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THE IMPACT OF
EXCHANGE RATE
INSTABILITY ON
PRODUCTIVITY
GROWTH
IN NIGERIA:
ANY ROLE
FOR FINANCIAL
DEVELOPMENT?

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Abstract:

This study seeks to examine whether financial development spurs productivity growth when the exchange rate is unstable. In this study, annual series data that spans between 1981 and 2017 was used. Three measures of financial development namely credit to private sector as a share of GDP, M2 as a share of GDP and Market capitalization as a share of GDP were also employed.

Exchange rate instability was measured as the annual standard deviation of the log difference of monthly multilateral real exchange rate. Bound testing approach to co-integration is used to ascertain for the existence of a long-run relationship.

Afterwards, the Ordinary Least Squares (OLS) estimation technique was adopted to examine the effect of exchange rate instability and financial development on productivity growth in Nigeria.

Our findings show that financial development cushions the adverse effect of exchange rate instability on productivity growth in Nigeria. The result is robust to the various measures of financial development.

Our study points out that for a country with flexible exchange rate regime experiencing significant fluctuation in exchange rate, a well-developed financial sector could minimise the adverse effect of exchange rate instability on productivity.

Impact of exchange rate instability on productivity growth in Nigeria: Any role for financial development?

I   Introduction

Nigeria operates a managed float exchange rate. Based on this exchange rate regime, the exchange rate has been less stable. Habib et al. (2017) and Schnabl (2008) examined the effect of exchange rate instability on economic performance and found that exchange rate fluctuation hinders economic growth. Furthermore, Demir (2010); Azid, Jamil, and Kousar, (2005) and Hericourt and Poncet (2015) found that exchange rate volatility hinders trade volume due to its negative consequence on the price of the product. Azid et al (2005) further stated that real exchange rate instability can have a negative influence on both domestic and foreign investment decisions which translate to the reallocation of resources among the sectors, thereby creating an uncertain environment for investment and lowering production level and by extension the level of productivity in the economy.

In the literature, instability in exchange rate has been found to hinder the rate at which productivity grows and this happens through the impact of exchange rate fluctuation on investment and trade volume (Azid et al, 2005 and Aghion et al. 2009). Since productivity growth determines the long-term standard of living of a country's citizenry (Adenikinju, 2005), the negative impact of exchange rate instability on productivity makes it crucial to examine the medium through which the negative impact could be cushioned.

Therefore, this study seeks to examine whether financial development spurs productivity growth when the exchange rate is not stable. This study is important for the following reason. First, exchange rate is known to be unstable in Nigeria. Second, it has been established in the literature that exchange rate instability hinders productivity growth. A decline in productivity growth is associated with the decline in the standard of living as well. Since the government core objective is to improve the standard of living of its citizens, studies that shed insight on how to boost the level of productivity in an economy should be encouraged. Hence, this study provides information on the extent to which financial development cushions

the adverse effect of exchange rate instability on productivity growth in Nigeria.

This study is divided into five sections. Following from the introductory section, we presented the literature review, which is divided into two sub-sections, theoretical review and empirical review. Data and methodology issues are presented in the third section. Empirical findings are presented in the four section and conclusion is the last section.

II   Literature review

In a bid to understand the relationship that exists between exchange rate instability, financial development, and productivity growth, as well as related issues, previous studies in line with the above-mentioned macroeconomic variables, were reviewed. Thus, this section is divided into two sub-sections: theoretical review and empirical review. This section is intended to provide clear information on the how exchange rate could affect economic/productivity growth and other macroeconomic indicators, the role financial development plays in economic growth/productivity growth as well as the link between productivity growth, exchange rate volatility and financial development.

Theoretical Review

Monetary growth theory argued that exchange rate volatility hinders productivity growth whereas financial development stimulates innovation and then foster productivity growth. Hence, during episodes of exchange rate volatility, it is expected that as the financial sector develops, the level of innovation is unaffected adversely, thereby leading to an increase in the level of productivity growth (Aghion et al. 2009).

In monetary growth theory, productivity growth occurred in an economy due to the presence of innovating firms. However, a firm's ability to innovate is anchored in its ability to overcome liquidity cost. Liquidity cost faced by firms arises from exchange rate volatility. Fluctuation in the exchange rate is expected to lead to fluctuation in firms' sales and reduction in firms' profit because firms' sales vary with the exchange rate (international price), whereas wage bill is unaffected due to wage stickiness. Reduction in firms'

profit is expected to result in lowered investment, thereby impacting on firms' level of innovation (Aghion et al. 2009).

Firms' ability to borrow is what determines whether they could overcome the liquidity cost and by extension, whether, they could borrow from the credit market. Credit constraints prevent firms from borrowing as much as they could in the credit market. Thus, credit constraint is the reciprocal of financial development. Schumpeter (1912) suggests that the development of financial system supports innovators in an economy by providing them with financial resources and ensuring that such funds are used efficiently. Therefore, in a well-developed financial sector, the probability that a firm obtains finance increases, thereby fostering innovation and productive growth. Hence, when exchange rate is unstable and the financial sector is well-developed, the overall effect of exchange rate changes on productivity growth reduces.

Empirical Review

Review of studies on the effect of exchange rate volatility/instability on the economy

The study by Pozo (1992) provides empirical evidence on how exchange rate uncertainty influences trade flow between Britain and US. The author discovered that exchange rate volatility reduced trade flow between the two countries. In a similar study, Ramsey and Ramsey (1995) focused on providing cross-country empirical evidence on the link between volatility and growth. The authors divide their study into two parts: the first part of the study covers 92 countries while the other part of the study covers 24 OECD countries. Based on their findings, the authors claimed that countries with lower growth rate volatility experience faster growth than countries with high growth rate volatility. They remarked that stable growth rate is necessary if an economy is to experience faster growth rate. Furthermore, the study by Bleamey and Greenaway (2001) focused on deepening the understanding of how terms of trade and exchange rate volatility impacted on investment and economic growth in sub-Saharan Africa. The paper was the first study on exchange rate volatility that makes use of only African countries as a case study. The study comprises of 14 Sub-Saharan African countries excluding

Nigeria with data starting from 1980 till 1995. The authors observed that a high level of exchange rate volatility lowers economic growth in the African countries. On the other hand, their results found no evidence of a significant relationship between exchange rate volatility and investment.

In recent studies, Schnabl (2008) focused on European Monetary Union periphery under the condition of free capital movement; Arratibel, Furceri, Martin and Zdzienicka-Durand (2011) focused on Nine Central and Eastern Europe (CEE) European Union member countries; Mirdala (2012) focused on Central Eastern European countries; Adewuyi and Akpokodje (2013) focused on African countries; Habib et al (2017) focused on 150 countries; all the recent studies arrived at the same conclusion, that exchange rate volatility has a negative effect on economic growth. Furthermore, Barguellil et al. (2018) used data from 45 developing countries and found that the detriment effect of exchange rate instability on economic growth is higher in countries with flexible exchange rate and lower in countries that trade less with the rest of the world.

Turning to country case studies, Javed and Farroq (2008), which focused on Pakistan found that exchange rate volatility has a positive but weak effect on Pakistan's economic growth. Aliyu (2009) focused on Nigeria and found out that volatility in the exchange rate tends to hinder economic growth. Furthermore, Demir (2010) examined how exchange rate volatility influences employment growth using firm data from 500 manufacturing firms in Turkey. The author's result showed that exchange rate volatility reduced employment growth in the country.

Review of studies on the exchange rate, financial development and economic growth

In line with Schumpeter (1912) submission, Levine and Zervos (1998) examined the relationship between financial development indicators and growth indicators comprising of 47 countries based on data from 1976 to 1993. The authors make use of cross-sectional regression analysis and found that bank development and stock market liquidity influence economic growth, productivity improvement and capital accumulation positively. This submission was also supported by Odeniran and Udeaja (2010) using data

from Nigeria; Bittencourt (2011) using data from Latin America and Zhang, Wang and Wang (2012) using data from China and Fowowe (2017) using firm-level data for African countries.

Aghion et al. (2009) provided empirical evidence on how financial development influences the impact of exchange rate volatility on productivity growth. The authors measure productivity as output per worker and confirmed what previous researchers found on the negative link between exchange rate volatility and economic performance (productivity growth). The authors further examined whether the pattern of impact varies with the level of financial development using data from 1960 to 2000 which was average over five (5) years for 83 countries. Their results showed that the effect of exchange rate volatility was lesser in countries with a high level of financial development than what was obtained in countries with a low level of financial development.

Diallo (2012) and Bristy (2014) conducted their study to test the theoretical prediction of Aghion et al (2009) on the role of financial development in conditioning the impact of exchange rate volatility on productivity growth. Diallo (2012) carried out a panel study using data starting from 1975 to 2004, which comprises of 74 countries drawn from 24 developed and 50 developing countries excluding Nigeria. The author's findings validate the theoretical prediction of Aghion et al (2009) that financial development conditioned the impact of exchange rate volatility on productivity growth.

Bristy (2014) focused on Bangladesh and established similar conclusion. The author makes use of data from 1980 to 2012 and found that Aghion et al (2009) prediction was also valid in Bangladesh. The result shows that as the financial sector in Bangladesh develops, the effect of exchange rate volatility on output growth reduces. In addition, Hericourt and Poncet (2015) show that financial sector development dampens the negative effect of exchange rate changes on trade flows. Also, Alagidele and Ibrahim (2017) found that an improvement in the level of innovation in a society and efficient allocation of resources reduces the detriment impact of exchange rate volatility on economic growth.

Gaps in the literature

Following the reviewed literature, we observed that empirical studies that examined exchange rate fluctuation, financial development, and productivity growth together are scarce, especially within the African context, and Nigeria in particular. This study seeks to provide empirical evidence on the impact of exchange rate instability on productivity growth in Nigeria given the level of financial sector development in the country.

Nigeria operates a managed float exchange rate. In a float exchange rate regime where exchange rate instability is prominent, the need to reduce the negative impact of exchange rate volatility through financial development becomes necessary to ensure improvement in the standard of living of the citizen. Based on the theoretical prediction of Aghion et al (2009), financial development conditions the impact of exchange rate instability on productivity growth. Positive productivity growth implies an increase in efficient use of resources, which leads to improvement in the standard of living. Therefore, a study such as this is important to understanding the extent to which financial development will condition the impact of exchange rate fluctuation in Nigeria.

III   Data and Methodology Issue

Model Specification

The study adopts the model of Aghion et al (2009), which expressed productivity growth as a function of exchange rate instability and financial development as presented below:

$$y_t - y_{t-1} = \alpha_1 ERV_t + \alpha_2 FD_t + \varepsilon_t \qquad (1)$$

Where: ERV = Real exchange rate volatility

    FD   = Financial development

    Y   = Productivity growth

The model of Aghion et al (2009) was modified to include real industrial output growth, which was observed by Jajri (2007) as a key determinant of productivity growth as it reflects the effect of resources shift within the sector

in the economy. This will enable us to test the industrialization as engine growth hypothesis. Again, we included trade openness as this capture the effect of trade policy on productivity growth. In addition, trade openness was introduced into the model estimation because it serves as the channel through which exchange rate instability could influence the domestic economic activities. As a result, we arrived at equation 2, and this is the model we estimate in this study.

$$y_t - y_{t-1} = \alpha_0 + \alpha_1 ERV_t + \alpha_2 FD_t + \alpha_3 Openness + \alpha_4 realindgr + \varepsilon_t \qquad (2)$$

where openness is trade openness, realindgr is real industrial output growth.

In this study, we measure productivity as labour productivity, which is calculated by dividing the total output by the total labour force (Levine and Zervos 1998). Furthermore, exchange rate instability is measured as the annual standard deviation of the log difference of monthly multilateral real exchange rate (Ramsey and Ramsey, 1995; and Demir, 2010). The apriori expectation for the variables used for the study stipulates that, ERV is expected to be negative whereas FD, openness, and realindgr are expected to be positive. The analysis is carried out in the following order. First, the descriptive statistics of the variables, this is followed by the stationary test, the stationary test is performed using Augmented Dickey-Fuller (ADF) and Phillip Perron (PP) test. The stationary test results reflect that the variables used are a mixture of variables that are stationary in level and first difference. Thus, Bound Test Cointegration Test developed by Pesaran, Shin and Smith (2001) is used. Afterwards, Ordinary Least Squares (OLS) estimation technique was used to examine the effect of exchange rate change and financial development on productivity growth in Nigeria.

In this study, annual series data that spans over the period of 1981 and 2017 were used. Financial development indicators such as Credit to private sector as a share of GDP, M2 as a share of GDP and Market capitalization as a share of GDP, Real Gross Domestic Product (GDP), exchange rate and industrial output are obtained from CBN Statistical Bulletin while trade openness and labour force are obtained from World Development Indicators.

IV   Empirical Findings

This section opens with the descriptive statistics of the variables used in the analysis and it is preceded by the correlation analysis and the unit root test, which determine the degree of relationship between the variables used and order of integration of the variables used in the study respectively. Afterwards, the result of the Bound test analysis that tests for the existence of a long-run association between the variables deployed is presented. While the estimates of the regression models were equally displayed and discussed afterwards.

Table 1: Result of the Descriptive Statistics

	Mean	Max	Min	Std. Dev.
Labour productivity growth	1.754	11.756	-9.894	4.432
Real industrial output growth	1.993	20.220	-16.068	7.232
Real exchange rate	156.607	289.870	44.631	70.996
Exchange rate instability SD	0.074	0.590	0.015	0.098
Money supply as % of GDP	14.539	24.343	9.152	4.578
Market capitalisation as % of GDP	10.420	39.950	3.053	8.455
Credit to Private Sector as % of GDP	11.174	23.076	5.917	5.856
Trade openness	30.319	58.918	7.362	12.777

Table 1 displays the descriptive statistics for the dataset used. The result in Table 1 shows that the maximum value of real GDP over the period covered in the study is more than three times the lowest value and almost twice of the mean. Furthermore, the descriptive analysis result shows that the maximum value of real industrial output over the period covered in the study is more than twice the lowest value and almost the same value with the mean. The mean value of credit to private sector as a percentage of GDP and that of market capitalization as a percentage of GDP are found to be almost the same thing but not too far from the mean value of monetary aggregate as a percentage of GDP. This reflects that the three indicators of financial development have a similar pattern.

Next, the results of the correlation analysis for the variables used in the study are presented in Table 2. The correlation results show that high correlation holds among the variables used as measures of financial development. Exchange rate instability is found to have a negative relationship with all the variables used in the study (labour productivity growth, financial development indicators, trade openness and real industrial output growth). Financial development indicators are found to be positive with the variables used in the study except for exchange rate instability.

Table 2: The result of the correlation analysis

Probability	Pworkergr	lcps	lm2	lmc	change	lopenness	realindgr
Pworkergr	1.000						
Lcps	0.077	1.000					
lm2	0.147	0.959***	1.000				
Lmc	0.307*	0.760***	0.760***	1.000			
instability	-0.253	-0.201	-0.166	-0.336**	1.000		
Lopenness	0.333**	-0.018	-0.022	0.381**	-0.318*	1.000	
Realindgr	0.656***	-0.111	-0.061	-0.050	-0.175	0.194	1.000

*, ** and *** implies significant at 10%, 5% and 1% respectively. Pworkergr implies labour productivity growth; lcps implies log of credit to private sector as percentage of GDP; lm2 implies log of monetary aggregate as percentage of GDP; lmc implies log of market capitalisation as percentage of GDP; instability implies standard deviation of the log of exchange rate; Lopenness implies log of import plus export divided by GDP; realindgr implies real industry output growth.

Afterwards, we present the stationary test result. This test is examined to avoid spurious regression estimates. In this study, ADF and PP tests are used. Both tests assume unit root that is the variables are non-stationary. The result of the unit root test is presented in Table 3 which shows that exchange rate change, productivity growth, and real industrial output growth are stationary at levels while financial development indicators, trade openness are stationary at first difference at the 5% significant level. Turning wholly to Table 4 where we presented the cointegration test result, which is based on the Bound test, the F-statistic shows that cointegration exists in all the three sub-sample at 10% significance level, implying that long-run relationship exists.

Table 3: The Result of the Unit Root test

Test	ADF				PP				Conclusion
	Levels		First difference		Levels		First difference		Conclusion
Variables	t-stat	Prob. Value	t-stat	Prob. value	t-stat	Prob. value	t-stat	Prob. value	Remark
Pworkergr	-3.427	0.017			-3.287	0.023			I(0)
Lcps	-2.023	0.569	-5.867	0.000	-2.061	0.550	-6.017	0.000	I(1)
Lm2	-2.208	0.471	-5.478	0.000	-2.322	0.412	-5.466	0.000	I(1)
Lmc	-2.559	0.300	-5.805	0.000	-2.603	0.281	-6.090	0.000	I(1)
instability	-5.596	0.000			-5.609	0.000			I(0)
Lopenness	-1.818	0.675	-7.654	0.000	-1.654	0.751	-7.760	0.000	I(1)
Realindgr	-5.480	0.000			-5.598				I(0)

Table 4: Result of the Bound test

Equation	F-statistics	Comment
F(Pworkergr, lopenness, realindgr, instability and lcps)	5.163***	Cointegration
F(Pworkergr, lopenness, realindgr, instability and lm2)	6.522***	Cointegration
F(Pworkergr, lopenness, realindgr, instability and lmc)	4.751**	Cointegration

*,** and *** connote statistical significance at 10%, 5% and 1% level

The key thrust of this study is to empirically test the impact of exchange rate instability on labour productivity growth as well as the role of financial development in reducing the overall impact of exchange rate instability on productivity growth in Nigeria. Table 5 shows that exchange rate instability has a negative impact on labour productivity growth in Nigeria. In column 1, the coefficient of instability is negative and significant. The argument initiated by Ramsey and Ramsey (1995) on the adverse effect of instability on growth was supported in the study. Also, existing studies such as Alagidele and Ibrahim (2017), Barguellil et al. (2018) and Demir (2010) found a similar result. Our findings point out that exchange rate instability hinders the level of productivity growth in Nigeria.

In column 2-4, the coefficient of instability turns insignificant but positive–whereas the coefficients of financial development indicators are significant and positive. This supports the proposition made by Schumpeter (1912) on the positive role the financial system plays in promoting innovation in an economy. As such, an improvement in the financial sector is expected to lead to productivity growth. Our findings support this proposition, which is

also confirmed in studies such as Fowowe (2017) Raitu and Folarin (2020), Levine and Zervos (1998) Odeniran and Udeaja (2010). The implication of this finding is that productivity growth in Nigeria could be improved upon through the implementation of policies that could stimulate the development of the financial sector. On the contrary, inefficiency in the sector might drag growth in productivity. The study further reveals that industrial output growth enhances productivity growth in Nigeria. As a result, we were able to confirm the hypothesis that industrialization serves as an engine of growth. Furthermore, trade openness has a positive but weak effect on productivity growth in Nigeria. This suggests that trade policies have a role in influencing growth in Nigeria. Overall, the result in Table 5 depicts that exchange rate instability negatively affects productivity growth in Nigeria while financial development contributes to productivity growth.

Table 5: Estimates of the regression model

	1	2	3	4
instability	-0.080**	0.012	0.020	0.008
	(0.061)	(0.040)	(0.031)	(0.8763)
Lcps		0.018***		
		(0.007)		
Lmc			0.016***	
			(0.004)	
Lm2				0.028***
				(0.010)
Realindgr		0.405***	0.416***	0.399***
		(0.053)	(0.055)	(0.055)
Lopenness		0.016	0.007	0.016
		(0.012)	(0.012)	(0.012)
Constant	0.022**	-0.089*	-0.053	-0.122**
	(0.009)	(0.048)	(0.044)	(0.053)
Adj R2	0.045	0.703	0.744	0.706
f-stat	4.771**	41.084***	38.276***	37.387***
	(0.037)	(0.000)	(0.000)	(0.000)
D.W	1.205	1.703	1.882	1.706

Notes: The value in Parenthesis is the standard error whereas the value above the parenthesis is the coefficient of the estimated parameters. *,** and *** connote statistical significance at 10%, 5% and 1% level

We further test for the sensitivity of the result to the measure of productivity growth. We derive total factor productivity using Solow residual. To arrive at this, we regress real GDP on the labour force and capital. The residual

obtained from the estimated equation is saved. This is then used as total factor productivity for the study's estimation[1]. The result based on this modification is presented in Table 6. The results show that the coefficient obtained for exchange rate instability and financial development indicators were lower than what is obtained using labour productivity to measure productivity. But the sign obtained is the same using both labour productivity and total factor productivity. The coefficient of industry output growth is found to be lower using total factor productivity when compared with labour factor productivity.

Overall, the results from our sensitivity analysis point out that the measure of productivity growth does not influence the narration on the impact of financial development and exchange rate instability on productivity growth. In summary, the study's findings were in line with the theoretical prediction of Aghion et al. (2009) on the effect of financial development in reducing the negative impact of exchange rate instability on productivity growth. The findings from this study revealed that in countries experiencing exchange rate instability, high instability increases the risk involved in doing business. The overall risk in the economy can be minimised through the development of the financial sector since credit constraints, which ought to hinder firms from making proper investment decision is addressed. Thus, financial development serves as a tool to for incubating an innovative idea, which might lead to an increase in productivity level in the country.

Table 6: Regression Estimation in which productivity is measured as Total factor productivity growth

	1	2	3	4
instability	-0.113** (0.050)	-0.052 (0.040)	-0.045 (0.029)	-0.059 (0.041)
Lcps		0.027*** (0.007)		
Lmc			0.021***	

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[1] For brevity, the regression result is not presented but is available on request...

			(0.005)	
Lm2				0.039***
				(0.012)
Realindgr		0.329***	0.340***	0.319***
		(0.058)	(0.063)	(0.062)
Lopenness		-0.002	-0.014	-0.002 (0.011)
		(0.011)	(0.010)	
Constant	0.010	-0.056	0.000 (0.036)	-0.096*
	(0.007)	(0.045)		(0.052)
Adj R2	0.104	0.600	0.651	0.588
f-stat	5.121**	19.700***	18.349***	13.938***
	(0.030)	(0.000)	(0.000)	(0.000)
D.W	1.423	2.007	2.224	1.972

Note: The value in Parenthesis is the standard error whereas the value above the parenthesis is the coefficient of the estimated parameters.

VI   Conclusion

This study attempted to evaluate the role of financial sector development in reducing the overall negative impact of exchange rate instability on productivity growth in Nigeria. Having recognized the importance of productivity growth in improving the standard of living of citizens, we provide empirical findings on the effect of exchange rate instability on productivity growth as well as examined the role of financial sector development on productivity growth in Nigeria. The study data covers thirty-seven years: 1981-2017. Three different financial development indicators were examined in the study. They are a credit to private sector as a percentage of GDP, monetary aggregate as a percentage of GDP and market capitalization as a percentage of GDP. The standard deviation of the log of the monthly exchange rate is used to measure exchange rate instability while productivity is measured using labour productivity.

Our result shows that the three different measures of financial development used in the study were highly correlated. In addition, our result shows that on one hand exchange rate instability negatively influences productivity growth while on the other hand financial development enhances productivity growth. Jointly, our results point out that financial development weakly reduces the negative impact of exchange rate instability on productivity. The

findings of this study are found to be robust to the various measures of financial development and productivity growth. The study did not address possible endogeneity problem that might hold. However, the study provides an area for future research to work on.

In terms of policy direction, our findings suggest that appropriate financial reforms that will develop the financial sector need to be institutionalized. This measure should be targeted at ensuring that entrepreneurs have access to funds. The above suggestion is expected to spur the development in the financial sector in Nigeria, thereby serving as a medium through which the detriment effect of exchange rate instability on the economy is dampened.

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