

Commercial banks regulation and intermediation function in an emerging market

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Abstract

Purpose — This paper investigates the effect of commercial bank regulations, namely the price, product, and geographic regulations, on the intermediation function of commercial banks in Nigeria.

Methods — Using secondary data from 1986 to 2017 from the Central Bank of Nigeria (CBN) and the World Bank, this study employs the Autoregressive Distributive Lag (ARDL) model and Granger causality framework.

Findings — This paper provides evidence of a long-run relationship between commercial bank regulation and intermediation function represented by private sector credit to RGDP (regional gross domestic product). It also finds that commercial banks' regulation index through price, product, and geographic regulation has a positive relationship with intermediation function. Furthermore, the long-run relationship between commercial bank regulation and intermediation function described by private sector credit to RGDP is affirmed.

Implication — The Central Bank of Nigeria (CBN) needs to relax the product regulation to allow commercial banks to engage in various conventionally non-banking activities.

Originality — The paper contributes to the literature by ascertaining the commercial banks' intermediation function to Nigeria's economic growth and development.

Keywords — Commercial bank regulation, geographic regulations, intermediation function.

Introduction

No economy will tear the part of growth and development without the intermediation function of financial institutions. Realistically, coupled with the uncertainty that characterized the macroeconomic environment of emerging economies, to presume there would be sustainability in growth in the economy shorn of the intermediation function of financial institutions is to assume our difficulties and worries away. Financial institutions, within the framework of the financial markets and instrumentality of the financial assets, intermediate in funds to bring 'together' the surplus and deficit economic agents in such a manner as to resolve existing financial resources' imbalance among them (Ezirim & Moughalu, 2002). Credit allocation to different sectors of the economy leans on the operation and structure of the financial institutions. Hence productive economic activities rely virtually on the intermediation process of financial institutions, especially

for emerging economies where the financial markets are in their developing stages, and firms vehemently trust the banking system for external finances. This declaration cannot be put to contention, for within the realm of theoretical literature, Nwakoby and Ananwude (2016) explicitly stated that when financial system and instruments of operation are strengthened, transaction and information costs in the economy will decline tremendously, which in turn, influence savings rate, investment decision, and innovative technological ventures. Strengthening financial institutions have roots in the legal and regulatory fundamentals of the economy. Sound legal and regulatory environments lower financial intermediation costs, whereas poor and weak legal and regulatory environments, result in intensification in financial intermediation costs, an indispensable reticence for financial deepening in the economy.

Empirical studies on the nexus between commercial banks regulation and intermediation function of financial institutions are relatively few for developed economies (see Bottazzi, Da Rin, & Hellmann, 2009; Kale, Eken, & Selimler, 2015; Vittas, 1991), but there abound large theoretical and documentary pieces of evidence. Concerning emerging economies, empirical studies are also scarce due to scholars' reluctance to research this area attributable to the immeasurability of proxies. In the course of review of empirical studies in the Nigerian setting, it was observed with dismay that there is a shortage of studies on the effect of banking regulation on the intermediation function of commercial banks. The only online available studies in this area at the time this study was undertaken were Ezirim and Moughalu (2002) and Ezirim, Muoghalu, and Emenyonu (2004). They established that commercial bank regulation exerts a significant effect on their intermediation function. By time or period implication, there is a need for further study in this area which this study seeks to fulfil. This study is slightly distinguished from Ezirim and Moughalu (2002) in three aspects. First, it specifically centered on commercial bank regulation, whereas Ezirim and Moughalu (2002) studied both the legal and regulatory environments. Secondly, it covered only the period of deregulation (1986 to 2017) compared to the period of the regulation (1970 to 1985) and deregulation (1986 to 2000) undertaken by Ezirim and Moughalu (2002). Finally, it introduced credit to the private sector relative to real gross domestic product to measured financial intermediation and total assets of commercial banks concerning the real gross domestic product.

Regulation plays a critical role in the efficient intermediation function of commercial banks. In its simplest form, regulation is a set of rules that guides the operation of commercial banks intending to ensure viability, sustainability, and stability of the financial system in such a manner that commands public confidence in the payment system. Regulation or supervision has to do with the laid down rules and regulations that control the operation of the financial institutions. Owing to the expanded competition, the borders between commercial banks are blurring, financial innovations are duplicating off-balance-sheet exercises, and internationalization is rendering control by financial specialists increasingly troublesome (Heremans & Paccès, 2011), hence the need for regulation of commercial banks. The rationale for government regulation of the financial system, which differs from country to country, is often tied to the disastrous effect of market failure and imperfection in market competition practices in the financial sector. The type of regulation imposed by the government influences financial institutions' type of financial products and services. Regulation in terms of interest rate affects the overall cost of capital in the economy. Regulation of permissible and non-permissible activities eminently affects the financial institutions' income, liquidity, and solvency position. Reserve requirements also alter the magnitude of commercial credit banks extends to the economy. Gorton and Winton (2002) avowed that government regulation by the provision of deposit insurance and intervention into banking markets, including bank supervision and examination, limitations on bank activities, capital requirements, charter requirements and entry restrictions, closure rules, and other rules are motivated by the fact that financial institutions, particularly the banks are regarded as flawed institutions prone to harmful banking panics. From theoretical and empirical shreds of evidence, the benefits of government intervention in the operation of commercial banks through regulation and supervision are indisputable.

Financial intermediation may be interpreted in different ways by scholars but for all point to the proficient mobilization and allocation of scarce economic resources. Financial

intermediation, as performed by commercial banks, which varies from country to country depending on the level of development in the financial system, is the process of bringing together surplus spending units (savers) and deficit spending units (borrowers) in an economy (Kwakye, 2012). From Ezirim (1999), financial intermediation is the process whereby financial institutions creating financial assets within the framework of the financial markets, bring together the surplus economic units and the deficit economic units to resolve the financial imbalance employing a price-related compensation mechanism referred to as interest rate. In Nigeria, commercial banks' intermediation function is largely performed compared to the financial markets and non-bank financial institutions operating in the country.

The theory of financial intermediation, in a nutshell, states that the effective and efficient intermediation function of financial institutions provides the economy with the needed funds for productive activities, which lead to growth and development. The theory of financial intermediation is seen as the finance-led growth theory: supply leading hypothesis advanced by Schumpeter in 1911 and made popular by Shaw (1973) and McKinnon (1973). Informational asymmetry and agency theory is considered the theoretical foundation of the theory of financial intermediation. The modern theory of financial intermediation is conceptualized that financial intermediaries serve to decrease costs of transaction and instructive asymmetries, for as improvements in data innovation, deregulation, development of financial markets, etc. tend to decrease transaction costs and information asymmetries, the financial intermediation hypothesis might conclude that intermediation gets to be futile (Scholtens & Wensveen, 2003). In this study, Ferreira de Freitas (2014) and Nwakoby and Ananwude (2016) instigated the discussion of the theory of financial intermediation using two concepts: information asymmetry and transaction cost.

Information asymmetry entails a situation where lenders of funds have inadequate information about the firms requiring the funds or the projects they utilize. There is no doubt that in the present-day business environment, especially in emerging economies, Nigeria, for instance, borrowers tend to have more information on the risk related to the projects they commit to lenders' funds compared to the savers themselves. The disclosure from Nwakoby and Ananwude (2016) affirmed that information asymmetry gives rise to the ethical risk and antagonistic determination problems, driving the plausibility of reducing the capability of efficiency of allocation of funds deficit units from excess units.

Transaction cost dwells on the cost of accessing financial products and services. Lenders would want to be paid interest for giving out their surplus funds. Likewise, the financial intermediaries would want income for lending mobilized funds to the ultimate users: borrowers. The interest rate required by depositors and the fee charged by the financial intermediaries through enforcement, monitoring, verification, and search costs, etc., determines the overall transaction cost in an economy. As said by Nwakoby and Ananwude (2016), the transaction cost approach is a follow up the perfect market condition where according to the neoclassical economists, prices in the market cannot be influenced by one partaker, conditions for lending and borrowing for all partakers are indistinguishable. All information concerning factors and components capable of influencing the present or future values of financial securities are instantaneously at the disposal of all partakers.

Kale et al. (2015) evaluated the impacts of regulations, macroeconomic changes, and political occasions on the effectiveness of the Turkish banks amid the period 1997-2013 when pivotal changes were experienced. A two-stage strategy was utilized. To begin with, the efficiency changes of each bank and the entire segment were measured by a DEA-based Malmquist Productivity Index (DEA-MPI). In common, a modern macroeconomic environment, especially new regulations, has positive impacts on efficiency. More tightly regulations, checking, confinements, solid supervision, more capital, and new reforms positively affect effectiveness.

Berka and Zimmermann (2018) assessed the impact of the Basel Accord on financial intermediation. They found that a monetary policy approach increments credit volume indeed when the economy is in great shape. In contrast, an active capital necessity approach is also viable if it suggests fixing of regulation in bad times.

Zheng, Rahman, Begum, and Ashraf (2017) assessed the impact of capital necessities on the cost of financial intermediation and bank profitability employing a board dataset of 32

Bangladeshi banks over 2000 to 2015. By utilizing the dynamic panel Generalized Method of Moments (GMM) estimator, the study supported that higher bank regulatory capital ratios decrease the costs of financial intermediation and increase bank profitability. Moreover, they found that switching from BASEL I to BASEL II has no quantifiable effect on the costs of financial intermediation and bank profitability in Bangladesh.

Antunes and Moraes (2017) investigated the behavior of financial intermediation through the analysis of a panel of 101 Brazilian banks. The results indicated an increase in non-performing loans and a tight monetary policy increase financial friction and reduced financial intermediation.

Bonner and Eijffinger (2016) examined the impact of liquidity regulation on bank intermediation applying regression discontinuity designs. Employing a special dataset on Dutch banks, it appeared that a liquidity requirement causes long-term borrowing and loaning rates as well as requests for long-term interbred advances to extend. Lower levels of total liquidity increment the assessed impacts.

Employing a panel data set of commercial banks from eight major Asian economies over the period 2001-2010, Deng, Casu, and Ferrari (2014) investigated how the coexistence of progression and prudential regulation influences banks' cost characteristics. Discoveries appeared that liberalization of bank interest rates and increased presence of foreign banks had had a positive and critical effect on technological progress and cost-efficiency. Results too uncovered that prudential regulation might unfavorably influence bank cost performance.

Ferreira de Freitas (2014) ascertained the effect of bank regulatory capital on liquidity creation for the economy based on a sample of Euro area banks for 2006-2012. The study found that higher regulatory capital negatively impacts liquidity creation. However, no evidence was found that the relationship between regulatory capital and liquidity creation differs from bank size or during a crisis period.

Wanjiru (2012) looked at the effect of financial regulation on the financial performance of deposit-taking microfinance institutions in Kenya. The research design that was used in this study was both a cross-sectional and descriptive survey method. The study concluded that the supportive deposit-taking microfinance regulations of 2008 led to the improved financial performance of deposit-taking microfinance institutions.

Demirgüç-Kunt, Laeven, and Levine (2004) looked at the impact of bank regulations, market structure, and national institutions on bank net interest margins and overhead costs, utilizing over 1,400 banks over 72 nations whereas controlling for bank-specific characteristics. The information showed that more tightly regulation on bank entry and bank activities boost financial intermediation cost.

Ezirim and Moughalu (2002) empirically ascertained the effect of the legal and regulatory environments on financial intermediation in an emerging Sub-Saharan economy, with evidence drowned from the Nigerian commercial banks. The method employed included the construction, estimation, and analysis of econometric models. Utilizing yearly time-series information (1970–2000), the findings appeared that the legal and regulatory environments exerted a noteworthy impact on the financial intermediation operations of commercial banks in Nigeria.

Park and Sehrt (2001) used Chinese provincial data from 1991 to 1997 to test whether financial reforms in the mid-1990s increased efficient intermediation by different financial institutions. The results indicated that financial intermediation in China is far from efficient and that financial reforms in the mid-1990s have not reversed the trend of worsening bank performance.

Having justified our motivation for undertaking this study and reviewed relevant literature, the next section of this article (methods) reviews the data, methodological steps, processes, and after that, result and discussion. The last section depicts the conclusion.

Methods

Firstly, we followed the step of determining the descriptive properties of the data employed in the study. That notwithstanding, we went further to ascertain the correlation matrix between commercial bank regulation and intermediation function variables.

In the second step, we checked for the stationarity properties of the data. This is because the non-stationarity of time series data leads to spurious regression results, which cast a dent in the statistical regression output's reliability concerning econometric assumption. To this end, the study used the Augmented Dickey-Fuller (ADF) Test and Phillips Perron (PP) tests of a unit root.

Thirdly, we estimated the long-run relationship between commercial bank regulation and intermediation function and the nature of the relationship in the long-run. The short-run relationship between the variables of interest was also evaluated. These estimations were carried out using the Autoregressive Distributive Lag (ARDL) technique. The choice of ARDL as an econometric tool hinges on the fact that it takes into account a different order of stationarity achieved by time-series data.

The fourth step led to evaluating the robustness of the model via serial correlation LM test, heteroscedasticity, and Ramsey Reset Specification test. These tests confirm the authenticity of the Autoregressive Distributive Lag (ARDL).

Finally, we employed the granger causality framework as against the Ordinary Least Square (OLS) technique to examine the effect of commercial bank regulation on intermediation function. Jeff-Anyeneh, Anawude, Ezu, and Nnoje (2020) had it that the Granger causality framework is superior to the Ordinary Least Square (OLS) technique since the Granger causality framework is more efficient and effective in determining whether a time-series variable is useful in predicting or forecasting another. The OLS ordinarily tests for the "mere" relationship between variables. Two variables may relate without one causing changes in the other, hence the vehement reliability of the granger causality framework in this regard.

The data used in the analysis were secondary and were sourced from the Central Bank of Nigeria Statistical Bulletins of various issues and the World Bank. The scope of the study spans from 1986 to 2017. The intermediation function of commercial banks was defined in terms of Private Sector Credit to Real Gross Domestic Product (CPSR) and Total Assets of Commercial Banks to Real Gross Domestic Product (TAR). The inclusion of private sector credit to the real gross domestic product as a proxy for financial intermediation is on the fact that in Nigeria, the depth or degree of intermediation function of commercial banks is seen in the magnitude of fund extended to the private sector from funds mobilized from surplus units, and was guided by the work of Nwakoby and Ananwude (2016). Commercial banks regulation indices are Prime Lending Rate (PLR) for price regulation; Liquidity Ratio (LR) for product regulation; Number of Commercial Banks Branches (NB) and Commercial Bank Density (DEN): the ratio of commercial banks branches to total population for geographic regulation.

The realization of the objective of this study followed an estimation of a linear regression equation, and a reminiscent of Ezirim and Moughalu (2002) expressed as:

$$FII = f(ILE, GI, PDI, PCI) \quad (1)$$

Where: *FII*: Financial intermediation index; *ILE*: Index of the legal environment; *GI*: Geographic regulation index; *PDI*: Product regulation index; *PCI*: Price regulation index

The model has been modified by removing the legal regulation index. In this regard, equation (1) is modified as:

$$FI = f(PCR, PDR, GR) \quad (2)$$

The linear and log-linear form of equation (1), having inputted the various measurement of regulation, are stated as:

For linear function:

$$CPSR_t = a_0 + a_1PLR_t + a_2LR_t + a_3NB_t + a_4DEN_t + \varepsilon_{1t} \quad (3)$$

$$TAR_t = a_0 + a_1PLR_t + a_2LR_t + a_3NB_t + a_4DEN_t + \varepsilon_{1t} \quad (4)$$

For log-linear function:

$$LogCPSR_t = \beta_0 + \beta_1LogPLR_t + \beta_2LogLR_t + \beta_3LogNB_t + \beta_4LogDEN_t + \varepsilon_{2t} \quad (5)$$

$$LogTAR_t = \beta_0 + \beta_1LogPLR_t + \beta_2LogLR_t + \beta_3LogNB_t + \beta_4LogDEN_t + \varepsilon_{2t} \quad (6)$$

Where:

CPSR: Private sector Credit to RGDP; *TAR*: Total assets of commercial banks to RGDP; *PLR*: Prime lending rate; *LR*: Liquidity ratio; *NB*: Number of branches of commercial banks; and *DEN*: Density of commercial banks.

Parameters and elasticities of the models are described by $\alpha_1, \beta_0, <_0 / >_0$; $\alpha_2, \beta_2, <_0$, $\alpha_3, \beta_3, <_0$, $\alpha_4, \beta_4 <_0$ and α_0 and β_0 respectively, while error terms are defined by ε_{1t} and ε_{2t} .

The application of the ARDL method of estimation would mean that the models will be partially adjusted in line with the Partial Adjustment Model (PAM)- Hence partial adjustment model for equation 3 – 6 are written is:

For linear function:

$$CPSR_t = \varphi_0 + \varphi_1 PLR_t + \varphi_2 LR_t + \varphi_3 NB_t + \varphi_4 DEN_t + \varphi_5 CPSR_{t-1} + \varepsilon_{1t} \quad (3a)$$

$$TAR_t = \varphi_0 + \varphi_1 PLR_t + \varphi_2 LR_t + \varphi_3 NB_t + \varphi_4 DEN_t + \varphi_5 TAR_{t-1} + \varepsilon_{1t} \quad (4a)$$

For log-linear function:

$$LogCPSR_t = \omega_0 + \omega_1 LogPLR_t + \omega_2 LogLR_t + \omega_3 LogNB_t + \omega_4 LogDEN_t + \omega_5 LogCPSR_{t-1} + \varepsilon_{2t} \quad (5a)$$

$$LogTAR_t = \omega_0 + \omega_1 LogPLR_t + \omega_2 LogLR_t + \omega_3 LogNB_t + \omega_4 LogDEN_t + \omega_5 LogTAR_{t-1} + \varepsilon_{2t} \quad (6a)$$

Where:

$\lambda = 1 - \varphi_5$; $m_0 = \varphi_0 / \lambda$; $m_1 = \varphi_1 / \lambda$; $m_2 = \varphi_2 / \lambda$; $m_3 = \varphi_3 / \lambda$; $m_4 = \varphi_4 / \lambda$. The short-run and long-run coefficients are described in terms of φ_{1-4} and m_{1-4} respectively.

$\lambda = 1 - \omega_5$; $l_0 = \omega_0 / \lambda$; $l_1 = \omega_1 / \lambda$; $l_2 = \omega_2 / \lambda$; $l_3 = \omega_3 / \lambda$; $l_4 = \omega_4 / \lambda$. The short-run and long-run coefficients are defined in terms of ω_{1-4} and l_{1-4} respectively.

Results and Discussion

The mean, median, maximum, standard deviation, skewness, kurtosis, Jarque-Bera, p-value, and the number of observations were utilized to describe the descriptive properties of the data, as shown in Table 1. Commercial banks regulation index concerning prime lending rate, liquidity ratio, number of commercial banks branches, and density reveal the mean of 18.79, 45.29, 3402.59, and 0.0023, while intermediation function defined in term of private credit to RGDP and total assets of commercial banks to RGDP has 11.85 and 158.23 respectively. The median of the data was defined in terms of 8.25, 92.17, 17.96, 44.65, 2703.50, and 0.002, while standard deviation as 6.02, 167.25, 3.78, 8.84, 1556.93, and 0.0006 accordingly for CPSR, TAR, PLR, LR, NB, and DEN. The maximum and minimum were explained by 23.10 and 6.20 for CPSR, 486.24 and 2.61 for TAR, 29.80 and 10.50 for PLR, 64.10 and 29.10 for LR, 5805 and 1367 for NB, and 0.034 and 0.001 for DEN. The data were positively skewed toward normality but from the Kurtosis statistic, only PLR was found to be leptokurtic. The p-values of the data (significant at 5% level) have proved beyond a reasonable doubt that the data followed a normal distribution. With this, the regression output would be said to be free from any outlier that may cast a dent in the data output.

Table 1: Data Descriptive Properties

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	P-value	Obs
CPSR	11.856	8.250	23.10000	6.200000	6.022803	0.806228	1.860801	7.197050	0.0343	32
TAR	158.23	92.175	486.2400	2.610000	167.2493	0.645843	1.788378	8.181974	0.0135	32
PLR	18.787	17.965	29.80000	10.50000	3.778648	0.947693	4.598371	8.196368	0.0166	32
LR	45.287	44.650	64.10000	29.10000	8.848579	0.213314	2.763320	7.317371	0.0432	32
NB	3402.594	2703.50	5805.000	1367.000	1556.934	0.445143	1.564329	6.805014	0.0491	32
DEN	0.002	0.002	0.003400	0.001430	0.000612	0.431968	1.742336	9.104141	0.0099	32

Source: Output data from E-views 10.0

The highest correlation (-0.30) for commercial banks regulation index was observed for price and geographic regulation: prime lending rate and the number of commercial bank branches. This is low and within the acceptable range of no multi-collinearity issue in a model. In this case, this study is convinced that there is no multi-collinearity problem between the measures of commercial banks regulation index as divulged in Table 2.

Table 2: Correlation Matrix

	CPSR	TAR	PLR	LR	NB	DEN
CPSR	1.000					
TAR	0.938	1.000				
PLR	-0.378	-0.367	1.000			
LR	-0.139	-0.017	-0.079	1.000		
NB	0.927	0.968	-0.303	-0.076	1.000	
DEN	0.900	0.907	-0.234	-0.199	0.975	1.000

Source: Output data from E-views 10.0

Table 3. ADF Test Result at Level

Variables	Intercept	Trend and Intercept	None	Remark
CPSR	-0.798 (0.80)	-2.097 (0.53)	0.461 (0.80)	Not Stationary
TAR	0.955 (0.99)	-2.033 (0.56)	1.430 (0.96)	Not Stationary
PLR	-4.569 (0.00)*	-5.886 (0.00)*	-1.357 (0.16)	Stationary
LR	-3.339 (0.02)**	-3.286 (0.08)	-0.311 (0.57)	Stationary
NB	-0.267 (0.92)	-2.687 (0.25)	2.266 (0.99)	Not Stationary
DEN	-0.994 (0.74)	-3.262 (0.09)	1.154 (0.93)	Not Stationary

Source: Output data from E-views 10.0

Note: The optimal lag for the ADF test is selected based on the Akaike Info Criteria (AIC), p-values are in parentheses where (*) and (**) denote significance at 1% and 5%, respectively.

Table 4. ADF Test Result at First Difference

Variables	Intercept	Trend and Intercept	None	Remark
CPSR	-5.846 (0.00)*	-5.817 (0.00)*	-5.783 (0.00)*	Stationary
TAR	-3.084 (0.04)**	-4.059 (0.01)*	-2.387 (0.01)*	Stationary
PLR	-4.945 (0.00)*	-4.894 (0.00)*	-4.698 (0.00)*	Stationary
LR	-6.109 (0.00)*	-5.971 (0.00)*	-6.216 (0.00)*	Stationary
NB	-4.053 (0.00)*	-3.990 (0.02)**	-3.499 (0.00)*	Stationary
DEN	-4.120 (0.00)*	-4.041 (0.02)**	-3.969 (0.00)*	Stationary

Source: Output data from E-views 10.0

Note: The optimal lag for the ADF test is selected based on the Akaike Info Criteria (AIC), p-values are in parentheses where (*) and (**) denote significance at 1% and 5% respectively.

Table 5. PP Test Result at Level

Variables	Intercept	Trend and Intercept	None	Remark
CPSR	-0.798 (0.81)	-2.097 (0.53)	0.544 (0.83)	Not Stationary
TAR	1.419 (0.99)	-1.443 (0.83)	2.743 (0.99)	Not Stationary
PLR	-4.687 (0.00)*	-5.793 (0.00)*	-0.155 (0.62)	Stationary
LR	-3.251 (0.02)**	-3.191 (0.10)	0.203 (0.74)	Stationary
NB	-0.267 (0.92)	-1.739 (0.71)	2.266 (0.99)	Not Stationary
DEN	-1.080 (0.71)	-1.794 (0.68)	1.155 (0.93)	Not Stationary

Source: Output data from E-views 10.0

Note: In determining the truncation lag for the PP test, the spectral estimation method selected is Bartlett kernel and Newey-West method for Bandwidth, p-values are in parentheses where (*) and (**) denote significance at 1% and 5%, respectively.

This study applied the Augmented Dickey-Fuller (ADF) Test and Phillips Perron (PP) tests of unit root to determine the stationarity of the data. Test for unit root was in level and first difference, and included in the test equation were: intercept, trend and intercept, and none. The data were all stationary from the unit test result in Tables 4 and 6; the data were all stationary at first difference as against non-stationarity for all data in Tables 3 and 5.

Table 6. PP Test Result at First Difference

Variables	Intercept	Trend and Intercept	None	Remark
CPSR	-5.846 (0.00)*	-5.818 (0.02)**	-5.783 (0.00)*	Stationary
TAR	-2.801 (0.05)**	-3.109 (0.04)**	-2.256 (0.03)**	Stationary
PLR	-10.197 (0.00)*	-9.867 (0.00)*	-10.400 (0.00)*	Stationary
LR	-13.200(0.00)*	-12.519 (0.00)*	-13.363 (0.00)*	Stationary
NB	-4.064 (0.00)*	-4.001 (0.02)**	-3.489 (0.00)*	Stationary
DEN	-4.125 (0.00)*	-4.046 (0.02)**	-3.964 (0.00)*	Stationary

Source: Output data from E-views 10.0

Note: In determining the truncation lag for the PP test, the spectral estimation method selected is Bartlett kernel and Newey-West method for Bandwidth, p-values are in parentheses where (*) and (**) denote significance at 1% and 5%, respectively.

If the f-statistic of the bound test is higher than the upper bound critical value at a 5% significance level, the null hypothesis of no long-run relationship is rejected. The revelation in Table 7 shows a long-run relationship between commercial bank regulation and intermediation function defined in terms of private sector credit to RGDP. Still, such is not the case for describing intermediation function by total assets of commercial banks to RGDP.

Table 7. Bound Test for Regulatory Index and Financial Intermediation

	FI by CPSR	FI by TAR
F-Statistic	3.69	2.37
Lower Bound @ 5% Critical Value Bound	2.56	2.56
Upper Bound @ 5% Critical Value Bound	3.49	3.49

Source: Output data from E-views 10.0

Table 7 provided the existence of a long-run relationship between commercial bank regulation and intermediation function represented by private sector credit to RGDP. By implication, the determination of the nature of the long-run relationship along the line the speed of adjustment becomes imperative. From the result in Table 8, commercial banks' regulation index through price, product, and geographic regulation has a positive relationship with intermediation function. For the speed of adjustment, the ECM is rightly signed and significant at a 5% level of significance. In essence, there is a tendency by the model to move towards equilibrium following disequilibrium in previous periods. Furthermore, the long-run relationship between commercial bank regulation and intermediation function described by private sector credit to RGDP is affirmed.

The relationship in the short run between commercial bank regulation and intermediation function was appraised by the ARDL estimation. The different order of integration of the data guided the choice of ARDL. Adjusted R-squared, F-statistic, and Durbin Watson statistic are three global model utility employed. Similarly, the relative statistics of the variables were not ignored. Table 9 provides evidence of an insignificant negative relationship between prime lending rate, liquidity ratio, and intermediation function defined in terms of private sector credit to RGDP. It also provides evidence of a positive relationship between the number of commercial bank branches, commercial banks density, and intermediation function. Intermediation function, when described by total assets of commercial banks to RGDP, has a negative relationship with prime lending rate and density but a positive relationship with liquidity ratio and the number of commercial banks branches.

Table 8. ARDL Error Correction CPSR→PLR, LR, NB and DEN

ECM Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CPSR(-1))	1.019	0.246	4.139	0.009
D(CPSR(-2))	0.184	0.150	1.228	0.274
D(PLR)	0.955	0.185	5.155	0.004
D(PLR(-1))	0.417	0.129	3.245	0.023
D(PLR(-2))	0.871	0.164	5.308	0.003
D(PLR(-3))	0.559	0.111	5.037	0.004
D(LR)	0.002	0.039	0.056	0.958
D(LR(-1))	-0.050	0.032	-1.598	0.171
D(LR(-2))	-0.112	0.029	-3.810	0.013
D(NB)	0.005	0.004	1.157	0.300
D(NB(-1))	0.046	0.007	6.558	0.001
D(NB(-2))	0.007	0.006	1.121	0.313
D(NB(-3))	0.021	0.005	3.947	0.011
D(DEN)	-6522.942	6134.716	-1.063	0.336
D(DEN(-1))	-78964.410	12020.090	-6.569	0.001
D(DEN(-2))	-24916.780	10442.740	-2.386	0.063
D(DEN(-3))	-39545.820	8414.873	-4.700	0.005
CointEq(-1)*	-2.071	0.311	-6.654	0.001
Long Run Coefficient				
PLR	0.359	0.224	1.601	0.170
LR	0.007	0.067	0.112	0.915
NB	0.001	0.002	0.731	0.497
DEN	6529.154	4373.435	1.493	0.196
C	-16.794	7.093	-2.368	0.064

Source: Output data from E-views 10.0

Table 9. ARDL Regression Result of Regulatory Environment and Financial Intermediation

Variables	FI by CPSR		FI by TAR	
	Coefficient	Prob.	Coefficient	Prob.
CPSR(-1); TAR(-1)	0.491	0.003	1.238	0.000
PLR	-0.207	0.099	-0.801	0.633
LR	-0.036	0.495	0.293	0.643
NB	0.001	0.372	0.033	0.418
DEN	834.820	0.805	-25414.210	0.645
C	5.151	0.368	-16.332	0.828
Adjusted R-squared	0.895		0.985	
F-statistic	52.207		205.606	
Prob(F-statistic)	0.000		0.000	
Durbin-Watson stat	2.165		1.953	

Note: FI by CPSR and FI by TAR defined financial intermediation by the credit to private sector ratio to RGDP and total assets of commercial banks ratio to RGDP, respectively.

Source: Output data from E-views 10.0

If commercial banks regulation index: price, product, and geographic regulations are held constant, intermediation function by CPSR would be 5.15, whereas intermediation function by TAR would be -16.33. CPSR model of intermediation function would rise by a factor of 0.0014 and 834.82, respectively, owing to a unit increase in the number of commercial bank branches and commercial banks density. In contrast, the CPSR intermediation function model would decline by 20.72% and 3.58%, accordingly following a percentage rise in prime lending rate and liquidity ratio. For the TAR model of intermediation function, a unit increase in prime lending rate and density of commercial banks result in 0.80 and 25414.21-factor decrease in intermediation function. In

contrast, a percentage appreciation in liquidity ratio and the number of commercial banks branches lead to 29.29% and 3.32% increase in intermediation function.

Concerning the adjusted R-square, TAR model of intermediation function (98.50%) is higher than CPSR (89.51%) model of intermediation function. Commercial banks regulation index: price, product, and geographic regulation significantly explained the changes in both CPSR and TAR intermediation function model (p -values of F^* for CPSR and TAR < 0.05). There is no autocorrelation issue in both models of intermediation function (CPSR and TAR) as the Durbin Watson coefficient of 2.16 and 1.95 absolved the models of autocorrelation problem.

The robustness of the models' *visa viz*: serial correlation and heteroskedasticity in Tables 10 and 11 absolve the models estimated of serial correlation and heteroskedasticity problems (p -values > 0.05). The residual diagnostic in Table 12 provided evidence that the models were well-specified, and no misspecification issue was observed (p -value > 0.05).

Table 10. Serial Correlation LM Test

Estimated Equations	Obs*R-squared	F-statistic	P-value
CPSR \rightarrow PLR + LR + NB + DEN	0.700	0.266	0.769
TAR \rightarrow PLR + LR + NB + DEN	1.371	0.422	0.663

Source: Output data from E-views 10.0

Table 11. Heteroskedasticity Test

Estimated Equations	Obs*R-squared	F-statistic	P-value
CPSR \rightarrow PLR + LR + NB + DEN	8.261	1.817	0.146
TAR \rightarrow PLR + LR + NB + DEN	0.884	8.562	0.556

Source: Output data from E-views 10.0

Table 12. Ramsey Reset Specification

Estimated Equations	F-statistic	df	P-value
CPSR \rightarrow PLR + LR + NB + DEN	0.216	(1, 24)	0.646
TAR \rightarrow PLR + LR + NB + DEN	1.215	(1, 18)	0.285

Source: Output data from E-views 10.0

Table 13. Granger Causality Analysis

Financial Intermediation by CPSR				
Null Hypothesis:	Obs	F-Statistic	Prob.	Remarks
PLR does not Granger Cause CPSR	31	0.264	0.612	No Causality
CPSR does not Granger Cause PLR		2.587	0.119	No Causality
LR does not Granger Cause CPSR	31	0.000	0.998	Causality
CPSR does not Granger Cause LR		0.183	0.672	No Causality
NB does not Granger Cause CPSR	31	11.030	0.003	Causality
CPSR does not Granger Cause NB		0.024	0.878	No Causality
DEN does not Granger Cause CPSR	31	8.093	0.008	Causality
CPSR does not Granger Cause DEN		0.586	0.451	No Causality
Financial Intermediation by TAR				
PLR does not Granger Cause TAR	31	0.462	0.502	No Causality
TAR does not Granger Cause PLR		5.144	0.031	Causality
LR does not Granger Cause TAR	31	6.223	0.319	Causality
TAR does not Granger Cause LR		0.249	0.622	No Causality
NB does not Granger Cause TAR	31	0.301	0.588	No Causality
TAR does not Granger Cause NB		9.493	0.005	Causality
DEN does not Granger Cause TAR	31	1.682	0.205	No Causality
TAR does not Granger Cause DEN		5.719	0.024	Causality

Source: Output data from E-views 10.0

In testing the effect of commercial bank regulation on intermediation function, the granger causality analysis was employed. Evidence from Table 13 shows that the liquidity ratio, the number of commercial bank branches, and commercial banks density significantly affect intermediation function defined by private sector credit to RGDP. Causality runs from liquidity ratio, the number of commercial bank branches, and commercial banks density to credit to the private sector ratio to RGDP model of intermediation function at a 5% level of significance. The explanation of intermediation function in terms of total assets of commercial banks to RGDP unveils that liquidity ratio exerts significance on the intermediation function of commercial banks. In furtherance, it was found that intermediation function measured by total assets of commercial banks to RGDP has a significant effect on commercial banks regulation through prime lending rate, the number of commercial bank branches, and commercial banks density. Causality runs from price and geographic regulations to intermediation function at a 5% level of significance.

The determination of the regulation index that most affects the financial intermediation of commercial banks led to variance decomposition estimation. The result in Table 14 discloses that for both models of financial intermediation, it was the number of commercial bank branches that have the most significant influence on the financial intermediation function of commercial banks. This is followed by commercial banks' density and liquidity ratio, while the prime lending rate has the least influence.

Table 14. Variance Decomposition

Financial Intermediation by CPSR						
Period	S.E.	CPSR	PLR	LR	NB	DEN
1	2.111	100.000	0.000	0.000	0.000	0.000
2	2.696	80.261	0.005	0.090	16.805	2.840
3	3.152	70.047	0.022	1.367	26.435	2.130
4	3.497	57.642	0.018	1.266	39.270	1.804
5	3.733	50.616	0.449	1.139	46.191	1.604
6	3.911	46.652	0.907	1.171	49.797	1.473
7	4.029	44.927	1.562	1.438	50.624	1.448
8	4.112	44.366	2.095	1.794	50.214	1.531
9	4.172	44.207	2.488	2.150	49.391	1.763
10	4.218	44.126	2.731	2.429	48.583	2.131
Financial Intermediation by TAR						
Period	S.E.	CPSR	PLR	LR	NB	DEN
1	22.426	100.000	0.000	0.000	0.000	0.000
2	38.753	99.491	0.147	0.007	0.336	0.019
3	49.014	96.776	0.160	1.072	1.005	0.987
4	54.996	91.714	0.128	3.068	2.534	2.557
5	59.008	85.702	0.113	3.846	5.682	4.657
6	62.805	78.700	0.148	3.831	10.664	6.657
7	66.967	71.261	0.211	3.585	16.768	8.175
8	71.536	64.090	0.291	3.282	23.092	9.246
9	76.361	57.704	0.383	2.987	29.030	9.896
10	81.279	52.276	0.483	2.721	34.272	10.248

Source: Output data from E-views 10.0

Table 9 for price regulation expressed by prime lending rate, the first model of intermediation function: private sector credit to RGDP, price, and product regulations have a negative relationship with intermediation function, while a positive relationship was observed for geographic regulation and intermediation function. For the second model of financial intermediation: total assets of commercial banks to RGDP, price and geographic regulation have a negative relationship with intermediation function, whereas product regulation was positively related to intermediation function. The negative relationship between price regulation and intermediation function did not agree with Ezirim and Moughalu (2002), who found a positive relationship between the duo. Though insignificant, it evidences that tightening price regulation through monetary policy adjustments would lower the intermediation function of the commercial

banks: a higher interest rate reduces the intermediation function of commercial banks. The granger causality test in Table 13 points out that price regulation has no significant effect on the intermediation function. In other words, the intermediation function of commercial banks is independent of price regulation. This is favorable with Ezirim and Moughalu (2002) that price regulation is not a major policy thrust for monetary regulation in Nigeria, especially when commercial banks are concerned. Conversely, the intermediation function is observed to exert a significant effect on price regulation. In essence, the level of intermediation function of commercial banks determines the price regulation in the economy.

For Table 9 on product regulation: liquidity ratio, product regulation would be said to be positively related with intermediation function with reliance on the second model of financial intermediation, with an adjusted R-squared of 98.50%. This result is consistent with Ezirim and Moughalu (2002) but in total disagreement with Kale et al. (2015) and Zheng et al. (2017) on the negative link between product regulation and intermediation function of banks. Ezirim and Moughalu (2002) assert that the effect of liquidity ratio or reserve requirement may not be necessarily negative because if it affects the supply-side of the intermediation process more than the demand side, the overall effect will have to be positive. The granger causality analysis envisages that product regulation significantly affects intermediation function, thus an important tool of monetary policy influencing intermediation function. Imposing restriction on the activities of commercial banks would in no little magnitude reduce profitability which ultimately affects their intermediation. On the other hand, relaxing restrictions on activities of commercial banks would mean more profitability to the banks by engaging in traditionally non-banking core activities such as insurance, pension, licensing, etc.

Relying on the second model of intermediation function, commercial banks density has a negative relationship with intermediation function, and in tandem with Ezirim and Moughalu (2002), while the number of branches exhibits a positive relationship, though all insignificant. Evidence from Granger causality analysis supports the significant effect of geographic regulation on intermediation function, hence a crucial aspect of commercial banks regulation that should be treated with utmost good faith. When there is an expansion in branch networks of commercial banks, there would be higher financial inclusion as individuals would have access to financial services at affordable prices. The resultant effect would be increased intermediation function owing to the mobilization of funds from large individuals and distributing the same to the deficit units in the economy. The low density of commercial banks results in a lower level of intermediation function as a large fraction of the population are financially excluded: financial intermediation activities would be within the confine of the urban populace.

Conclusion

The intermediation function of the commercial banks: effective and efficient mobilizations and scarce economic resources and allocating same to deficit economic units are pivotal to the growth and development of the economy. In this study, how commercial banks' regulation affects their intermediation function was ascertained. Based on the findings, the study concludes that commercial bank regulation exerts a significant effect on their intermediation function.

In line with the findings, the study makes some recommendations and hopes that it will be giving favorable attention by our policymakers. First, the Central Bank of Nigeria should relax price regulation through a reduction in the monetary policy rate. Relaxation of price regulation will increase credit requests from productive segments of the economy, thus a rise in intermediation activities of commercial banks. Secondly, product regulation should be relaxed too to allow commercial banks to engage in various conventionally non-banking activities to cause an upsurge in the level of their intermediation, and the resultant effect on the part of commercial banks be a rise in profitability. Finally, apart from capital adequacy and reserve requirements, other pre-requisite such as documentation requirements for establishing new branches and other banking outlets should be relaxed to allow banks to open more branches and enter the market. This will, to a very great extent, boost the intermediation function of commercial banks.

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