 (-0.38)
CG	-0.014*** (-2.81)	-0.012 (-1.29)	-0.387 (-0.78)	-0.281 (-0.69)
ZSCORE	0.009 (1-55)	0.003 (0.47)	0.069 (0.21)	0.245 (1-26)
Cl	0.004 (1.52)	0.001 (0.39)	-0.045 (-0.20)	0.157 (0.88)
LAW	0.079 (0.87)	0.267* (1.99)	-3.008 (-0.36)	-3.615 (-0.83)
R^2	42.26	69.97	62.92	69.83
Adjusted R^2	5.52	50.87	39.32	50.64
J-statistic	2.523	3.19	1.32	0.96
P(J-statistic)	0.283	0.202	0.52	0.618

The GMM instruments for the LogCGDP and RGDP dependent variables are the lagged variables. The GMM instruments for the LogCGDP estimation in column 1 are: LogCGDP(-l), LogCGDP(-2), CS(-l), CSHl(-l), LAW*CS*CSH1(-1), CG(-l), ZSCORE(-l), Cl(-l) and LAW(-l). The GMM instruments for the LogCGDP estimation in column 2 are: LogCGDP(-l), LogCGDP(-2), CS(-l), CSH2(-1), LAW*CS*CSH2(-1), CG(-l), ZSCORE(-l), Cl(-l) and LAW(-l). The GMM instruments for the RGDP estimation in column 3 are: RGDP(-l), RGDP(-2), CS(-l), CSHl(-l), LAW*CS*CSH1(-1), CG(-l), ZSCORE(-l), Cl(-l) and LAW(-l). The GMM instruments for the RGDP estimation in column 4 are: RGDP(-l), RGDP(-2), CS(-l), CSH2(-1), LAW*CS*CSH2(-1), CG(-l), ZSCORE(-l), Cl(-1) and LAW(-l). ***, * represent statistical significance at 1% and 10% respectively. CGDP = GDP per capita. RGDP = real GDP growth. CSH = binary variable representing shock arising from abnormal increase in credit supply. CSH1 and CSH2 variables = abnormal credit shock variables. CS*CSH1 = binary variable representing abnormal increase in credit supply based on above-average mean of CS. CS*CSH2 = binary variable representing abnormal increase in credit supply based on upper 5% percentile of CS. CS = domestic credit to private sector as a percentage of GDP. CG = central bank assets

to GDP in percentage. ZSCORE = banking sector stability. CI = banking efficiency. LAW = rule of law variable.

CONCLUSION

We examined the effect of abnormal increase in credit supply on economic growth in Nigeria while controlling for the quality of the legal system, size of central bank asset, banking sector cost efficiency and banking sector insolvency risk.

The findings show evidence that the abnormal increase in credit supply has a significant effect on economic growth in Nigeria. The abnormal increase in credit supply has a significant positive effect on real GDP growth. Also, the abnormal increase in credit supply has a significant negative effect on real GDP per capita particularly during the global financial crisis. We also find that abnormal increase in domestic credit to the private sector has a significant positive effect on GDP per capita when there is strong legal system quality in Nigeria. In contrast, abnormal increase in domestic credit to private sector has a significant negative effect on real GDP growth when there is strong legal system quality in Nigeria.

The implication of the results is that the abnormal increase in credit supply has a significant effect on economic growth, and the direction of the effect depends on how economic growth is measured. As the results suggest, the abnormal increase in credit supply can increase economic growth when economic growth is measured in terms of real GDP growth while the abnormal increase in credit supply can decrease economic growth when economic growth is measured in terms of GDP per capita, and the effect is more persistent during financial crisis. The results also show that a strong legal system or strong rule of law in Nigeria has a significant moderating influence on the relationship between abnormal increase in credit supply and economic growth in Nigeria.

Therefore, it is recommended that policymakers should strengthen the legal system in Nigeria. Policymakers should allow the rule of law to take its place so that the legal system can support economic activities towards growth. It is also recommended that policymakers should encourage financial institutions to increase credit supply in a sustainable way. Policymakers should not pressure financial institutions to release an abnormally large amount of credit into the economy particularly during financial crises. Rather, policymakers should encourage financial institutions to supply credit in a sustained manner- not in an abnormal manner-and in a way that supports economic growth in Nigeria.

The study has some limitations. The first limitation of the study is that it focused on abnormal credit supply in aggregate terms. It did not investigate abnormal credit supply at the individual bank level. Another limitation of the study is that the study focused only on Nigeria. This means that the findings of the study cannot be generalised to West African countries or to sub-Saharan African countries.

Future studies can extend the research in this paper by investigating the impact of abnormal decrease in credit supply on economic growth in Nigeria. Future studies can also extend the research in this paper by conducting a micro-analysis of individuals' banks to determine how abnormal increase in credit supply by each individual bank might affect their performance and economic growth. Future studies can also extend the analysis to sub-Saharan African countries.

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