

Testing the Validity of the Simultaneous Openness Hypothesis in Nigeria (1990–2015)

Michael Adebayo Ajayi and Olufemi Adewale Aluko*

Abstract: Since the seminal paper by Rajan and Zingales in 2003, a plethora of studies have been motivated to establish whether the simultaneous opening of trade and capital borders leads to financial sector development. We test whether the simultaneous openness hypothesis is valid for Nigeria, with a focus on the banking sector and stock market. Using annual data from 1990 to 2015 and an instrumental variable regression estimation technique, we show that the simultaneous increase of trade and financial openness limits banking sector and stock market development. Thus, there is no empirical evidence to validate the simultaneous openness hypothesis in Nigeria. It also shows that trade openness is more beneficial for banking sector and stock market development in Nigeria than financial openness.

1. Introduction

Over the past decades, there has been growing research interest on factors responsible for financial sector development. Openness to trade and finance has often been cited as important for successful financial sector development. Rajan and Zingales (2003) state that openness to trade and finance are responsible for international differences in, and time series variation of, financial sector development. They suggest to policymakers that the level of financial sector development tends to increase subsequent to the simultaneous opening of the economy to external trade and finance. Existing (incumbent) firms in the domestic goods and financial markets oppose financial sector development because it encourages new firms to set up business due to greater access to finance, thus breeding competition and reducing their profits. Once the economy is open to trade and capital at the same time, incumbent firms' opposition to financial sector development diminishes because it offers more opportunities for them to earn higher profits (Rajan and Zingales, 2003). Openness to trade only results in more loan subsidies and repressed financial sector. On the other hand, openness to finance alone paves the way for the largest firms operating in the domestic market to access external finance while constraining domestic infant and potential firms from access to foreign capital markets.

The simultaneous openness hypothesis contends with the sequencing process of financial liberalization. While the simultaneous openness hypothesis suggests that trade and financial openness are complements, the sequencing process of financial liberalization suggests implementing trade openness before financial openness.¹ Empirically, the simultaneous openness hypothesis remains contentious. A strand of literature establishes that trade openness accompanied by financial openness promotes financial sector development (e.g. Aluko and Ajayi, 2018; Aluko *et al.*, 2019; Andrianaivo and Yartey, 2010; Becerra *et al.*, 2012; Law, 2007, 2009; Mahawiya, 2015; Onanuga and Onanuga, 2016; Zhang *et al.*, 2015). Nonetheless, another strand shows that higher levels of financial sector development may not be experienced by increasing trade and financial openness at the same time (Arif and Rawar, 2018; Baltagi *et al.*, 2009; Law, 2008).

Evidence on the validity of the simultaneous openness hypothesis has been well documented in cross-country studies, but narrow evidence exists from country-specific studies. To this end, we test the validity of the simultaneous openness hypothesis

*Olufemi Adewale Aluko (corresponding author), Department of Finance, University of Ilorin, Kwara State, Nigeria, e-mail: olufemiadewale6@gmail.com. Michael Adebayo Ajayi, Department of Finance, University of Ilorin, Kwara State, Nigeria; e-mail: maajayi@unilorin.edu.ng.

in the case of Nigeria. To the best of our knowledge, the recent paper by Onanuga and Onanuga (2016) seems to be the only existing empirical literature on Nigeria. Using different single measures of banking sector and stock market development, Onanuga and Onanuga (2016) show that simultaneous opening of trade and capital borders promote banking sector development, but there is mixed evidence on stock market development. They also provide mixed findings on the effect of trade and financial openness on banking sector and stock market development.

We advance on the existing empirical literature in two ways. First, we deviate from using different single measures by employing composite indexes of banking sector and stock market development. This is imperative in view of the fact that no single measure can capture banking sector and stock market development adequately due to their multifaceted nature. Therefore, we resort to the use of composite indexes constructed from different single measures in order to deal with the measurement complexity associated with banking sector and stock market development. The use of the composite indexes allows us to measure banking sector and stock market development more comprehensively while avoiding the possibility of producing mixed results. Second, we account for the incidence of crises in the financial sector. This is based on the premise that financial crisis may change the nature of the relationship between openness and financial sector development. Hanh (2010) demonstrates that financial crisis indirectly hinders financial sector development through the channels of trade and financial openness.

In contrast to Onanuga and Onanuga (2016), our findings suggest the banking sector and stock market in Nigeria is unlikely to become better developed when there is a simultaneous increase in trade and finance openness. However, we provide evidence that trade and financial openness promote banking sector and stock market development in Nigeria in tandem with Onanuga and Onanuga (2016). The rest of this paper is as follows. Section 2 presents stylized facts on financial sector development in Nigeria. Section 3 reviews empirical studies. Sections 4 and 5 present the methodology and empirical results, respectively. Section 6 provides the conclusion.

2. Financial Sector Development in Nigeria: Stylized Facts

2.1 Banking Sector Development

The Nigerian banking sector is dynamic and relatively well capitalized and the banks pursue innovative banking practices (Allen *et al.*, 2011). Since the early 1990s, the Nigerian banking sector has considerably witnessed series of reforms aimed at fostering its development. Notable among them are: issuance of prudential guidelines, enactment of the Central Bank of Nigeria (CBN) Act No. 24 and Banks and Other Financial Institutions Act No. 25, introduction of the universal banking model, introduction of electronic banking, consolidation reform, replacing the universal banking model with the new banking model under the Project Alpha Initiative, establishment of Asset Management Corporation of Nigeria, implementation of the cashless policy, and provision of Bank Verification Number for bank account holders. Despite these reforms, the Nigerian banking sector is still relatively underdeveloped compared to most banking sectors in the sub-Saharan African region, particularly in terms of private credit provided by deposit money banks (DMBs). Private credit by DMBs in Nigeria accounts for 11.6 per cent of GDP in 2013, which is a far cry from their sub-Saharan African counterparts like Botswana, Mauritius and South Africa (World Bank, 2015).

Table 1 shows the periodic averages of banking sector development indicators in Nigeria from 1990 to 2015. Throughout the period under review, the composite index, private credit (percentage of GDP), liquid liabilities (percentage of GDP) and DMB assets (percentage of DMBs and CBN assets) range between -1.84 and 2.95, 8.55 per cent and 36.01 per cent, and 33.94 per cent and 95.33 per cent, respectively. Except for DMB assets (percentage of DMBs and CBN assets), the remaining indicators recorded their highest average value in the period 2006–2009, which suggests that the banking sector was better developed in this period. This perhaps can be linked to the 2005 bank consolidation reform which led to the formation of mega banks as well as the financial support provided to banks by the CBN.

Table 1 shows that the average values of the composite index were negative in most periods. In the period 1990–1993, the average value of the composite index was 0.26. After this period, it had negative figures for three consecutive periods. It became positive in the period 2006–2009 with an average of 1.11 but the following periods (2010–2013 and 2014–2015) recorded negative averages again. For private credit (percentage GDP), the table shows that the average value is 10.02 per cent between 1990 and 1993 and it continually increased in the following two periods. In the period 2002–2005, it declined to 12.42 per cent but rose astronomically to 23.6 per cent in the subsequent period. However, it drastically reduced to 13.2 per cent in

Table 1: Banking sector development indicators (periodic average)

Period	Composite index	Private credit (% of GDP)	Liquid liabilities (% of GDP)	DMBs assets (% of DMBs and CBN assets)
1990–1993	0.26	10.02	21.76	36.99
1994–1997	−0.79	10.24	17.67	40.67
1998–2001	−0.01	13.03	20.55	54.82
2002–2005	−0.41	12.42	18.67	75.54
2006–2009	1.11	23.60	27.54	88.77
2010–2013	−0.07	13.20	20.06	95.05
2014–2015	−0.18	13.70	19.60	92.86

Source: Authors' computation.

the period 2010–2013. A systematic banking crisis was experienced during this period which led to a credit crunch in the banking sector. However, it marginally increased to an average of 13.7 per cent between 2014 and 2015. It can be observed that the trend of the average values of liquid liabilities (percentage GDP) is mixed. The average value stood at 21.76 per cent between 1990 and 1993 but fell to 17.67 per cent in the period 1994–1997. From 1998 to 2001, it moved upwardly to an average of 20.55 per cent but declined to 18.67 per cent in the next period. On average, it tremendously increased to 27.54 per cent in the 2006–2009 period but fell sharply to 20.06 per cent between 2010 and 2013 and further dropped slightly to 19.60 per cent in the period 2014–2015. There is an upward movement in the averages of DMBs assets (percentage DMBs and CBN assets) over the periods except in the last period. It increased from an average of 36.99 per cent from 1990–1993 to 95.05 per cent in the period 2010–2013 but decreased to 92.86 per cent between 2014 and 2015.

2.2 Stock Market Development

The Nigerian stock market is one of the largest and most active stock markets in sub-Saharan Africa. Based on the Morgan Stanley Capital International index, the Nigerian stock market is classified as a frontier stock market. It officially became internationalized with the promulgation of the Nigerian Investment Promotion Act No. 16 and Foreign Exchange (Monitoring and Miscellaneous Provisions) Act No. 17 in 1995 (Adeyeye *et al.*, 2017). Ever since then, it has gained reputation as one of the most preferred investment hubs for international investors in Africa. Foreign portfolio investment inflow into Nigeria in 2017 amounts to US\$7.3 billion, with substantial inflows from the United Kingdom, United States, Belgium and Singapore (National Bureau of Statistics, 2018). Adjasi and Biekpe (2006) identify the Nigerian stock market as one of the best performing markets in Africa in 2003–2004. Recently, the S&P Dow Jones Indexes rated the Nigerian stock market among the top five stock markets in the world and as the best African stock market in 2017.

Table 2 shows the periodic average values of stock market development indicators in Nigeria from 1990 to 2015. The composite stock market index, stock market capitalization (percentage GDP), value of equity traded (percentage GDP) and turnover ratio fall between −1.87 and 1.51, 3.92 per cent and 35.84 per cent, 0.02 per cent and 8.65 per cent, and 0.62 per cent and 29.4 per cent,

Table 2: Stock market development indicators (periodic average)

Period	Composite index	Stock market capitalization (% of GDP)	Value of equity traded (% of GDP)	Turnover ratio (%)
1990–1993	−1.29	6.36	0.06	1.06
1994–1997	0.77	23.79	0.53	2.65
1998–2001	0.18	17.83	0.87	6.28
2002–2005	−0.35	12.34	1.31	10.38
2006–2009	1.05	27.62	5.57	19.50
2010–2013	0.25	11.34	1.07	9.71
2014–2015 ^a	−0.22	11.65	0.93	7.57

Source: Authors' computation.

respectively, in the period under review. As shown in the table, it appears that the stock market was better developed between 2006 and 2009, similar to the banking sector. This is because the highest value, on average, for all the stock market indicators was recorded in this period. The 2005 bank consolidation reform which prompted most banks to besiege the stock market to raise capital to meet the statutory capital requirements may be a reason for this phenomenon during this period.

Table 2 shows that the average of the composite index stood at -1.29 in the period 1990–1993 but increased markedly to 0.77 between 1994 and 1997. It is not unlikely that the full liberalization of the stock market during this period is the probable cause for this marked increase. It reduced to 0.18 in the period 1998–2001 and further declined to an average of -0.35 in the successive period. However, between 2006 and 2009, there was a drastic increase in the average value of composite index. A downward trend was experienced in the 2010–2013 period and this trend continued in the subsequent periods. Stock market capitalization (percentage GDP) has an average of 6.36 per cent in the 1990–1993 period but increased drastically to 23.79 per cent in the following period. It dropped to an average of 17.83 per cent between 1998 and 2001 and moved further down to 12.34 per cent in the period 2002–2005; however, it soared high to 27.62 per cent in the 2006–2009 period. It experienced a substantial fall to an average of 11.34 per cent between 2010 and 2013 but slightly rose to 11.65 per cent. A similar trend can be observed for averages of values of equity traded (percentage GDP) and turnover ratio. The reason for this similar trend is because both indicators are measures of stock market liquidity; hence they tend to have a strong positive correlation. The average of value of equity traded (percentage GDP) and turnover ratio between 1990 and 1993 stood at 0.06 per cent and 1.06 per cent, respectively, and they continually moved upwards and both peaked in the 2006–2009 period. However, in the following periods, they moved downwards.

3. Review of Empirical Studies

3.1 Trade Openness and Financial Sector Development

Trade openness increases the demand for external finance and consequently leads to financial sector development (Do and Levchenko, 2007). Do and Levchenko (2004) argue that the effect of trade openness on financial sector development differs across countries due to differences in wealth. They show that trade openness promotes financial sector development in richer countries while the reverse is the case in poorer countries.

Aluko *et al.* (2019) find that trade openness spurs financial sector development in sub-Saharan Africa. Ibrahim and Sare (2018) establish that trade openness plays a promoting role in financial sector development in Africa, with the role being enhanced by higher levels of human capital endowments. Based on bank-level data, Ashraf (2018) demonstrates that further opening to external trade promotes financial sector development in emerging economies by increasing the volume of bank credit and reducing the cost and risk associated with bank credit. Le *et al.* (2016) and Law and Habibullah (2009) point out that increased trade openness leads to financial sector development in developed countries. Baltagi *et al.* (2009) and Law (2009) reveal that a higher degree of trade openness results in higher levels of financial sector development in developing countries.

Luo *et al.* (2016) identify that trade openness is negatively associated with financial sector development across the provinces in China. Kim *et al.* (2012) find that trade openness adversely affects financial sector development, especially in countries with low income, high inflation or large agricultural sector.

Aluko and Ajayi (2018) observe that trade openness promotes financial sector development in sub-Saharan Africa by deepening the financial sector, but retards financial sector development by lessening the efficiency of the financial sector. Ho and Iyke (2018), in their study on sub-Saharan Africa, find that trade openness and financial sector development are positively related in the long run; however, they are unrelated in the short run. The authors also find that trade openness promotes financial sector development in low-income countries but impairs financial sector development in middle-income countries. Kim *et al.* (2010) document that trade openness is negatively related to financial sector development in the short run; the relationship is otherwise in the long run.

3.2 Financial Openness and Financial Sector Development

Levine (2001) claims that financial openness tends to lead to financial sector development by promoting stock market liquidity and efficiency of the banking sector. Research suggests that there are some conditions important for the potency of financial

openness on financial sector development. For instance, Andrianaivo and Yartey (2010) find that financial openness tends to promote financial sector development in the presence of strong legal and political institutions. Chinn and Ito (2006) show that legal institutional development must be at a threshold level before increased financial openness can lead to higher levels of financial sector development.

Ozkok (2015) put forth that financial openness spurs financial sector development in a sample of developed and developing countries. Baltagi *et al.* (2009), using both *de jure* and *de facto* measures of financial openness, establish that financial openness is a positive determinant of financial sector development in developing countries. Klein and Olivei (2008) show that financial openness leads to financial sector development in a cross-section of developing and developed countries.

Aluko *et al.* (2019) and Aluko and Ajayi (2018) exhibit that increased financial openness limits financial sector development in sub-Saharan Africa. Aluko and Ajayi (2018) further show that increasing financial openness tends to dampen financial sector development by increasing financial fragility. Becerra *et al.* (2012) show that openness to more finance restricts the financial sector development in a panel consisting of developing and developed countries. Hassan *et al.* (2012) discern that financial openness in the form of foreign bank entry limits financial sector development in countries in the Middle East and North Africa region by reducing domestic banks' profit margins and increasing their operating costs, especially in countries with less developed stock markets.

Mahawiya (2015), in a comparative study, shows that financial openness is negatively related to financial sector development in the Southern African Development Community, but insignificantly related in Economic Community of West African States. Based on provincial data, Zhang *et al.* (2015) find that financial development in China is affected by financial openness through reduced financial sector size and increased efficiency and competition.

4. Methodology

4.1 Model and Estimation Method

Based on prior studies (Baltagi *et al.*, 2009; Law, 2008, 2009), we employ an econometric model that allows for the testing of the simultaneous openness hypothesis, while accounting for incidence of financial crisis. Based on the premise that financial sector development depends on its own past realizations, one-period lagged value of financial sector development is included in the model. The econometric model is thus specified as

$$FSD_t = \gamma + \beta_1 FSD_{t-1} + \beta_2 \ln Y_t + \beta_3 \ln TO_t + \beta_4 \ln FO_t + \beta_5 (\ln TO \times \ln FO)_t + \beta_6 CRISIS + \varepsilon_t \quad (1)$$

where $\ln$ denotes natural logarithm, FSD is financial sector development—banking sector development and stock market development, Y is per capita GDP, TO is trade openness, FO is financial openness, $CRISIS$ is financial crisis and ε is the stochastic error term. The interaction term of trade openness and financial openness ($TO \times FO$) is included in the model to test for the simultaneous openness hypothesis. If β_5 is positive and statistically significant, it means the hypothesis can be upheld.

The marginal effects of trade openness and financial openness can be derived by taking the partial derivatives of financial sector development with respect to trade openness and financial openness:

$$\frac{\partial FSD_t}{\partial \ln TO_t} = \beta_3 + \beta_5 \ln FO_t \quad (2)$$

$$\frac{\partial FSD_t}{\partial \ln FO_t} = \beta_4 + \beta_5 \ln TO_t \quad (3)$$

Baltagi *et al.* (2009) propose the loose and strict versions of the simultaneous openness hypothesis. The loose version states that a marginal increase in either trade or financial openness would result in financial sector development. It is valid if β_3 , β_4 and β_5 are positive and statistically significant. The strict version expects that the marginal effect of trade openness should be non-positive when an economy's capital border is relatively closed and the marginal effect of financial openness should be negative or zero when the economy is closed to trade.

The estimation method is an instrumental variable (IV) regression estimation technique based on the Hansen *et al.* (1996) generalized method of moments (GMM) continuously updated estimator.² The GMM continuously updated estimator is more robust in the presence of weak instrumentation and has better finite sample properties than IV (two-stage least squares) and two-step feasible efficient GMM estimators (Baum *et al.*, 2007; Hahn *et al.*, 2004).

4.2 Data

The data are annual time series covering the period 1990–2015. The year 1990 is selected as the beginning of the sample period because reforms targeted at developing the Nigerian financial sector were less pronounced before the 1990s. Financial sector development is captured by composite indexes of banking sector development and stock market development, constructed using principal component analysis (PCA). For banking sector development, the composite index is based on three commonly used measures in empirical studies, namely private sector credit to GDP (*PRIVY*), liquid liabilities to GDP (*DEPTH*) and DMBs assets to sum of DMBs and central bank assets (*BANK*). *PRIVY* captures the extent to which DMBs allocate credit to the private sector. *DEPTH* reflects the size of the banking sector relative to the size of the economy. *BANK* shows the advantages of DMBs to convert savings into investment, monitor investment, exert corporate governance, pool savings and ameliorate risk relative to the central bank.³

The composite index of stock market development is also based on three measures widely used in empirical studies. These include stock market capitalization to GDP (*MCAP*), value of equity traded to GDP (*VALUE*) and turnover ratio (*TURNOVER*). *MCAP* indicates the size of the stock market relative to the economy. *VALUE* is a measure of stock market liquidity which indicates the value of equity transactions in relation to the size of the economy. *TURNOVER* is also a measure of stock market liquidity and it equals the value of equity transactions to stock market capitalization.

Data on the measures of banking sector development and stock market development are obtained from World Bank's Global Financial Development (GFD) database and are used in their logarithm form for the construction of the composite indexes. Table 3 reports the results of the PCA. The table shows that the first principal components explain 68.50 per cent and 78.98 per cent of the variance among the measures of banking sector and stock market development, respectively. This implies that the first principal components retain more information on banking sector and stock market development than the remaining principal components. Therefore, we extract the first principal components as the composite indexes after rotating the principal components.

Per capita GDP is a proxy for economic growth and is obtained from World Development Indicators (WDI). The *de facto* measure of trade and financial openness is preferred to the *de jure* measure.⁴ Trade openness is measured by the ratio of the sum of imports and exports to GDP and it is sourced from WDI. Financial openness is measured by Lane and Milesi-Ferretti's (2007) index of financial integration, calculated as the ratio of foreign assets plus foreign liabilities to GDP. It is obtained from Lane and Milesi-Ferretti (2018). *CRISIS* is a dummy variable to capture the incidence of crises in the banking sector and stock market. It takes a value of 1 during financial crisis and 0 when there is no financial crisis. For the banking sector, the GFD database provides data for the banking sector crisis dummy. In the case of the stock market, the stock market crisis dummy is

Table 3: Principal component analyses

Principal component	Eigenvalue	Variance (%)	Cumulative (%)
Panel A: Banking sector development			
1	2.06	68.50	68.50
2	0.83	27.59	96.09
3	0.12	3.91	100
Panel B: Stock market development			
1	2.37	78.98	78.98
2	0.58	19.25	98.23
3	0.53	1.77	100

Source: Authors' computation.

Table 4: Summary statistics and correlation results

Variable	Unit of measurement	Mean	Minimum	Maximum			
Banking sector development index [1]	PCA	8.38×10^{-9}	-1.84	2.95			
Stock market development index [2]	PCA	-2.55×10^{-8}	-1.88	1.51			
Per capita GDP [3]	US dollar	1,025.10	153.08	3,080.32			
Trade openness [4]	% of GDP	56.38	21.45	81.81			
Financial openness [5]	% of GDP	77.26	35.39	146.44			
Banking sector crisis [6]	Binary code	0.31	0	1			
Stock market crisis [7]	Binary code	0.08	0	1			
Correlation matrix							
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
[1]	1.00	-	-	-	-	-	-
[2]	0.33	1.00	-	-	-	-	-
[3]	0.03	0.32	1.00	-	-	-	-
[4]	0.09	0.10	-0.71***	1.00	-	-	-
[5]	0.20	-0.44	-0.47**	0.17	1.00	-	-
[6]	0.37*	-0.31	-0.10	-0.05	0.25	1.00	-
[7]	0.78***	0.42	0.06	0.14	-0.17	0.12	1.00

Notes: *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

Source: Authors' computation

developed taking into consideration the stock market crash caused by the global financial crisis. Therefore, a value of 1 is assigned for the period that coincides with the global financial crisis period (i.e. 2008 and 2009) while the remaining years are given the value of 0.

The summary statistics of the variables and the correlation results are presented in Table 4. The banking sector and stock market development composite indexes averaged 8.38×10^{-9} and -2.55×10^{-8} , respectively, over the sample period, indicating that the Nigerian banking sector and stock market is relatively underdeveloped. Nevertheless, the banking sector appears to be better developed than the stock market and this may be attributed to the bank-based feature of the Nigerian financial sector. Per capita GDP has a mean value of US\$1,025.10 and this shows the relatively low-income status of Nigeria. Trade openness has a mean value of 56.38 per cent; this is lower than that of financial openness, which is 77.26 per cent, suggesting that on average, Nigeria is more open to finance than trade over the sample period. The correlation matrix shows that only the banking sector and stock market crisis have a significant positive correlation with banking sector development while stock market development is uncorrelated with all other variables.

5. Empirical Results

In order to produce heteroscedastic and autocorrelation-consistent coefficients, standard errors of the coefficients are calculated using the Newey and West (1987) covariance matrix estimator based on the Bartlett kernel function. The bandwidth of the Bartlett kernel function is automatically selected using Newey and West (1994). Based on the neoclassical production function, per capita GDP (economic growth) is treated as an endogenous regressor and it is instrumented with capital and labour, both used in their logarithmic form. Table 5 reports the regression results. As shown in the table, the Kleibergen-Paap rk Wald F -statistic indicates that the instruments used in the models are not weakly identified because it exceeds 10.⁵ The Hansen J -statistic does not reject the hypothesis that the overidentifying restrictions in the models are valid, thus confirming the instruments satisfy the orthogonality condition. The F -statistic indicates the rejection of the hypothesis that the regression estimates are equal to 0 and this signifies that the model has the capability to make prediction.

As reported in Table 5, the lagged dependent variables are positive and significant, thus affirming the correctness of introducing dynamism into the models. This further suggests that there is persistence in banking sector and stock market development. Consistent with Law and Habibullah (2009), per capita GDP has a positive and significant coefficient in the

Table 5: Regression results

	Dependent variable	
	Banking sector development	Stock market development
Constant	-98.13 (32.15)***	-35.38 (21.24)*
Dependent variable, $t-1$	0.70 (0.15)***	0.34 (0.10)***
Per capita GDP	0.96 (0.17)*	0.00 (0.16)
Trade openness	21.28 (7.70)***	9.80 (4.95)**
Financial openness	20.67 (7.76)***	8.09 (4.65)*
Trade openness $\times$ Financial openness	-4.76 (1.84)**	-2.24 (1.13)**
Financial crisis	0.34 (0.42)	-0.34 (0.17)**
Model diagnostics		
Kleibergen-Paap rk Wald F -statistic	1,641.91	626.63
Hansen J -statistic	1.75 [0.1859]	0.99 (0.3192)
F -statistic	26.99 [0.0000]***	51.85 [0.0000]***
Root mean squared error	0.8743	0.5295

Notes: *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively. Also, standard errors and p -values are placed in parentheses and square brackets, respectively.

Source: Authors' computation.

banking sector development regression and this suggests that economic growth increases the demand for bank credit which as a result leads to banking sector development. However, in the stock market development regression, per capita GDP enters with a positive but insignificant coefficient and this finding contradicts Manasseh *et al.* (2017). In line with Baltagi *et al.* (2009) and Law (2007), trade and financial openness enter into the banking sector and stock market development regressions with positive and significant coefficients. These findings indicate that trade and financial openness promote banking sector and stock market development. Trade openness has a higher positive coefficient than financial openness in both regressions, implying that trade openness is more crucial for banking sector and stock market development than financial openness. Surprisingly, the interaction term of trade openness and financial openness enters both regressions with negative and significant coefficients, similar to Baltagi *et al.* (2009). This implies that banking sector and stock market development are hindered by simultaneous trade and finance openness, as against the argument of Rajan and Zingales (2003). It is evident that simultaneous increase in trade and financial openness is more detrimental to banking sector development than stock market development because the interaction term has a higher negative coefficient in the banking sector development regression. Turning to financial crisis, only the financial crisis dummy in the stock market development regression has a negative and significant coefficient and this indicates that stock market development is adversely affected by financial crisis.

The marginal effects of trade openness and financial openness on banking sector development and stock market development are presented in Table 6. The marginal effects of trade (financial) openness are derived by substituting the mean, minimum and maximum values of financial (trade) openness in Equation (2,3). Table 6 shows that trade (financial) openness has a positive marginal effect on banking sector development at the mean and minimum levels of financial (trade) openness but a negative effect when financial (trade) openness is at its maximum level. The marginal effect of trade (financial) openness on banking sector development is highest at the minimum level of financial (trade) openness.

Focusing attention on stock market development, trade (financial) openness has a negative (positive) marginal effect at the maximum (minimum) level of financial (trade) openness. Similar to the results for banking sector development, the marginal effect of trade (financial) openness on stock market development is highest at the minimum level of financial (trade) openness. The loose version of the simultaneous openness hypothesis, which requires that all the derivatives should be positive, is not validated by the empirical results, thus suggesting that a small increase in trade and financial openness may not necessarily promote banking sector and stock market development. Also, the strict version of the simultaneous openness hypothesis states that the marginal effect of trade openness should be non-positive when the capital border is relatively closed while the marginal effect of financial openness is expected to be negative or zero when the economy is not open to trade. The strict version cannot be upheld since the derivative of trade (financial) openness is positive at the minimum level of financial (trade) openness.

Table 6: Marginal effects results

Level	Banking sector development	Stock market development
Panel A: Marginal effects of trade openness		
Financial openness (mean)	0.52	0.06
Financial openness (minimum)	4.29	1.80
Financial openness (maximum)	-2.47	-1.38
Panel B: Marginal effects of financial openness		
Trade openness (mean)	1.49	-0.94
Trade openness (minimum)	6.06	1.21
Trade openness (maximum)	-0.27	-1.77

Source: Authors' computation.

We compute the net effects of trade and financial openness on banking sector development and stock market development.⁶ The net effects of trade and financial openness on banking sector development are 2.1 and -0.04, respectively. The net effects of trade and financial openness are 0.77 and -1.65, respectively. Trade (financial) openness has a positive (negative) net effect on banking sector and stock market development. Therefore, increase (decrease) in trade (financial) openness would lead to the development of the Nigerian banking sector and stock market.

5.1 Sensitivity Analyses

To perform the sensitivity analyses, we re-estimate Equation (1) by substituting the composite indexes of banking sector and stock market development with the single measures used for their construction. The rationale for the sensitivity analyses is to confirm whether the estimation results obtained from the composite indexes of banking sector and stock market development regressions are consistent with those derived from their respective single measures, particularly in terms of sign and statistical significance of the regression estimates. The single measures are used in their logarithmic form for the sensitivity analyses.

Table 7: Sensitivity analyses for banking sector development

	Dependent variable		
	PRIVY	DEPTH	BANK
Constant	-27.16 (6.65)***	-21.23 (7.53)***	-1.97 (3.86)
Dependent variable _{t-1}	1.00 (0.08)***	0.69 (0.15)***	1.08 (0.21)***
Per capita GDP	0.18 (0.03)***	0.21 (0.04)***	-0.02 (0.09)
Trade openness	6.25 (1.57)***	4.80 (1.74)***	0.51 (1.00)
Financial openness	5.45 (1.43)***	4.67 (1.76)***	0.42 (0.96)
Trade openness × Financial openness	-1.30 (0.34)***	-1.07 (0.42)**	-0.13 (0.24)
Financial crisis	0.14 (0.10)	0.08 (0.09)	0.04 (0.04)
Model diagnostics			
Kleibergen-Paap rk Wald F-statistic	1614.41	1641.90	92.17
Hansen J-statistic	1.40 [0.2371]	1.75 [0.1859]	1.46 [0.2267]
F-statistic	56.91 [0.0000]***	27.00 [0.0000]***	587.39 [0.0000]***
Root mean squared error	0.2927	0.1973	0.1056

Notes: *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively. Also, standard errors and *p*-values are placed in parentheses and square brackets, respectively.

Source: Authors' computation.

Table 8: Sensitivity analyses for stock market development

	Dependent variable		
	MCAP	VALUE	TURNOVER
Constant	-16.49 (17.50)	-54.38 (36.91)	-1.97 (3.86)
Dependent variable _{t-1}	0.28 (0.11)***	0.16 (0.06)**	1.08 (0.21)***
Per capita GDP	-0.08 (0.12)	0.12 (0.38)	-0.02 (0.09)
Trade openness	5.42 (4.06)	13.40 (8.44)	0.51 (1.00)
Financial openness	4.40 (3.89)	12.31 (8.21)	0.42 (0.96)
Trade openness × Financial openness	-1.26 (0.93)	-3.06 (1.98)	-0.13 (0.24)
Financial crisis	0.28 (0.18)	1.06 (0.17)***	0.04 (0.04)
Model diagnostics			
Kleibergen-Paap rk Wald <i>F</i> -statistic	301.27	1036.10	92.17
Hansen <i>J</i> -statistic	1.15 [0.2842]	1.43 [0.2314]	1.461 [0.2267]
<i>F</i> -statistic	39.21 [0.0000]***	299.98 [0.000]***	587.39 [0.0000]***
Root mean squared error	0.3436	1.091	0.1056

Notes: *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively. Also, standard errors and *p*-values are placed in round and square parentheses, respectively.

Source: Authors' computation.

Tables 7 and 8 report the sensitivity analyses results for banking sector and stock market development, respectively. With respect to banking sector development, only the result obtained from the *BANK* regression is not in tandem with the composite index regression result. Pertaining to stock market development, none of the single measures produces regression results analogous to the composite index regression result. In sum, with the exemption of *PRIVY* and *DEPTH*, the single measures do not produce findings robust to the findings obtained from the composite indexes. We infer from the sensitivity analyses that trade and financial openness are more important for banking sector development than stock market development, given the positive and significant effect of trade and financial openness on only *PRIVY* and *DEPTH*. Also, we deduce that the effect of trade openness, financial openness and the interaction term of trade and financial openness is sensitive to the choice of measure of banking sector and stock market development.

6. Conclusion

Nigeria is an open economy with a relatively underdeveloped financial sector. Rajan and Zingales' (2003) simultaneous openness hypothesis proposes that increasing trade and financial openness at the same time promotes financial sector development. Accordingly, we test for the validity of the simultaneous openness hypothesis in Nigeria, focusing on the banking sector and stock market. The regression results show that trade and financial openness promote banking sector and stock market development. However, banking sector and stock market development is adversely affected when trade and financial openness are interacted, implying that simultaneous trade and financial openness limits banking sector development and stock market development. This confirms that the simultaneous openness hypothesis is not valid for Nigeria and this indicates that trade and financial openness cannot be simultaneously increased to develop the Nigerian banking sector and stock market. We offer strong evidence to show that trade openness is more vital for banking sector and stock market development than financial openness. The findings suggest that the Nigerian government should ensure that the economy is more open to trade than finance, as against its present openness policy which seems to favour financial openness more than trade openness as construed from the summary statistics.

Notes

1. McKinnon (1991) argues that opening of the financial sector is the last step in the financial liberalization sequencing process. Chinn and Ito (2006) document that trade openness is a precondition for financial openness.

2. IV regression estimation techniques address potential endogeneity problem in regression models. We use Stata's *ivreg2* command developed by Baum *et al.* (2007).
3. The composite banking sector development index is similar to the index used in Jalil *et al.* (2010). The composite stock market development index is constructed using the three measures used by Demirgüç-Kunt and Levine (1996) for the construction of INDEX1.
4. Baltagi *et al.* (2009) note that *de jure* measures are prone to enforcement issues and endogeneity bias.
5. Baum *et al.* (2007) advise that researchers should either apply with caution Stock and Yogo's (2005) critical values, particularly in the case of independent and identically distributed (i.i.d) errors or use Staiger and Stock's (1997) rule of thumb which states that the *F*-statistic should be greater than 10 to confirm the absence of weak identification problem.
6. The net effect of trade (financial) openness is computed as [(natural logarithm of mean value of trade (financial) openness × coefficient of interaction term) + coefficient of trade (financial) openness].

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