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Institutional Quality and Industrial Growth: A Causality Analysis

A. O. B. Babasanya [a], O. A. Adelowokan [a] and F. F. Oyebamiji [b*]

[a] Department of Economics, Olabisi Onabanjo University, Ago-Iwoye, Nigeria.
[b] Department of Procurement and Supply Chain Management, The Polytechnic, Ibadan, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The research study investigates the causal links between institutional quality and industrial output growth in Nigeria for the periods 1996:Q1-2018:Q4. Institutional quality was delineated into three i.e. economic institution (government effectiveness, regulatory quality, rule of law, and control of corruption), financial institution (contract intensive money, lending rate, and financial deepening), and political institution (voice and accountability, and political stability and absence of violence). The study computed the Granger causality test using both the VECM and the Toda and Yamamoto [1] and Dolado and Lutkepohl [2] (TYDL) augmented VAR procedure. The causality result in the short run showed that none of the institutional quality variables have a causal effect on industrial output growth but the feedback was reported. In the long run, a bi-causal relationship was reported from government effectiveness, control of corruption, financial deepening, and voice and accountability to industrial growth, whereas, a one-way directional relation was found running from industrial growth to regulatory quality and political stability & absence of violence. Thus, there is a need for the government to intensify efforts towards improving the extent people can challenge her power and authority because these play significant roles in the development level of Nigerian industries.

Keywords: Institutional dysfunction; industrial output; causality test; Nigeria.

**Corresponding author: Email: opaleyeflorencefunmilola35@gmail.com;*

1. INTRODUCTION

In developing countries like Nigeria, the quality institutional framework has been a major item on the developmental agenda of the country because of its role in promoting sustainable growth and development. Ensuring quality institutions is not only vital for industrial output growth but also crucial for other sectors and national growth and development. The quality of institutions is relatively positively related to industrial growth and development, which is highly required by every economy in achieving the developmental goals. It also serves as a good platform for forwarding and backward linkage with other sectors. This circular weakness of the institutional components (economic, financial, and political) and industrial output growth constitute a serious development problem. Thus, a country's institutional framework is considered as primary criteria for industrial survival and long-term output growth and development.

Industrial growth can be seen as an increase in the share of the manufacturing sector in the Gross Domestic Product (GDP) and in the employment of the economically active population. It describes the development of economic activity in relatively large units of production, making much use of machinery and other capital assets, with the tasks of labour divided and the relationships of employment formalized [3-5]. Its concern is with the expansion of a country's manufacturing activities, including the generation of electricity and the growth of its communications network. Adejugbe [6] Gamu, Le Billon and Spiegel [7] and Olawuyi [8] argued that industrial development has been a process of reducing the relative importance of extractive industries while concentrating more on both secondary and tertiary sectors.

Theories have also provided explanations on how institutions affect growth. For instance, in the growth theory, the traditional neoclassical thought [9,10]. had provided a rich set of explanations on why productivity levels or growth rates are different across countries, and whether the explanations hold over time. The neoclassical growth model proposed by Solow [9] assumed growth to be driven by a combination of factors including technological change. However, this technological change in the neoclassical growth model was assumed to be exogenously determined. Endogenous growth theories assume quite the opposite by treating technological changes as private goods hence allowing for potential divergence in the patterns of economic growth across nations or regions. Such theories allow for knowledge spillovers when innovations generated by a firm make this knowledge available to other firms in the industry or even to other industries.

Additionally, the empirical literature has extensively addressed the central question in economics on how to explain the large and persistent differences in per capita income across countries. It should also be noted that economists have attempted to explain the fraction of growth otherwise unexplained by simple factor accumulation by emphasizing the importance of increasing returns to human capital technological change ownership [11], McConnell and Servaes [12] among others. On the other hand, the views of other scholars such as Olson [13], North [14], Clague and Rausser [15] among others relate the differences to its institutions or the organization of society. They reiterated the vitality of building up adequate legal infrastructure and proper functioning institutions in promoting economic growth. Unlike the neoclassical growth theories like Solow [9] emphasizing the role of physical capital accumulation to growth, the modern theories extended factor determinants of growth to innovations, technology, human capital including institutional settings of economies. The arguments in favour of a strong institutional structure are numerous [16]. First, transaction costs associated with running a business are likely to increase in the presence of corruption and bureaucratic obstacles. Second, barriers to entry and exit might become very high without clear and transparent legal and regulatory mechanisms governing entry and exit. Lastly, gains from trade are easier to realize when transactions are carried out through efficiently functioning market mechanisms [17].

Furthermore, the role of institutions in promoting both industrial and national growth in developing and emerging economies like Nigeria cannot be overemphasized. This has sparked the interest of international organizations like the World Bank [18,19]. and scholars such as Stiglitz [20], Robert [21], Akinwale [22], Nathan and Okon [23], Ologunla, Kareem, and Raheem [24] among others. This is because the quality of institutions (public and private), the structure of governance, and the extent of social capital also affect growth. It should be noted that many African countries possess weak institutional settings, while sub-

Saharan African countries have experienced the slowest economic growth than any region in the world coupled with a severe poverty rate. Several cross-sectional studies [25,26] have found that the conventional factors of growth (labour, physical and human capital) do not explain African's experience and have turned to an institutional explanation.

Equally, previous studies have shown that differences in institutional quality are among the most important determinants of industrial growth in economies. The research inquiry as regards the aspects of institutions that matter most in the long-run industrial output growth had thrown more controversies in the literature than the proposition that institutions matter towards overall growth. The diverse measures used encompass property rights, political freedom, political instability, governance, and measures of the quality of institutions for economic exchange. This study utilized the six World Bank Governance Indicators for the overall institutional framework measurements and also identified the institutions (economic, financial, and political) that appear to be the most significant cause of industrial growth in Nigeria.

Other parts of the study area are into four sections. The second section presents a brief literature review while the data and methods of analysis were discussed in the third section. Section four provides the empirical analysis of data and the last part of the research study concludes and offers appropriate policies towards the improvement of industrial output growth.

2. BRIEF LITERATURE REVIEW

The empirical evidence of previous studies such as Knack and Keefer [27] Mauro [28] Hall and Jones [29] La Porta et al. [30] Acemoglu, Johnson and Robinson [31] Sala-i-Martin, Xavier and Subramanian [32] focused on the overall quality of institutions in promoting economic growth. However, empirical work on the institutional-growth hypothesis, especially on the institutional channel as a potentially important cause of output growth has rarely been verified with much success especially in the case of Africa, most especially Nigeria where institutions are weak. Likewise, the effects of each unbundled institutional component (control of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, rule of law, and voice and accountability) on growth have not received adequate attention. For instance, Sachs and Warner [33] and Papyrakis and Gerlagh [34] simply controlled for institutional quality by using a measure of corruption. Likewise, Olayungbo and Adediran used only the corruption perception index as a measure of institutional quality. Ubi and Udah [35] and Udah, Ubi and Efiom [36] used contract intensive money measured by the differences between broad money supply and currency in circulation and corruption by corruption perception index as a measure for institutional quality. This study is however at variance with the previous studies as it aimed to examine the effects of institutional quality variables constructed using the World Bank Governance Indicators, that is political governance (voice & accountability and political stability & absence of violence), economic governance (government effectiveness, regulatory quality, rule of law and control of corruption), and financial institution (contract intensive money, lending rate, and financial deepening). This study contributes to the existing literature by investigating the causal links between institutions and industrial performance.

Ross [37] used a pooled time-series data of 113 developing countries between 1971 and 1997 to explore whether oil impedes democracy as it has been widely claimed for Middle East countries because their government has been authoritarian since gaining independence. Using panel OLS, the study found that oil impedes democracy. It further revealed that oil does greater damage to democracy in poor states than in rich ones, and a given rise in oil exports will do more harm in oil-poor states than in oil-rich ones. Therefore, oil inhibits democracy even when exports are relatively small, particularly in poor states. The study also established that the harmful influence of oil is not restricted to the Middle East. Oil wealth has probably made democratization harder in states like Indonesia, Malaysia, Mexico, and Nigeria - it may well have the same effect on the oil-rich states of Central Asia. Also, non-fuel mineral wealth also impedes democratization. While the major oil exporters are concentrated in the Mideast, major mineral exporters are scattered across Africa, Asia, and the Americas. This group includes many states where progress toward democracy has been halting or elusive, including Angola, Chile, the Democratic Republic of Congo, Cambodia, and Peru. The finding is contrary to earlier studies with the assumption that the anti-democratic effects of oil were restricted to the Middle East, that they influenced only states that were almost wholly dependent on oil, and that they did not extend to the mineral-rich states. The study supports three causal mechanisms that link oil and authoritarianism: a rentier effect, through which governments use low tax rates and high spending to dampen pressures for democracy; a repression effect, by which governments build up their internal security forces to ward off democratic pressures; and a modernization effect, in which the failure of the population to move into industrial and service sector jobs renders them less likely to push for democracy.

Mohsen, Chua, and Che Sab [38] investigated the factor determinants of industrial output in Syria over the period 1980–2010. The estimation methods used were the Johansen cointegration test, Granger causality test, impulse response functions, variance decomposition analysis, and stability tests. The result from the Johansen cointegration test indicates that industrial output is positively related to capital, manufactured exports, population, and agricultural output, but negatively related to the oil price. Also, agricultural output has the biggest effect on industrial output. The causality test revealed a bidirectional causality between capital, oil price, manufacturing exports, population, agricultural output, and industrial output in the short and long run.

Saidi, Montasser, and Ajmi [39] investigated the role of institutions (using broader measures such as corruption, bureaucracy quality, democracy accountability, law and order, and ethnic tensions) in the nexus of renewable energy and economic growth in the MENA region between 1986 and 2015. Using the panel cointegration tests, they discovered that renewable energy, economic growth, and the institutional measures considered in this study are cointegrated. Specifically, the study found a strong causality running from renewable energy and the institutional measures, except law and order to grow. More so, a reverse path is also observed since there is also a strong causality running from growth to renewable energy when the causal regression includes any institutional measure. The findings corroborate the fact that establishing an attractive institutional framework in MENA countries could be of ultimate importance in the profitability of renewable energy investments and in accelerating economic growth [40,41].

Nathan and Okon investigated whether the slow performance of the Nigerian economy to Canada and Brazil is a result of over-dependence on oil and weak institutions. The study used the difference in difference method in terms of income per capita, oil rent to GDP, corruption index, government effectiveness, and the inflation rate of Nigeria between Canada and Brazil. The estimation methods used are Granger causality and ordinary least square techniques within the period of 2000 and 2010. The result from the causality tests shows that the difference in economic growth between Canada and Nigeria is caused by differences in their level of corruption. The study also reported bi-directional causation between differences in corruption and the difference in governance effectiveness between Canada and Nigeria.

Ajudua and Ojima [42] investigated the determinants of output in the Nigerian manufacturing sector from 1986 and 2014. The factor determinants considered were gross capital formation, bank credit to the manufacturing sector, lending rate, employed labour force, foreign direct investment, manufacturing capacity utilization rate, and foreign exchange. The Johansen co-integration test was employed to test for long-run equilibrium relationship among the variables while the Granger Causality test was conducted so as to ascertain the causal relationship between variables while the stability test was also conducted to check for the long-run stability of the variables employed.

3. DATA AND METHODOLOGY

The time series variables for analysing the effects of institutional quality on industrial growth in Nigeria span between 1996:Q1 and 2018: Q4. These time series variables are Nigeria’s industrial output growth, changes in capital, labour force, voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, control of corruption, life expectancy, domestic credit to private sector and trade intensity.

Table 1 presents the description of data and summary statistics. The mean of industrial output as a percentage of GDP stood at 26.49%, implying that the Nigerian industrial sector account for an average of 26.49% of all economic activities carried out by all sectors in the Nigerian economy. The average values of economic institutions measured by government effectiveness (gef), regulatory quality (rqv), rule of law (rlw), and control of corruption (ccn) were -

1.022, -0.899, -1.166 and -1.168. One of the main reasons for the weak nature of economic institutional settings in the country is the unstable nature of her political structure over the years. The mean of financial institution indices measured by contract intensive money (cim), lending rate, and financial deepening proxied by credit to the private sector to GDP (fd) were 82.32%, 19.68%, and 13.46% respectively. The average value of voice and accountability (vac) and political stability & absence of violence (psav) stood at -0.709 and -1.717 respectively. It confirms the poor state of the Nigerian political system over the years. The average values of the two key factor determinants of industrial growth stood at 23.75% and 45,993,900 for capital investment (k) and labour force (l) respectively under the reviewed periods. For the control variables, the mean values of foreign direct investment to GDP (fdi) and trade intensity proxy by total trade as a ratio of GDP (ti) are 1.80% and 38.17% correspondingly.

The variance autoregressive (VAR) approach proposed by Sims [43] was used to depict the causal relationship between institutional quality and industrial growth which allows interaction between all the specified variables. A VAR framework constitutes a convenient framework to assess the interrelationships within a system of variables when the imposition of strong a-priori restrictive assumptions cannot be derived by economic theory [44,45]. The variables included in the VAR are industrial output growth measured by a total percentage value of the industrial output of GDP (iy), economic institutions (EI), financial institution (FI), political institutions (PI), changes in capital proxy by gross fixed capital formation to GDP (k), labour force (lab), foreign direct investment (fdi) and trade intensity (ti). The VAR model takes each of the variables in the system and relates its variation to its own past history and the past values of all the other variables in the system. A typical VAR model in standard form can bewritten as:

$$Y_t = C + \sum_{t=1}^{p} A_i Y_{t-1} + \varepsilon_t \qquad (1)$$

The vector of endogenous variables Y_t is given as: $Y_t = f(iy_t, ei_t, pi_t, fi_t, k_t, lab_t, fdi_t, ti_t)$.*C* is a (8x1) vector of intercept terms; and A_i is the matrix of autoregressive coefficients of order i. The basic identification scheme uses a recursive VAR model that follows the following ordering as: $[iy_t, ei_t, pi_t, fi_t, k_t, lab_t, fdi_t, ti_t]$ where the contemporaneously exogenous variables are ordered first. The variable in the VAR is thus ordered from the most exogenous to the least exogenous one.

This study employed the Toda and Yamamoto [1] and Doladao and Lutkepohl [2] augmented Vector autoregressive (VAR) procedure to estimate the causal estimates.Awokuse noted that the method for causal interference derived from an augmented level VAR with integrated and cointgrated processes. In a VAR form, the equation is written as:

$$Z_t = A_0 + \sum_{i=1}^{k} \Gamma_j Z_{t=j} + \mu_i \qquad (2)$$

Where Z_t is a 8 by 1 dimensional vector of non-stationary endogenous variables of the model, A_0 is a 8 by 1 dimensional vector of constant; Γ is a vector of parameters; μ_i is *k*-dimentional vector of stochastic error term normally distributed with white noise properties $N(0, \sigma^2)$. A modified-Wald test was used in the Toda and Yamamoto [1] and Doladao and Lutkepohl [2] augmented VAR procedure. In this procedure, a VAR $[k + d(\max)]$ that has *k* degree of freedom with a maximum order of cointegration for the series $d(\max)$ is estimated.

4. EMPIRICAL ANALYSIS AND DISCUSSION OF FINDINGS

The result of the causal relationship between institutional quality and industrial output growth is presented in this section. It is achieved by computing the Granger causality test using both the VECM and the Toda and Yamamoto [1] and Dolado and Lutkepohl [2] (TYDL) augmented VAR procedure of the causal relationship between institutional quality and industrial growth measured by industrial output to GDP in Nigeria between 1996:Q1 and 2018:Q4. The result is reported for both short- and lung- run causal estimates which are presented in Tables 2 and 3 respectively.

The short-run causality result in Table 2 based on the YDL procedure indicated that none of the institutional quality variables have a causal effect on industrial output growth in Nigeria. However, the table shows that there is feedback from the industrial output growth to all the institutional quality variables. Thus, a uni-directional causal relationship from industrial output growth to all the institutional quality variables (government effectiveness, regulatory quality, rule of law, control of corruption, contract intensive money, lending rate, financial deepening, voice & accountability, and political stability & absence of violence) was reported in the study. For the key factor inputs, a bi-causal relationship exists between labour force and industrial output growth in Nigeria, whereas, a one-way causal effect is found from industrial output growth to capital investment. Similarly, a uni-directional causal impact is reported from industrial output growth to foreign direct investment, while there is no causal relationship existing between trade intensity and industrial output growth in Nigeria.

Furthermore, the table reports a causal relationship among the three institutional quality variables. For economic institution variables, a bi-causal relationship exists between rule of law and control of corruption, while one-way causal relationships were reported from rule of law and control of corruption to government effectiveness, and control of corruption to regulatory quality. In the case of the financial institutions, a two-way causal relationship was found between financial deepening and contract intensive money, while a uni-directional causal relationship was reported from lending rate to contract intensive money, and financial deepening to lending rate. Meanwhile, there is no causal relationship reported between the political institution variables, i.e. voice & accountability and political stability & absence of violence. Similarly, no causal relationship was found between the two key factor inputs (i.e. capital investment and labour force). However, a bi-causal relationship was reported between the two controlling variables. Thus, foreign direct investment and trade intensity have bi-causal relationships. In addition, the table further reported the causal relationship existing among the variables of institutional quality, key factor input, and the controlling indicators.

Table 3 presented the long-run Granger causal results using the TYDL augmented VAR procedure to explain whether there is a causal relationship between institutional quality variables and industrial output growth in the long run. The result of the causal relations between the economic institution and industrial output growth reported a bi-causal relationship from government effectiveness and control of corruption to industrial output growth; a uni-direction relation from industrial output growth to regulatory quality and no causal relations between rule of law and industrial output growth. For the financial institutions, a two-way causal relationships exists between financial deepening and industrial output growth while industrial output growth does not have any causal relation with contract intensive money and lending rate and no feedback. In the case of political institutions, a bi-causal relationship exists between voice & accountability and industrial output growth, whereas, a uni-directional relation was reported from industrial output growth to political stability and absence of violence. The study further found that the two key factor inputs (capital and labour force) have bi-causal relations with industrial output growth in Nigeria, whereas a one-way causal relation was reported from industrial output growth to the control variables (FDI and trade intensity).

Empirical findings revealed that none of the institutional quality variables have a causal effect on industrial output growth, whereas feedback was reported in the short run. In the long run, a bi-causal relationship was reported from government effectiveness, control of corruption, financial deepening, and voice & accountability to industrial output growth. However, a uni-direction relation was found running from industrial output growth to regulatory quality and political stability & absence of violence. More so, causal relations existed from rule of law and lending rate to industrial output growth. The study revealed found that capital and labour force have bi-causal relations with industrial output growth, while a one-way causal relation was reported from industrial output growth to FDI and trade intensity. The bi-causal relation between capital and industrial output growth is similar to the results of Mohsen, Chua, and Che Sab in Syria.

Table 1. Data description and summary statistics

Signs	Variable Description	Mean	Std. Dev.	Max.	Min.
iy	Industrial output growth measures the total rate of output produced in the industrial sector to GDP.	26.490	4.670	37.847	17.021
Economic institution variables					
gef	Government effectiveness captures the quality of public services and the degree of its independence from political pressures.	-1.022	0.088	-0.878	-1.256
rqv	Regulatory quality is the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	-0.899	0.182	-0.631	-1.454
rlw	Rule of law captures particularly the quality of contract enforcement, property rights, the police, and the courts, i.e. the enforcement of the rules of society.	-1.166	0.155	-0.837	-1.431
ccn	Control of corruption shows that the stronger the control of corruption, the more economic success is a function of effort and competence, rather than connections and bribery.	-1.168	0.128	-0.859	-1.450
Financial institution indicators					
cim	Contract intensive money measures the total money supply less currency outside the banking system as a ratio of broad money.	82.318	9.366	92.570	65.276
lr	Lending rate is the rate at which commercial bank give loan to people seeking financial assistant.	19.682	3.792	31.680	14.427
fd	Financial deepening measures by domestic credit to private sector to GDP shows the total level of domestic credit/loans provided by banks to the private sector to the size of the economy.	13.464	5.630	21.111	6.089
Political institution indices					
vac	Voice and accountability capture the extent to which a country's citizens can select and challenge its government, thus limiting executive power.	-0.709	0.278	-0.304	-1.635
psav	Political stability and absence of violence states that the lower the probability of political instability and/or politically motivated violence, the more a country's citizens are incentivized to invest in their own prosperous future.	-1.717	0.414	-0.469	-2.262
Key factor inputs					
k	Capital measured by gross fixed capital formation measures by the total capital of private investors in the economy.	23.750	8.881	41.018	13.970
l	Labour force is the number of people who are within the age bracket of working class in an economy.	45993.9	7935.6	62166.8	33924.3
Control variables					
fdi	The foreign direct investment measure the total investment capital of foreign investors in the country.	1.801	0.707	3.243	0.550
ti	Trade index measures the total volume in market values of total trade to the economic size of the country.	38.172	9.306	55.289	19.759

Note: Std. Dev. – standard deviation; Max. – maximum; Min. – minimum; Prob. – probability; and number of observations is 92
Source: Authors' computation (2021)

Table 2. Short-run Granger Causality Results based on TYDL Procedure and VECM

Dependent Variables	**Results based on an Augmented VEC Model [Short run lagged differences (F-statistics)]**													
	Independent Variables													
	Δ*iy*	**Δ*gef***	**Δ*rqv***	**Δ*rlw***	**Δ*ccn***	**Δ*cim***	**Δ*lr***	**Δ*fd***	**Δ*vac***	**Δ*psav***	**Δ*k***	**Δ*l***	**Δ*fdi***	**Δ*ti***
Δ*iy*		0.229	1.660	1.042	3.069	0.736	2.857	1.871	1.097	0.038	1.020	**10.16**	0.614	1.269
		(0.892)	(0.436)	(0.594)	(0.216)	(0.692)	(0.240)	(0.392)	(0.578)	(0.981)	(0.601)	**(0.006)**	(0.736)	(0.530)
Δ*gef*	1.934		0.674	0.252	0.647	0.333	2.600	2.601	1.085	1.339	0.997	4.085	0.923	0.421
	(0.380)		(0.714)	(0.882)	(0.724)	(0.847)	(0.273)	(0.272)	(0.581)	(0.512)	(0.607)	(0.130)	(0.630)	(0.810)
Δ*rqv*	**18.05**	1.715		0.343	1.255	0.061	3.570	0.750	0.621	1.291	0.363	**9.129**	0.376	**5.585**
	(0.000)	(0.424)		(0.842)	(0.534)	(0.970)	(0.168)	(0.687)	(0.733)	(0.524)	(0.834)	**(0.010)**	(0.829)	**(0.061)**
Δ*rlw*	**9.735**	**9.396**	0.861		**13.47**	**5.913**	**9.236**	3.167	1.232	**7.561**	**8.723**	**6.788**	**6.103**	**4.991**
	(0.008)	**(0.009)**	(0.650)		**(0.001)**	**(0.052)**	**(0.010)**	(0.205)	(0.540)	**(0.023)**	**(0.013)**	**(0.034)**	**(0.047)**	**(0.083)**
Δ*ccn*	**22.45**	**21.26**	**14.23**	**16.10**		**17.50**	**15.82**	**5.361**	**11.01**	**10.88**	**16.10**	**7.584**	**10.09**	**16.68**
	0.000	**0.000**	**(0.001)**	**(0.000)**		**(0.000)**	**(0.000)**	**(0.069)**	**(0.004)**	**(0.004)**	**(0.000)**	**(0.023)**	**(0.006)**	**(0.000)**
Δ*cim*	**5.020**	**8.670**	**4.690**	**19.04**	**8.810**		**6.918**	**6.701**	**22.08**	**9.426**	**6.744**	**14.05**	**8.676**	**18.29**
	(0.081)	**(0.013)**	**(0.096)**	**(0.000)**	**(0.012)**		**(0.032)**	**(0.035)**	**(0.000)**	**(0.009)**	**(0.034)**	**(0.001)**	**(0.013)**	**(0.000)**
Δ*lr*	**5.355**	3.529	0.540	0.248	0.681	0.996		2.073	3.591	0.103	0.480	2.426	0.009	1.260
	(0.069)	(0.171)	(0.763)	(0.883)	(0.712)	(0.608)		(0.355)	(0.166)	(0.950)	(0.787)	(0.297)	(0.995)	(0.533)
Δ*fd*	**6.384**	**11.26**	**8.648**	**17.28**	3.208	**13.04**	**8.841**		**12.37**	4.137	**14.61**	2.633	**22.35**	**13.83**
	(0.041)	**(0.004)**	**(0.013)**	**(0.000)**	(0.201)	**(0.002)**	**(0.012)**		**(0.002)**	(0.126)	**(0.001)**	(0.268)	**(0.000)**	**(0.001)**
Δ*vac*	**4.586**	**4.846**	1.079	1.463	**4.733**	4.011	**4.934**	3.837		0.743	0.892	3.967	1.492	1.341
	(0.101)	**(0.089)**	(0.583)	(0.481)	**(0.094)**	(0.135)	**(0.085)**	(0.147)		(0.690)	(0.640)	(0.138)	(0.474)	(0.512)
Δ*psav*	**4.735**	1.577	0.834	0.044	0.841	0.162	1.104	0.088	0.887		**5.824**	0.838	0.197	0.527
	(0.094)	(0.455)	(0.659)	(0.978)	(0.657)	(0.922)	(0.576)	(0.957)	(0.642)		**(0.054)**	(0.658)	(0.906)	(0.768)
Δ*k*	**16.13**	1.033	1.109	1.159	**8.353**	0.715	**15.54**	1.207	1.767	3.828		3.433	1.874	1.269
	(0.000)	(0.597)	(0.574)	(0.560)	**(0.015)**	(0.700)	**(0.000)**	(0.547)	(0.413)	(0.148)		(0.180)	(0.392)	(0.530)
Δ*l*	**13.95**	1.684	1.287	1.411	4.486	0.310	1.502	2.082	1.319	1.257	0.033		0.181	0.633
	(0.001)	(0.431)	(0.526)	(0.494)	(0.106)	(0.856)	(0.472)	(0.353)	(0.517)	(0.533)	(0.984)		(0.914)	(0.729)
Δ*fdi*	**5.359**	0.922	**13.90**	0.791	**7.089**	1.265	1.959	0.448	2.324	1.327	2.613	2.960		**4.544**
	(0.069)	(0.631)	**(0.001)**	(0.673)	**(0.029)**	(0.531)	(0.376)	(0.800)	(0.313)	(0.515)	(0.271)	(0.228)		**(0.103)**
Δ*ti*	0.249	2.852	2.141	2.133	1.269	1.687	1.370	**14.56**	1.692	2.935	2.735	1.025	**4.969**	
	(0.883)	(0.240)	(0.343)	(0.344)	(0.530)	(0.430)	(0.504)	**(0.001)**	(0.429)	(0.231)	(0.255)	(0.599)	**(0.083)**	

Note: Values in parenthesis are probability values. The bolded values are found statistically significant at 1%, 5% and 10% significance level

Source: Authors' computation (2021)

Table 3. Long-run Granger Causality Results based on TYDL Procedure and VAR

Dependent Variables	**Results based on Augmented VAR Model (TYDL Procedure) (Modified Wald-statistics)**													
	Independent Variables													
	iy	***gef***	***rqv***	***rlw***	***ccn***	***cim***	***lr***	***fd***	***vac***	***psav***	***k***	***l***	***fdi***	***ti***
ly		**7.088**	3.873	0.296	**7.425**	3.517	1.633	**14.12**	**12.55**	2.110	**7.889**	**17.21**	1.121	2.478
		(0.029)	(0.144)	(0.862)	**(0.024)**	(0.172)	(0.442)	**(0.001)**	**(0.002)**	(0.348)	**(0.019)**	**(0.000)**	(0.571)	(0.290)
Gef	**6.192**		**17.957**	0.973	**8.642**	**34.06**	**21.33**	**11.63**	**8.658**	**14.74**	1.091	**22.91**	**6.359**	3.068
	(0.045)		**(0.000)**	(0.615)	**(0.013)**	**(0.000)**	**(0.000)**	**(0.003)**	**(0.013)**	**(0.001)**	(0.579)	**(0.000)**	**(0.042)**	(0.216)
rqv	**38.43**	**17.52**		**10.04**	**16.60**	1.335	**14.25**	1.089	2.577	**10.72**	**16.62**	**23.69**	**7.663**	**5.927**
	(0.000)	**(0.000)**		**(0.007)**	**(0.000)**	(0.513)	**(0.001)**	(0.580)	(0.276)	**(0.005)**	**(0.000)**	**(0.000)**	**(0.022)**	**(0.052)**
rlw	0.640	**5.114**	1.065		**7.369**	3.944	**5.372**	4.399	3.885	0.663	**4.716**	**5.164**	3.501	**8.713**
	(0.726)	**(0.078)**	(0.587)		**(0.025)**	(0.139)	**(0.068)**	(0.111)	(0.143)	(0.718)	**(0.095)**	**(0.076)**	(0.174)	**(0.013)**
ccn	**7.390**	**36.13**	**7.039**	**37.78**		**7.568**	1.168	**17.27**	0.605	**6.515**	**23.24**	**9.701**	**17.80**	**18.58**
	(0.025)	**(0.000)**	**(0.030)**	**(0.000)**		**(0.023)**	(0.558)	**(0.000)**	(0.739)	**(0.039)**	**(0.000)**	**(0.008)**	**(0.000)**	**(0.000)**
cim	0.350	**7.823**	3.425	0.726	1.148		0.112	**7.785**	0.938	0.234	1.967	0.607	3.770	2.893
	(0.839)	**(0.020)**	(0.180)	(0.696)	(0.563)		(0.946)	**(0.020)**	(0.626)	(0.890)	(0.374)	(0.738)	(0.152)	(0.235)
lr	3.103	4.431	2.593	2.675	3.333	0.685		**8.818**	0.234	0.794	**10.37**	1.110	3.395	**13.19**
	(0.212)	(0.109)	(0.274)	(0.263)	(0.189)	(0.710)		**(0.012)**	(0.890)	(0.672)	**(0.006)**	(0.574)	(0.183)	**(0.001)**
fd	**7.244**	**20.85**	2.138	**35.33**	**12.81**	**32.37**	3.649		**10.04**	**22.05**	**40.83**	**17.09**	**5.998**	**13.84**
	(0.027)	**(0.000)**	(0.343)	**(0.000)**	**(0.002)**	**(0.000)**	(0.161)		**(0.007)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.050)**	**(0.001)**
vac	**14.978**	**19.58**	**10.115**	3.590	**5.068**	**15.66**	4.376	13.10		**7.793**	0.079	**10.98**	1.558	**9.608**
	(0.001)	**(0.000)**	**(0.006)**	(0.166)	**(0.079)**	**(0.000)**	(0.112)	(0.001)		**(0.020)**	(0.962)	**(0.004)**	(0.459)	**(0.008)**
psav	**8.377**	**7.816**	**9.829**	3.845	**13.66**	**4.581**	**19.11**	1.177	1.243		**6.258**	1.022	**6.499**	3.755
	(0.015)	**(0.020)**	**(0.007)**	(0.146)	**(0.001)**	**(0.101)**	**(0.000)**	(0.555)	(0.537)		**(0.044)**	(0.600)	**(0.039)**	(0.153)
k	**53.37**	**8.218**	**9.067**	3.947	**14.88**	**11.53**	**52.76**	4.466	2.386	**21.70**		**5.689**	1.387	**10.57**
	(0.000)	**(0.016)**	**(0.011)**	(0.139)	**(0.001)**	**(0.003)**	**(0.000)**	(0.107)	(0.303)	**(0.000)**		**(0.058)**	(0.500)	**(0.005)**
l	**4.748**	**4.816**	1.261	1.656	3.940	0.085	1.235	3.860	1.028	0.340	3.708		0.146	1.012
	(0.093)	**(0.090)**	(0.532)	(0.437)	(0.140)	(0.958)	(0.539)	(0.145)	(0.598)	(0.844)	(0.157)		(0.930)	(0.603)
fdi	**38.95**	3.995	**39.65**	0.057	**46.08**	**9.956**	**26.65**	**11.92**	**20.96**	**8.566**	**11.55**	**28.57**		**32.47**
	(0.000)	(0.136)	**(0.000)**	(0.972)	**(0.000)**	**(0.007)**	**(0.000)**	**(0.003)**	**(0.000)**	**(0.014)**	**(0.003)**	**(0.000)**		**(0.000)**
ti	**9.932**	26.59	**9.218**	**17.987**	**43.26**	**7.923**	**55.50**	**50.99**	**13.04**	4.566	2.372	**11.48**	**10.01**	
	(0.007)	0.000	**(0.010)**	**(0.000)**	**(0.000)**	**(0.019)**	**(0.000)**	**(0.000)**	**(0.002)**	(0.102)	(0.306)	**(0.003)**	**(0.007)**	

Note: Values in parenthesis are probability values. The bolded values are found statistically significant at 1%, 5% and 10% significance level.

Source: Authors' computation (2021)

5. CONCLUSION

This study investigates the effects of institutional quality on industrial sector growth in Nigeria using quarterly derived data from 1996 to 2018. We found that none of the institutional quality variables have a causal effect on industrial output growth, whereas feedback was reported in the short run. In the long run, a bi-causal relationship was reported from government effectiveness, control of corruption, financial deepening, and voice & accountability to industrial growth. However, a uni-direction relation was found running from industrial growth to regulatory quality and political stability, and absence of violence. More so, a causal relation existed from rule of law and lending rate to industrial output growth. The study revealed found that capital and labour force have bi-causal relations with industrial output growth, while a one-way causal relation was reported from industrial output growth to FDI and trade intensity. Thus, there is a need for the government to intensify efforts towards improving the extent people can challenge her power and authority because these play significant roles in the development level of Nigerian industries. This is because limiting the power of executives with the purpose of challenging their policies and actions are the necessary determinants of industrial sector growth. Also, there is a need to control unstable political structure and violence because the political atmosphere of the country plays a major role in the growth process of Nigerian industries.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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