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Empirical X-Ray of Trade Liberalization, Exchange Rate and Tax Revenue in Nigeria

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Abstract

Inconclusive results arising from empirical evidence on the link between trade liberalization, exchange rates and tax revenue, serve as a motivation for this study. The study investigates these linkages in Nigeria over the sample period 1980-2016. It finds that only term of trade poses a substantial effect on the long-term tax revenue in the country, whereas trade liberalization, exchange rate and inflation rate are driving factors that influence short-term tax revenues.

Keywords: Exchange rate, Inflation rate, Tax revenue, Trade liberalization

1. Introduction

Economic development places an important priority on liberalizing trading activities especially developing nations like Nigeria. Trade liberalization entails the removal of tariff barriers and non-tariff barriers. This measure is complemented by currency devaluation and local tax reform. However, it is difficult for the government to design liberalization programs due to high volatility of exchange rate.

There are two main streams of literature in this area of interest. First stream of research examines the link between government revenue and trade liberalization while another stream focuses on the link between exchange rate changes, inflation and tax revenues. The influence of exchange rate policies on trade liberalization calls for the empirical analysis that concomitantly considers the link between trade liberalization and changes in macroeconomic variables as well as government revenues.

Therefore, nexus between trade liberalization, the exchange rate, and tax revenue is practically critical. In the light of this, this study aims at investigating the nexus in the Nigerian context.

The rest of the study is structured as follows: Section Two reviews the existing studies in this area. Data and methodology are described in Section Three. Section Four presents and discusses the results, while Section Five is concluding remarks.

2. Literature Review

Government revenue is influenced by trade liberalization through its impact on foreign trade tax revenue. The outcome of this link depends on the nature of trade liberalization as well as the responses of imports and exports. However, this link is a function of several variables such as the nature of trade liberalization and the response of imports and exports to liberalization. At initial stage, trade liberalization replaces quantitative barriers with import duties. The initial move for trade liberalization is to replace quantitative barriers with import duties. With the increasing trade liberalization, import duties are reduced and invariably translates into a decline in foreign tax revenue (Ebill, Stotsky, & Gropp, 1999). Studies such as Ebrill et al. (1999), Keen & Ligthart (2002) consider the structure of tax system and administrative capabilities as other factors that might affect the link between trade liberalization and tax revenue.

Tanzi (1989) investigated how macroeconomic variables such as inflation, exchange rates influence tax revenue. His finding established an inverse relationship between a country's tax revenue and real exchange rate. He concluded that overvaluation directly influences both import and export bases, which determine the revenues from foreign trade taxes, and sales and excise taxes. This indirectly leads to a declining incentive to produce goods for export, an increasing capital flight and currency substitution, the deteriorating balance of payments, creation of black markets and encouragement of trade restrictions. He called for future research on how devaluation affects the fiscal equilibrium especially in heavily indebted countries.

Ebrill et al. (1999) conducted an analysis on drivers of government tax revenue. Their findings indicated a significant relationship between exchange rate depreciation and higher trade tax revenues, validating Tanzi's hypothesis, but Ghura (1998) revealed an insignificant link.

Khattry & Mohan Rao (2002) tested the Tanzi hypothesis using a panel of 80 developing and developed countries, for the period 1970-1998, with the aid of a fixed-effect regression technique. Their findings showed that there is a negative relationship between trade liberalization and total tax revenue, and between trade liberalization and international trade tax revenue. However, no significant relationship is established between the exchange rate and foreign trade tax revenue. They concluded that tariff reductions would boost international trade tax revenues.

Adam, Bevan, & Chambas (2001) investigated the connection between tax revenue, exchange rates, and trade openness in sub-Saharan Africa, by employing a difference Generalized Method of Moments (GMM) dynamic panel estimation. Their findings indicate that openness increases overall tax revenue in CFA franc countries while it poses little effect in non- CFA franc countries.

However, the disaggregate revenue result shows that trade liberalization boosts trade tax revenue and reduces goods and service tax revenue. In addition, depreciation and removal of real exchange rate imbalance reduces tax revenue in CFA countries but increases tax revenue in non-CFA countries. Their findings vary with the component of tax revenue. Using income taxes, the exchange rate poses no effect in non-CFA countries while depreciation exhibits a significant and positive effect in CFA countries, though it weakens over time. As exchange rate approaches equilibrium, the exchange rate has an adverse effect on income taxes. Using trade taxes variable as dependent leads to a positive link between exchange rate depreciation and revenues. However, the effect varies across African sub-regions.

Higher revenue is associated with exchange rate depreciation when trade taxes are used as a dependent variable. However, the effect changes across CFA and non-CFA countries. For indirect taxes, real exchange rate depreciation increases indirect tax revenues in non-CFA countries but reduces the tax yield in CFA countries. They concluded that environmental and structural variables are responsible for the poor revenue performance in the CFA countries.

Differences in the pattern of tax collection among African countries, pose a challenge of making a general conclusion on how trade liberalization and macroeconomic variables influence tax revenues. This calls for country-specific research on how tax revenues response to variation in different sources of taxes.

Therefore, this study contributes to the existing knowledge from two directions. First, it focuses on Nigeria being the largest African economy and vulnerable to recent global uncertainty. Nigerian government generates more than 60 percent of its revenues from oil sector. This makes the country highly vulnerable to oil price shocks. Due to the declining crude-oil price in the mid-year 2014, the country's oil revenue significantly fell to about US$ 9.9 billion in 2016 from US$44 billion in 2014. This triggers the ongoing government

efforts to boost its revenues from taxes. The instability of foreign exchange market arising partially from global crude oil prices, incapacitates the government policy directions. Therefore, to the author's best of knowledge, scanty research works have been explored for the case of Nigeria. Second, the inconclusive results on Tanzi's theory create an existing vacuum that has to be filled. Therefore, the study tests the validity of Tanzi's proposition using the most recent data.

3. Econometric Methods

Recent literature utilize both cross-sectional and panel data to examine the relationship between macroeconomic variables and tax revenues. They concluded that the income level, agriculture share as well as other economic structure variables, and the share of international trade in GDP (as a proxy for an index of trade liberalization and the degree of openness) etc. are substantially significant in explaining the cross-country variation in the revenue ratio.

This study follows their suits in examining macroeconomic effects of government tax revenue in Nigeria using time series data from 1981 to 2015. The study also builds a model that uses exogenous and endogenous macro variables.

3.1 Data and Methodology

In this section, empirical methodology and the dataset are presented. The fundamental technique is taken from the work of Adam et al. (2001), with some adjustments. Construction of a good proxy measure for the degree of liberalization has been identified as one of the main challenges in the estimation process. Therefore, several indicators have been developed in the literature in order to capture trade liberalization. For instance, IMF (1998) built a trade restrictiveness index that entails measurements of the restrictiveness of tariffs and non-tariff barriers but it is not publicly available. Studies such as Ebrill et al. (1999) and Adam et al. (2001) utilized a traditional indicator of openness (defined as foreign trade as a share of GDP). The higher the ratio, the greater trade liberalization is. They also added another alternative named as the collected tariff rate, which is measured by the ratio of import duties to the value of imports. Based on this measure, a fall in the index implies greater trade liberalization.

Another measure is the ratio of foreign trade taxes to foreign trade, which entails the export component of taxes and trade. This measure is utilized by Khatty & Mohan Rao (2002) but it is not appropriate because changes in exports are less closely linked to trade liberalization than changes in imports. Use of episodes of trade liberalization is considered in Ebrill et al. (1999) as alternative approach. However, absence of sufficient data poses a big challenge in utilizing this approach.

For the purpose of this study, trade openness is employed as a proxy for trade liberalization. The concerned variables include an index of trade liberalization (keeping in mind that an increase in the first measure indicates greater trade liberalization), share of tax revenues in GDP, real GDP per capita, the inflation rate, the terms of trade, and the real effective exchange rate. These data are obtained from the World Bank World Development Bank (WDI) and Central Bank of Nigeria (CBN) Annual Statistical Bulletin.

4. **Empirical Results and Discussions**

4.1 Pre-Estimation Results

As reported in Table 1, Nigeria's share of government tax revenue to GDP (REV) is about 12.15 percent on average for the sample period. The average annual shares of oil tax revenue (OIL) and non-oil tax revenue (NOIL) to the country's economy from 1981 to 2015, were 9. 14 percent and 3.06 percent respectively. Its trade liberalization index (OPEN) was 0.36 on average while its term of trade (TOT) was 246.56 for the sample period. This reflects the low level of trade liberalization in the country. Between 1981 and 2015, an average Nigerian earned about US$1631.20 (GDPC) on yearly basis as illustrated in the table 1. However, inflation rate (INFL) and exchange rate (REER) recorded average annual figures of 19.71 percent and N154.34/US$ respectively.

This poses a concern as the average inflation rate is far exceeding the country's inflation target. Also, its official exchange rate in 2017 is almost double of the sample's average exchange rate (See table 1).

Table 1. Summary of descriptive statistics

Statistics	**REV**	**OIL**	**NOIL**	**OPEN**	**TOT**	**GDPC**	**INFL**	**REER**
Mean	12.15	9.14	3.06	0.36	246.56	1631.20	19.71	154.34
Median	12.43	9.44	3.36	0.34	232.67	1398.52	12.22	99.12
Maximum	20.84	17.30	6.16	0.54	494.87	2535.07	72.84	546.05
Minimum	5.61	4.03	1.05	0.27	74.09	1141.06	5.38	49.74
Std. Dev.	4.29	3.48	1.33	0.06	105.59	459.59	17.94	126.71
Skewness	0.07	0.31	0.27	0.98	0.56	0.81	1.63	1.71
Kurtosis	1.88	2.35	2.11	3.88	2.77	2.11	4.37	5.01
Jarque-Bera	1.86	1.19	1.57	6.69	1.93	5.02	18.17	22.94
Probability	0.40	0.55	0.46	0.04	0.38	0.08	0.00	0.00
Sum	425.13	320.05	107.19	12.43	8629.47	57092.05	690.01	5401.92
Obs.	35	35	35	35	35	35	35	35

Source: Computed by the author using E-views 9.

It can be observed in Table 2, that all correlation values are below 0.6 except for the case of total tax revenue (REV) in relation to oil tax revenue (OIL) and non-oil tax revenue (NOIL). Their values are not a big concern because each of these variables is used separately in different models as a dependent variable.

Table 2. Correlation matrix

	REV	OIL	NOIL	OPEN	TOT	LGDPC	INFL	REER
REV	1.00	0.97	0.69	0.47	-0.54	0.46	-0.29	0.26
OIL	0.97	1.00	0.49	0.40	-0.48	0.42	-0.26	0.12
NOIL	0.69	0.49	1.00	0.41	-0.53	0.34	-0.25	0.48
OPEN	0.47	0.40	0.41	1.00	-0.44	0.30	-0.29	0.17
TOT	-0.54	-0.48	-0.53	-0.44	1.00	-0.44	0.41	-0.34
LGDPC	0.46	0.42	0.34	0.30	-0.44	1.00	-0.43	-0.12
INFL	-0.29	-0.26	-0.25	-0.29	0.41	-0.43	1.00	-0.15
REER	0.26	0.12	0.48	0.17	-0.34	-0.12	-0.15	1.00

Source: Computed by the author using E-views 9.

Owing to the features of time-series data, the study subjects each variable series to stationarity tests. As reported in Table 3, some variables exhibit stationarity status at level-I(0), while others are first difference-I(1). Based on this, Autoregressive Distributed Lag (ARDL) co-integration technique is employed to examine the long-run relationship among the variables.

Table 3. Unit Root Tests (ADF)

Statistics	None		Individual Intercept		Individual Intercept & Trend	
	Level	First Diff.	Level	First Diff.	Level	First Diff.
GDPC	1.73	-4.09***	0.99	-4.29***	-1.86	-5.13***
INFL	-1.85*	-5.44***	-2.74*	-5.35***	-3.77**	-5.29***
NOIL	-1.65*	-6.82***	-3.65***	-6.71***	-3.84**	-6.65***
OIL	-1.31	-7.09***	-3.18**	-6.99***	-3.49*	-6.87***
OPEN	-0.69	-	-4.95***	-	-4.99***	-
REER	-1.60	-3.99***	-1.93	-3.95***	-1.86	-3.94**
REV	-1.31	-6.63***	-3.15**	-6.54***	-3.52*	-6.40***
TOT	-0.44	-5.68***	-2.56	-5.66***	-2.72	-4.15**

Note. *, **, and *** represents 10%, 5% and 1% significant level respectively.

4.2 Regression Estimation Results

4.2.1 Co-integration Results

All these results in the bound test show that there is long-run connections between explained variables and explanatory variables, as supported with high value of F-statistic compared to the values of the upper bound at 5 percent level of significance (see Table 4, 5 & 6).

Table 4. Bound Test-Tax Revenue (REV) as a dependent variable

Test Statistic	**Value**	**K**
F-statistic	69.58	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.08	3
5%	2.39	3.38
2.50%	2.7	3.73
1%	3.06	4.15

Source: Computed by the author using E-views 9.

Table 5. Bound Test- Oil Tax Revenue (OIL) as a dependent variable

Test Statistic	**Value**	**K**
F-statistic	103.09	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.08	3
5%	2.39	3.38
2.50%	2.7	3.73
1%	3.06	4.15

Source: Computed by the author using E-views 9.

Table 6. Bound Test—Non-oil Tax Revenue as a dependent variable

Test Statistic	**Value**	**K**
F-statistic	4.01	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.08	3
5%	2.39	3.38
2.50%	2.7	3.73
1%	3.06	4.15

Source: Computed by the author using E-views 9.

4.2.2 OLS Estimation Results

Table 7 presents the estimation results of the drivers of aggregate tax revenue in the country. The result from the aggregate model, indicates that all explanatory variables excluding real exchange rate (REER) and term of trade (TOT), have positive influences on the long-run tax revenue in Nigeria. However, only the term of trade with negative coefficient (-0.03) is

statistically significant at 5 percent in the long-run.

In the short-run period, the regression coefficients of most explanatory variables are statistically significant at 5 percent. Variables such as one-year lag of tax revenue(REV), trade openness (OPEN), real exchange rate (REER) including their lags, positively and statistically influence the performance of government tax revenue in the short-run while others such as one-year and three-year lag of per capita income(LGDPC), all lags of inflation rate(INFL), term of trade(TOT) with its lags, adversely and substantially affect the short-term government tax revenue at 5 percent significance level. The coefficient of speed adjustment term (ECT) is -1.97, which is statistically significant and has a correct sign. However, the error term coefficient is not in the expected range value - between 0 and 1 in absolute term (see Table 7).

Table 7. Results of tax revenue regression model

Variable	**Coefficient**	**t-Statistic**	**Prob.**
Dependent Variable: REV			
Long Run Estimates			
Constant	18.19	2.99	0.21
LGDPC	0.60	0.62	0.65
INFL	0.03	1.79	0.32
OPEN	1.55	0.28	0.83
REER	-0.02	-6.21	0.10
TOT	-0.03	-15.96	0.04
Short Run Estimates			
D(REV(-1))	0.56	24.91	0.03
D(REV(-2))	0.10	5.53	0.11
D(REV(-3))	0.10	5.68	0.11
D(LGDPC)	-4.09	-3.38	0.18
D(LGDPC(-1))	-18.90	-21.24	0.03
D(LGDPC(-2))	3.51	3.56	0.17
D(LGDPC(-3))	-23.89	-23.52	0.03
D(INFL)	0.01	1.25	0.43
D(INFL(-1))	-0.19	-32.44	0.02
D(INFL(-2))	-0.16	-30.42	0.02
D(INFL(-3))	-0.14	-30.03	0.02
D(OPEN)	23.36	20.25	0.03
D(OPEN(-1))	27.26	23.57	0.03
D(OPEN(-2))	29.67	27.14	0.02
D(OPEN(-3))	2.40	2.17	0.28
D(REER)	0.03	30.77	0.02
D(REER(-1))	0.03	30.74	0.02
D(REER(-2))	0.03	27.30	0.02
D(REER(-3))	0.02	16.46	0.04
D(TOT)	-0.02	-21.38	0.03
D(TOT(-1))	0.05	51.84	0.01
D(TOT(-2))	0.07	63.08	0.01
D(TOT(-3))	0.03	28.54	0.02
ECT(-1)	-1.97	-58.39	0.01

Source: Computed by the author using E-views 9.

By decomposing the tax revenue in oil and non-oil tax revenues, the outcome of sub-models in which oil-tax revenue is used as a dependent variable instead of the aggregate tax revenue, is reported in Table 8. From the table 8, term of trade (TOT), real exchange rate (REER) and per capita income (LGDPC) negatively affect the long-term oil tax revenues (OIL) while others exhibit positive effects. In terms of significance nature, only term of trade is critically relevant at 5 percent.

In the short-run, almost all the independent variables exhibit positive and significant impacts on oil tax revenue in the sample period. Inflation with its lags, and term of trade negatively affect the short-term oil tax revenue. The estimated coefficient of the error term is not perfectly confirmed to the theoretical expectation due to its value being above 1.

Table 8. Results of oil-tax revenue regression model

Variable	**Coefficient**	**t-Statistic**	**Prob.**
Dependent Variable: OIL			
Long Run Estimates			
Constant	21.46	5.49	0.11
LGDPC	-0.68	-1.10	0.47
INFL	0.01	0.91	0.53
OPEN	0.77	0.22	0.86
REER	-0.01	-4.13	0.15
TOT	-0.03	-19.74	0.03
Short Run Estimates			
D(OIL(-1))	0.70	37.05	0.02
D(OIL(-2))	0.17	10.80	0.06
D(OIL(-3))	0.09	6.37	0.10
D(LGDPC)	-5.65	-6.54	0.10
D(LGDPC(-1))	-4.74	-7.53	0.08
D(LGDPC(-2))	12.99	19.14	0.03
D(LGDPC(-3))	-4.36	-5.50	0.11
D(INFL)	0.02	5.04	0.12
D(INFL(-1))	-0.08	-23.38	0.03
D(INFL(-2))	-0.08	-28.17	0.02
D(INFL(-3))	-0.10	-33.62	0.02
D(OPEN)	21.84	26.46	0.02
D(OPEN(-1))	36.78	40.14	0.02
D(OPEN(-2))	37.41	45.27	0.01
D(OPEN(-3))	14.61	16.55	0.04
D(REER)	0.04	50.35	0.01
D(REER(-1))	0.03	29.85	0.02
D(REER(-2))	0.02	29.60	0.02
D(REER(-3))	0.02	24.33	0.03
D(TOT)	-0.01	-22.21	0.03
D(TOT(-1))	0.04	58.90	0.01
D(TOT(-2))	0.06	74.69	0.01
D(TOT(-3))	0.03	29.78	0.02
CointEq(-1)	-2.22	-71.07	0.01

Source: Computed by the author using E-views 9.

With the reference to Table 9, the result of non- oil tax revenue as an explained variable, is presented. All the explanatory variables do not have significant influences in determining the long-run tax revenue from non-oil sector in Nigeria. However, quite a lot of independent variables significantly affect the short-run non-oil tax revenue either positively or negatively. The coefficient of the error term is not perfectly confirmed to the theoretical expectation because of its value does not lie within the range.

Table 9. Results of non-oil tax revenue regression model

Variable	Coefficient	t-Statistic	Prob.
Dependent Variable: NOIL			
Long Run Estimates			
Constant	11.66	4.22	0.15
LGDPC	-0.88	-1.92	0.31
INFL	-0.08	-4.07	0.15
OPEN	0.11	0.05	0.97
REER	-0.01	-4.76	0.13
TOT	0.00	0.36	0.78
Short Run Estimates			
D(NOIL(-1))	-6.49	-14.26	0.04
D(NOIL(-2))	-3.56	-12.73	0.05
D(NOIL(-3))	-1.39	-11.33	0.06
D(LGDPC)	3.54	3.65	0.17
D(LGDPC(-1))	13.09	13.14	0.05
D(LGDPC(-2))	46.96	16.27	0.04
D(LGDPC(-3))	32.29	10.31	0.06
D(INFL)	0.23	17.73	0.04
D(INFL(-1))	-0.04	-6.81	0.09
D(INFL(-2))	0.07	18.80	0.03
D(INFL(-3))	0.08	10.62	0.06
D(OPEN)	5.33	6.21	0.10
D(OPEN(-1))	35.05	16.14	0.04
D(OPEN(-2))	44.24	14.34	0.04
D(OPEN(-3))	17.26	8.68	0.07
D(REER)	0.02	19.60	0.03
D(REER(-1))	-0.04	-13.11	0.05
D(REER(-2))	-0.03	-13.00	0.05
D(REER(-3))	-0.01	-3.70	0.17
D(TOT)	-0.03	-18.55	0.03
D(TOT(-1))	-0.04	-13.20	0.05
D(TOT(-2))	0.00	-2.57	0.24
D(TOT(-3))	0.01	10.59	0.06
ECT(-1)	5.99	14.02	0.05

Source: Computed by the author using E-views 9.

5. Concluding Remark

The great concern for policymakers around the world is the issue of tax systems of various countries. The special focus is also paid to the ease of tax compliance. The need to improve the tax revenue performance with the presence of unfavourable crude oil prices, motivates

this study.

The paper examined the link between tax revenue, trade liberalization, and exchange rate using a time series dataset of Nigerian economy. Its findings reveal that only term of trade is identified as a critical factor that can influence the long-run tax revenue and oil-tax revenue, whereas in the short term, all variables such as trade openness, per capita income, inflation, exchange rate as well as term of trade affect the aggregate tax revenue and disaggregated tax revenue in Nigeria.

In the first quarter of 2017, the country witnessed a positive trade balance because of rising exports and falling imports. With the continuous government efforts on diversifying the economy, the study's results anticipate an improvement in the long-term tax revenue in the country. In addition, the short-term tax revenue would increase as the Central Bank of Nigeria (CBN) is frequently controlling the inflation rate and exchange rate in the country. The foreign exchange intervention of the CBN as well as its unchanged monetary policy rate since 2016, has led to a depreciation in the value of dollar compared to the domestic currency, and to a fifth consecutive fall in inflation rate in the country. This might collectively improve the country's term of trade.

The degree of trade liberalization plays a crucial role in determining the country's tax revenue in a positive direction in the short-run. This implies that the greater trade liberalization in the country, the more the government revenue generated from taxes. However, more attentions are needed to often check the term of trade involved because as the term of trade increases in the short-run, it poses a danger on government tax revenue in the country.

All in all, the government needs to boost tax revenues by strengthening an effective monitoring system that can improve tax compliance rate within its domestic economy, and conducting an in-depth analysis when engaging in any trade agreement with the rest of the world.

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