The Asymmetric Effects of Trade Openness on Industrial Productivity and Competitiveness: Evidence from Nigeria (1986–2023)

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ABSTRACT

Purpose: This study examines the impact of trade openness on Nigeria's industrial productivity and competitiveness between 1986 and 2023.

Methodology: Annual time-series data on industrial productivity, competitiveness, trade openness, foreign direct investment, inflation and institutional quality were sourced from the National Bureau of Statistics, the World Bank's World Development Indicators, the Central Bank of Nigeria and the Worldwide Governance Indicators. Two separate Autoregressive Distributed Lag (ARDL) models were estimated to capture the distinct effects of trade openness on industrial productivity and on competitiveness, with bounds testing for cointegration and error correction modelling for short-run dynamics.

Findings: The bounds test confirms long-run cointegration in both models. Trade openness exerts a positive but statistically insignificant long-run effect on industrial productivity, while institutional quality is the only significant long-run productivity determinant. Conversely, trade openness has a significant negative long-run effect on competitiveness, alongside a significant negative effect from foreign direct investment.

Originality: The study contributes by separately modelling productivity and competitiveness as outcomes of trade openness, departing from studies that conflate the two, and by applying the ARDL bounds testing approach to a near four-decade dataset spanning Nigeria's major trade policy reforms.

Keywords: trade openness, industrial productivity, competitiveness, ARDL, Nigeria, institutional quality

INTRODUCTION

Structural transformation, that reallocation of labour and capital from low to high-productivity sectors like agriculture to manufacturing, is a common feature of sustained economic development (Timmer & Akkus, 2008; Markaki & Papadakis, 2023). This is not a natural process or a foregone conclusion, but rather a process that depends on conducive policy conditions, which need to be accompanied by the simultaneous removal of systemic barriers like poor infrastructure, low investment, and weak technological capacity (Lin, 2011; Mamba et al., 2020). In this respect, two of the most important policy tools at the disposal of developing countries are industrial policy and trade openness. Industrial policy is the overarching framework that guides governments in allocating resources, remediating market failures and developing productive capacity in high-priority industries. Trade openness, by reducing tariff barriers, promoting exports and integrating domestic markets with international markets, expands the reach of local industries and brings competitive pressures that can drive efficiency and innovation (Atoyebi et al., 2023; Omoke & Opuala-Charles, 2021). These, combined and coordinated properly, can speed the transition from primary production to industry and service. The history of the East Asian countries, including South Korea, Taiwan and Singapore, shows that a strategic policy of deliberate industrial development coupled with careful integration of trade into the economic process can create the conditions for the rapid and sustained transformation of the economy from agriculture to manufacturing (Krueger, 2020; Siregar & Widjanarko, 2022).

The Nigerian case, however, is one that is very different from this experience and which has taken many decades of policy reform. Nigeria's manufacturing sector has been underperforming when compared with its potential, even as one of Africa's five largest economies. The sector's contribution to GDP declined from 20.50% in 1986 to only 10.89% in 2023, while the tertiary sector expanded from 30.83% to 58.37% over the same period (NBS, 2024). This trajectory is a result of a growth path that does not involve industrialisation, which is known as premature de-industrialisation in the literature on development (Rodrik, 2016; Chabi & Saygılı, 2024). Nigeria has not seen significant primary to secondary sector shifts, but rather both primary and secondary sectors have contracted as a percentage of GDP, with growth coming from services that are structurally uncoupled from manufacturing.

This anomaly is the result of a complicated and sometimes confused policy landscape. The Structural Adjustment Programme (SAP) of 1986, which was introduced with the aid of the World Bank and the International Monetary Fund (IMF), was a turning point from the import substitution industrialisation (ISI) policies of the post-independence era to the policies of market liberalisation, currency devaluation, and trade openness (Bakre & Ojugbele, 2020). The removal of tariff protection caused the small domestic industries to be exposed to fierce competition from cheaper imported products, which resulted in a reduction in manufacturing volume by an estimated 10% and capacity utilisation below 40% (Umoru & Eborieme, 2013; Adegoke et al., 2020). However, further measures, such as the National Economic Empowerment and Development Strategy (NEEDS) of 2004, the Nigerian Oil and Gas Industry Content Development Act of 2010 and the National Industrial Revolution Plan (NIRP) of 2014 were implemented to boost the industrial base in various ways such as national content regulations, power and logistics infrastructure investment, and export promotion, with only moderate success from poor implementation, inadequate coordination, and insufficient complementary investment in power and logistics infrastructure (Omotayo & Odeleke, 2022; Akinlo et al., 2021).

In recent years, there has been an increasing focus on the relationship between openness and industry performance in development economics literature. Theoretically, trade liberalisation can increase productivity due to technology spillovers, imported capital goods, and competitive discipline on domestic firms (Solow, 1956; Karimu, 2019; Malefane, 2020). It is also expected to improve competitiveness in terms of opening up markets and incentivising quality upgrading to international standards (Elfaki et al., 2021). The benefits are contingent, however, on the existence of complementary conditions, absorptive capacity, functional institutions, and available human resources that can facilitate domestic firms to benefit from, not be overwhelmed by, trade integration (Gandjon-Fankem & Feyom, 2024; Omoke & Opuala-Charles, 2021). In countries where these complementary conditions are limited, trade openness can also lead to a decrease in industrial productivity, as local industries are replaced by foreign ones that offer lower prices and reduce competitiveness by making domestic industries vulnerable to foreign competitors who have scale economies and state subsidies (Adegoke et al., 2020; Chabi & Saygılı, 2024).

First, before the current study, research on Nigeria's industrial policy or trade openness has tended to be isolated in its approach, either looking at industrial policy effects on structural transformation as a whole, or at the effect of industrial policy or trade openness on specific macroeconomic outcomes like GDP growth. This methodology lumps together the impact of trade openness on industrial efficiency, productivity, and international market performance and competitiveness, thus missing out on important distinctions between these impacts. If the trade policy regime does not help to increase the efficiency of domestic firms in using their factors of production, it will still impact positively or negatively on the proportion of manufactured goods in Nigeria's export basket. On the other hand, productivity improvements can be met by negative output effects that result from exchange rate overvaluation, weak institutional capacity, or bad infrastructure, which decreases competitiveness. It is crucial to separate these two dimensions to explain the inefficiencies and lack of competitiveness of Nigeria's manufacturing sector in the wake of repeated rounds of trade liberalisation.

This study thus aims at more comprehensive research on industrial policy, trade openness and structural transformation in Nigeria; to examine the effect of trade openness on industrial productivity and competitiveness of Nigeria from 1986 to 2023. Two separate Autoregressive Distributed Lag (ARDL) models are estimated, one for industrial productivity (measured by manufacturing output per worker) and one for competitiveness (measured by the ratio of manufacturing exports to total exports), both using the bounds testing methodology of Pesaran, Shin and Smith (2001). Such an empirical evaluation provides an opportunity to test the theoretical

benefits of trade openness for Nigeria's manufacturing sector, and to determine the role of complementary factors, in particular institutional quality, foreign direct investment and macroeconomic stability, in the process. It is a specific timeframe of 1986–2023 that covers the entire experience of Nigeria's implementation of the SAP and the operationalisation of the African Continental Free Trade Area (AfCFTA) and hence offers a near four-decade window for studying the long-run impacts of the policy.

The remainder of this article is structured as follows. The next section reviews the theoretical and empirical literature on trade openness, industrial productivity and competitiveness, situating the study within the existing body of knowledge. The methodology section describes the data, model specifications and estimation procedure. The results section reports and explains the results of the ARDL bounds tests, the long run coefficient estimates, the error correction models and diagnostic tests. The discussion section outlines the findings in the light of the wider literature, while the conclusion outlines the major policy implications.

LITERATURE REVIEW

Theoretical Review

Neo-Classical Growth Theory and Endogenous Growth Theory

The Neo-Classical Growth Theory, formalised by Solow (1956) through the Cobb-Douglas production function $Y = AK^{\alpha}L^{1-\alpha}$, provides the primary theoretical foundation for the study of trade openness and industrial productivity. Within this framework, technological progress (A) is the key driver of sustained per capita growth, and trade openness is theorised as a channel for raising A by facilitating the diffusion of foreign technologies, management practices, and production techniques (Solow, 1999; Karimu, 2019). The theory suggests that by allowing greater access to capital goods and the ability to learn from foreign competition, the total factor productivity of domestic firms can be increased through trade liberalisation. In Nigeria's context, the expectation was the trigger for the SAP's trade liberalisation programme, which assumed that liberalisation would increase industrial efficiency. But as Akinlo et al. (2021) and Umoru and Eborieme (2013) have shown, the expected convergence did not materialise due to Nigeria's failure to have the absorptive capacity, measured in human capital, institutional quality and complementary infrastructure, to absorb and convert market exposure into a real productivity gain. The neo-classical framework therefore establishes a condition for the increase in industrial productivity due to trade openness: the absorptive conditions.

The neoclassical model was extended by endogenous growth theory developed by Romer (1994) and Aghion et al. (1998), which considers technological progress as an endogenous result of conscious investments in knowledge, human capital and research and development. This theory is relevant to the topic of openness of trade in that it predicts that openness to foreign markets boosts long run growth not simply by technology transfers, but by the process of knowledge capital accumulation that results from continuous exposure to foreign ideas, innovations and pressures. The endogenous growth view suggests that trade openness improves export performance by generating dynamic comparative advantages in knowledge-intensive sectors where trade is unrestricted. The theory's focus on the creation of human capital and R&D investment is congruent with the finding of this study, which shows that, unlike the level of trade openness, institutional quality is what determines the extent to which productivity gains are achieved because institutional effectiveness sets the place where knowledge is accumulated (Omoke & Opuala-Charles, 2021; Gandjon-Fankem & Feyom, 2024).

Structuralist Economics and Strategic Trade Theory

Structuralist Economics, rooted in the contributions of Hirschman (1958) and Lin (2011), offers a complementary but more sceptical perspective on the relationship between trade openness and industrial performance. Structuralists contend that in economies with limited industrial capacity and weak inter-sectoral linkages, such as Nigeria, trade openness without supporting industrial policy can aggravate structural vulnerabilities rather than resolve them. The liberalisation of imports may displace developing domestic industries before they reach the scale economies and technological maturity to compete in the international market, thus resulting in deindustrialisation instead of productivity. The structuralist theory would best be applied in this study to explain the competitiveness outcomes of trade openness, as this theory holds that

unmanaged openness would hurt export competitiveness in underdeveloped industrial economies, as observed in this study for Nigeria (Chabi & Saygılı, 2024; Madichie et al., 2018).

Krugman (1986) and others have developed the Strategic Trade Theory, an alternative paradigm to the free trade model which suggests that government intervention can provide first-mover advantages and create long-run gains in competitiveness which free markets cannot achieve in industries where imperfect competition and increasing returns to scale prevail. The theory suggests that the best situation for trade openness is for domestic industries to be developed first to a competitive level, using targeted subsidies and export incentives and protecting them from early competition from foreign producers, before being opened to the global market. The Export Expansion Grant (EEG) scheme and a few sector-specific incentives as experienced in Nigeria also have some features of this strategy, but they were inadequate due to poor implementation and lack of supporting measures (Ajayi & Araoye, 2019). Thus, the theory offers a theoretical justification of the outcome of openness of trade to decrease and not increase the competitiveness of manufacturing in Nigeria, because falling short of support from the industrial sector, liberalisation has thrown domestic firms at competition they are structurally inadequate for absorbing.

Empirical Evidence

Trade Openness and Industrial Productivity

The empirical evidence on trade openness and industrial productivity in Nigeria is unanimous, and the benefits of liberalisation have not come true. Adegoke et al. (2020) used an ARDL model for the period 1986-2015 and reported that industrial output loss following liberalisation was associated with a 10% decline, and Umoru and Eborieme (2013) employed cointegration analysis for the period 1980-2010 and found that productivity loss as a consequence of liberalisation may be attributed to a 5% loss due to subsidised imports. A similar result was reported by Kılavuz and Doğan (2021), who used regression analysis on emerging markets and reported 10% decline in industrial competitiveness due to unprotected import competition, while Omotayo and Odeleke (2022) used descriptive statistical analysis and reported a 3% productivity loss as a result of a lack of complementary export infrastructure, including reliable power, logistics and quality certification. The second strand of literature draws on the concept of weak absorptive capacity and limited spillover effects from trade integration, with Madichie, et al. (2018) reporting a negative impact of less than 1% on productivity from integration into trade using a sectoral data sample over 1990-2016, and Omoke and Opuala-Charles (2021) pointing to a 6% depressing effect of institutional weaknesses on the link between trade exposure and technology uptake from the results of their VECM analysis of 1980-2018, both of which are also corroborated in the present study, showing that the only long-run determinant of industrial productivity is institutional quality, which was found to be a statistically significant mediator. A third strand shows that the absence of complementarities in industrial policy is associated with losses in productivity, with Adeyemi and Olufemi (2020) using cointegration analysis between 1980 and 2018 finding a 12% gap in productivity between agriculture and manufacturing, due to the lack of policy, Chabi and Saygılı (2024) using ARDL panel analysis for West Africa, including Nigeria, over 1990–2020, reported a 7% productivity loss, Ojuolape and Adeniyi (2020) for the period 1980–2018 reported a 7% loss in manufacturing efficiency, and Obioma and Eke (2017) for 1980–2017 reported a 5% productivity loss directly attributed to the lack of policy support. These studies, when considered together, confirm that in most cases, liberalisation has resulted in losses of productivity ranging from 3% to 12% depending on the method and period studied, with institutional and policy factors being at the heart of the story.

Trade Openness and Industrial Competitiveness

Other literature on the impact of trade openness and industrial competitiveness in Nigeria also suggests negative impacts, with different studies assigning the costs of competitiveness loss to various reasons. Liberalisation caused a 10% loss of manufacturing output which was attributed to import competition and a direct loss of domestic market share, as predicted by Strategic Trade Theory, Adegoke et al. (2020) reported that liberalisation reduced competitiveness in such scale-intensive industries by 10% in a panel regression study; Umoru and Eborieme (2013) recorded a 5% drop in industrial output due to the negative impact of the SAP's liberalisation policies, while Ojuolape and Adeniyi (2020) attributed 7% decline in manufacturing capacity to unprotected trade exposure. The second theme is the lack of positive competitiveness-enhancing effect of trade openness

through technology transfer, which Ajayi and Araoye (2019) found to be negative, attributed to low institutional quality and governance, which they found to be a link between trade openness and productivity; Omoke and Opuala-Charles (2021) found that trade openness hurt competitiveness because the technology transfer was not made to the manufacturing sector, with the industrial sector being the main recipient of FDI; and Madichie et al. (2018) found that the competitiveness of manufacturing increased by less than 1%, despite significant fluctuations in trade openness, because they found low technology absorption capacity. The third theme is that of policy misalignment: Chabi and Saygılı (2024) found a 7% loss of competitiveness in the industrial sector resulting from the lack of coherence between trade and industrial development policy; Adeyemi and Olufemi (2020) recorded a loss of competitiveness of 12% between agriculture and manufacturing; Edeme and Karimo (2014) reported a loss of competitiveness of 5% in industrial performance, and Obioma and Eke (2017) reported a loss of competitiveness of 5%. The present study results (−0.205 for trade openness, −0.140 for FDI) fall at the low end of the range reported above and are further emphasised by its finding that trade openness has a significant negative competitiveness impact but not a significant productivity impact, a finding not emphasised in studies that combine both effects as a measure of industrial performance.

Gaps in the Literature

The foregoing review of empirical literature reveals several important gaps that justify the present study. First, the majority of studies examine the effects of trade openness on either productivity or competitiveness in isolation, or conflate the two within a single measure of industrial performance. This prevents the identification of the asymmetric dynamics documented in this study, the finding that trade openness has a negligible effect on productive efficiency but a significant negative effect on export competitiveness, which has distinct and important policy implications. Second, most existing studies for Nigeria cover the period up to 2015 or 2018 at most (Adegoke et al., 2020; Adeyemi & Olufemi, 2020), and therefore do not capture the impact of Nigeria's operationalisation of the AfCFTA from 2020, nor the full long-run trajectory of post-SAP trade liberalisation over nearly four decades. The 1986–2023 window employed in this study provides a substantially longer and more comprehensive time series than has previously been analysed in this context. Third, while studies such as Omoke and Opuala-Charles (2021) and Gandjon-Fankem and Feyom (2024) identify institutional quality as a mediating variable in the trade-productivity relationship, none employ an ARDL framework that allows simultaneous estimation of long-run and short-run dynamics for both productivity and competitiveness with institutional quality as a regressor alongside trade openness and FDI. The ARDL bounds testing approach adopted here directly addresses this gap, enabling a more rigorous identification of the conditioning role of institutions. Fourth, the separate treatment of FDI as a distinct determinant of competitiveness, alongside trade openness, is relatively rare in the Nigeria-specific literature, yet the finding that FDI exerts a significant negative long-run effect on competitiveness alongside trade openness is a substantively important result that warrants separate attention and is not captured by studies that either exclude FDI or treat it as a component of trade flows rather than as an independent variable.

METHODS

Data

Data for the years 1986–2023 were averaged over the year. Industrial productivity (IPRO) is proxied by manufacturing output per worker (logged), and competitiveness (CP) is proxied by the percentage of manufacturing exports in total exports. Trade openness (TO) is defined as the ratio of trade to GDP. Foreign direct investment (FDI) is represented by net FDI inflows divided by GDP; inflation (INF) is the annual percentage change in the consumer price index; and institutional quality (INST) is a gauge of governance effectiveness from the Worldwide Governance Indicators. The National Bureau of Statistics (NBS), the World Bank's World Development Indicators (WDI), the Central Bank of Nigeria (CBN) Statistical Bulletin and the International Country Risk Guide were the sources of data. Descriptions for the variables are summarised in Table 3.1.

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Table 3.1: Variable Descriptions

Variable	Symbol	Measurement	Justification / Role	Data Source
Industrial Productivity	logIPRO	Log of manufacturing output per worker (manufacturing output in million Naira ÷ manufacturing employment)	Reflects efficiency gains from trade openness via technology spillovers and imported inputs	NBS Nigeria
Competitiveness	CP	Share of manufacturing exports in total exports (%)	Measures export market performance and international competitive positioning	World Bank WDI
Trade Openness	TO	Trade-to-GDP ratio (%)	Mediates productivity through spillovers; risks deindustrialisation without complementary policies	World Bank WDI
Foreign Direct Investment	FDI	Net FDI inflows (% of GDP)	Expected to inject capital and technology, boosting productivity and competitiveness	World Bank WDI
Inflation	INF	Annual change in Consumer Price Index (%)	Controls for macroeconomic stability; ambiguous effect on productivity and competitiveness	CBN Statistical Bulletin
Institutional Quality	INST	Governance effectiveness index	Better governance supports productivity and competitiveness through policy stability	International Country Risk Guide

Source: Author's compilation, 2026

Model Specification and Method of Analysis

Following Pesaran *et al.* (2001), two ARDL models were specified to separately capture the effect of trade openness on industrial productivity and on competitiveness:

$$logIPRO_t = f(TO_t, FDI_t, INF_t, INQ_t) \quad (3.1)$$

$$CP_t = f(TO_t, FDI_t, INF_t, INQ_t) \quad (3.2)$$

The ARDL model for logIPRO in equation 3.3 below examines how TO influences manufacturing output per worker, reflecting efficiency gains or losses due to trade exposure:

$$\Delta logIPRO_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta logIPRO_{t-i} + \sum_{i=0}^{q} \beta_{2i} \Delta TO_{t-i} + \sum_{i=0}^{r} \beta_{3i} \Delta FDI_{t-i} + \sum_{i=0}^{w} \beta_{4i} \Delta INF_{t-i} + \sum_{i=1}^{v} \beta_{5i} \Delta INST_{t-i} + \delta_1 logIPRO_{t-1} + \delta_2 TO_{t-1} + \delta_3 FDI_{t-1} + \delta_4 INF_{t-1} + \delta_5 INST_{t-1} + \varepsilon_t \quad (3.3)$$

The ARDL model for CP in equation 3.4 below examines how TO influences the share of manufacturing exports, reflecting Nigeria's ability to compete in global markets:

$$CP_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta CP_{t-i} + \sum_{i=0}^{q} \beta_{2i} \Delta TO_{t-i} + \sum_{i=0}^{r} \beta_{3i} \Delta FDI_{t-i} + \sum_{i=0}^{w} \beta_{4i} \Delta INF_{t-i} + \sum_{i=1}^{v} \beta_{5i} \Delta INST_{t-i} + \delta_1 CP_{t-1} + \delta_2 TO_{t-1} + \delta_3 FDI_{t-1} + \delta_4 INF_{t-1} + \delta_5 INST_{t-1} + \varepsilon_t \quad (3.4)$$

For both models, the Wald or F-statistic tests for long-run cointegration by restricting one-period lagged levels to zero ($\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$). If the F-statistic exceeds the upper-bound critical value, cointegration is confirmed, rejecting the null of no cointegration (Pesaran *et al.,* 2001). Upon cointegration, equations 3.5 and 3.6 below are estimated as the long-run models:

$$logIPRO_t = \theta_0 + \theta_1 TO_{t-1} + \theta_2 FDI_{t-1} + \theta_3 INF_{t-1} + \theta_4 INST_{t-1} + \mu_t \quad (3.5)$$

$$CP_t = \theta_0 + \theta_1 TO_{t-1} + \theta_2 FDI_{t-1} + \theta_3 INF_{t-1} + \theta_4 INST_{t-1} + \mu_t \quad (3.6)$$

The Error Correction Models (ECMs) capture short-run dynamics for each model in equations 3.7 and 3.8

$$\Delta logIPRO_t = \varphi_0 + \sum_{i=1}^{p} \varphi_{1i} \Delta logIPRO_{t-i} + \sum_{i=0}^{q} \varphi_{2i} \Delta TO_{t-i} + \sum_{i=0}^{r} \varphi_{3i} \Delta FDI_{t-i} + \sum_{i=0}^{w} \varphi_{4i} \Delta INF_{t-i} + \sum_{i=1}^{v} \varphi_{5i} \Delta INST_{t-i} + \lambda ECM_{t-1} + v_t \quad (3.7)$$

$$\Delta CP_t = \varphi_0 + \sum_{i=1}^{p} \varphi_{1i} \Delta CP_{t-i} + \sum_{i=0}^{q} \varphi_{2i} \Delta TO_{t-i} + \sum_{i=0}^{r} \varphi_{3i} \Delta FDI_{t-i} + \sum_{i=0}^{w} \varphi_{4i} \Delta INF_{t-i} + \sum_{i=1}^{v} \varphi_{5i} \Delta INST_{t-i} + \lambda ECM_{t-1} + v_t \quad (3.8)$$

The ARDL bounds testing approach was chosen for its robustness to small samples and its capacity to accommodate variables that are a mixture of I(0) and I(1), avoiding the spurious regression problems associated with non-stationary time series. For each model, the bounds F-test examines whether the lagged levels of the variables are jointly significant; where cointegration is established, long-run coefficients are estimated, followed by an Error Correction Model (ECM) capturing short-run dynamics and the speed of adjustment to long-run equilibrium.

RESULTS AND DISCUSSION

Descriptive Statistics

The descriptive statistics of the variables used for both models are provided in Table 4.1. The mean of the industrial productivity index for the period under study is 1.6054, and the range is from 1.2840 to 1.9078, showing that the dispersion of manufacturing output per worker is relatively small. Nigeria's average openness was recorded at 25.62% of GDP, which is in the range of 17.85% and 30.60%, representing moderate and progressive integration into global markets over the various regimes of trade policies. The variability of inflation is an outlier with a maximum of 72.84% and a mean of 19.31%, which is indicative of the macroeconomic

volatility which Nigerian economy has been experiencing over the years, with its positive skewness of 1.8175 and leptokurtic distribution (kurtosis of 5.2319) indicating periods of extreme inflationary spikes and the Jarque-Bera statistic of 28.8083 and probability of 0.00001 rejecting the normality distribution of the variable. The governance environment is quite stable (but still low) in terms of institutional quality, with a standard deviation of 0.0965, and moderately variable in terms of FDI inflows (average of 1.55% of GDP). All variables, other than inflation, have Jarque-Bera probabilities above 5%, suggesting that most of the series are reasonably close to normality and can be used in the ARDL framework.

Table 4.1: Descriptive Statistics

	IPRO	TO	INF	INST	FDI
Mean	1.6054	25.6197	19.3121	-1.0427	1.5532
Median	1.6116	26.8000	12.9450	-1.0295	1.3000
Maximum	1.9078	30.6000	72.8400	-0.8479	5.5200
Minimum	1.2840	17.8500	5.3800	-1.2132	-2.3400
Std. Dev.	0.1886	3.7914	16.7136	0.0965	1.5752
Skewness	-0.0673	-0.6285	1.8175	-0.0137	0.3219
Kurtosis	1.7949	2.1951	5.2319	2.2048	3.5014
Jarque-Bera	2.3280	3.4346	28.8083	0.7386	1.0544
Probability	0.3122	0.1796	0.00001	0.6912	0.5903

Source: Author's computation, 2026

Note: Competitiveness (CP) records a mean of 2.7097, median of 2.6350, maximum of 3.4700, minimum of 2.1800 and standard deviation of 0.3273; the remaining series (TO, INF, INST, FDI) are identical across both models.

Unit Root Tests

The order of integration of the series was determined using the Phillips-Perron and Augmented Dickey-Fuller tests. The results show that the variables of institutional quality and inflation are stationary at level and classified as I(0), while industrial productivity, trade openness, competitiveness and FDI are stationary at level but not at a higher order of differencing and are classified as I(1). There is no variable of order two, which justifies the bounds testing of the ARDL model (Pesaran et al., 2001). The Phillips-Perron and the Augmented Dickey-Fuller results are consistent with the same orders of integration for both specifications, adding to the confidence in the orders of integration and supporting the application of ARDL to both models.

Cointegration Results: Industrial Productivity Model

The bounds testing results for the industrial productivity model are shown in Table 4.2. The computed F statistic of 7.237966 is greater than the critical values at all conventional significance levels with four regressors, for the 10% critical value of 4.06, 5% critical value of 4.57, the 2.5% critical value of 5.07 and 1% critical value of 5.72. This implies that there is strong evidence against the null hypothesis of no cointegration, which shows that over 1986-2023, there is a long-run relationship between industrial productivity, trade openness, foreign direct investment, inflation and institutional quality. This outcome warrants the use of ARDL estimation of the long-run coefficients as well as the error correction model.

Table 4.2: Co-integration Test Result (ARDL Bounds Testing Technique)

Bounds test result		
F-statistic	**No. of Regressors (K)**	
7.237966	4	
Significance	**I(0)**	**I(1)**
10%	3.03	4.06
5%	3.47	4.57

2.5%	3.89	5.07
1%	4.40	5.72

Source: Author's computation, 2026

Long-Run and Short-Run Estimates: Industrial Productivity

The long-run estimates in Table 4.3 indicate that trade openness has a positive coefficient of 0.000805, but it is not statistically significant (p = 0.1503). This shows that the potential gains that might come from trade liberalisation, via technology spillovers, importation of inputs and competitive pressure, have not been realised to a significant extent for Nigeria's manufacturing sector during the study period. FDI also has a positive, although statistically not significant, coefficient (0.000541, p = 0.5705), which may indicate that FDI inflows have not led to productivity increases, possibly due to low absorptive capacity, less linkage with foreign firms, or the focusing of FDI in sectors that do not have significant spillovers to manufacturing. The coefficient of inflation is also very low (8.18E-06) and insignificant (p = 0.9545). The only variable that has a statistically significant long-run effect is institutional quality, with a value of 0.013076 (p = 0.0225) significant at the 5% level, which implies that a one-unit increase in institutional quality results in an increase of 1.31% of industrial productivity.

The error correction model in Table 4.4 shows a CointEq(-1) coefficient of -0.318547, which is negative and statistically significant at the 1% level (t = -7.031567). This indicates that about 31.85% of any disequilibrium in industrial productivity is corrected within a year, reflecting a moderate adjustment speed. The short-run trade openness dynamics are complex: positive and significant effects are observed for both the current period (D(TO) = 0.000270) and the first lag (D(TO(-1)) = 0.000318), while the second lag exhibits a sharp negative effect (D(TO(-2)) = -0.001205). This suggests that initial productivity gains from trade openness are later offset. The short-run impact of FDI remains negative across the current period and both lagged periods, indicating possible market displacement or adjustment costs for domestic firms. The model fits the data very well, with an R-squared of 0.997217, an adjusted R-squared of 0.990857, and an F-statistic of 156.7905 (p-value = 0.000000).

Table 4.3: Estimated Long-Run Coefficients

Dependent Variable: Industrial Productivity (logIPRO)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.413710	0.244660	1.690957	0.1894
@TREND	0.005262	0.003058	1.720637	0.1838
TO	0.000805	0.000419	1.922157	0.1503
FDI	0.000541	0.000852	0.635107	0.5705
INF	8.18E-06	0.000132	0.061990	0.9545
INST	0.013076**	0.003010	4.344855	0.0225

Source: Author's computation, 2026
Notes: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%.

Table 4.4: Error Correction Model (ECM) Estimates

Dependent Variable: Industrial Productivity (logIPRO)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.413710	0.057381	7.209887	0.0055
@TREND	0.005262	0.000755	6.968868	0.0061
D(LOGIPRO(-1))	0.484550	0.066643	7.270866	0.0054
D(LOGIPRO(-2))	-0.088087	0.052640	-1.673365	0.1928
D(LOGIPRO(-3))	0.202000	0.047852	4.221347	0.0243
D(TO)	0.000270***	3.58E-05	7.523890	0.0049
D(TO(-1))	0.000318***	3.62E-05	8.800504	0.0031

D(TO(-2))	-0.001205***	0.000121	-9.958506	0.0022
D(FDI)	-0.000196***	3.36E-05	-5.843928	0.0100
D(FDI(-1))	-0.000384***	2.86E-05	-13.43043	0.0009
D(FDI(-2))	-0.000168***	2.76E-05	-6.101398	0.0088
D(INF)	-4.23E-05***	7.55E-06	-5.606435	0.0112
D(INF(-1))	-8.01E-05***	6.87E-06	-11.64920	0.0014
D(INST)	-2.75E-05	0.000324	-0.085092	0.9375
D(INST(-1))	0.000781	0.000501	1.559802	0.2167
D(INST(-2))	0.000548	0.000243	2.254182	0.1095
CointEq(-1)***	-0.318547	0.045302	-7.031567	0.0059
R-squared: 0.997217	Mean dependent var: 0.016424			
Adjusted R-squared: 0.990857	S.D. dependent var: 0.000849			
F-statistic: 156.7905	Prob(F-statistic): 0.000000			
Durbin-Watson stat: 3.000573	Akaike info criterion: -15.81579			

Source: Author's computation, 2026
Notes: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%.

Diagnostic Tests

Table 4.5 shows some diagnostic tests, confirming the robustness of the productivity model. The Breusch-Godfrey LM test produces F-statistics of 1.471350 (2 lags, p = 0.4046) and 0.497132 (3 lags, p = 0.7489), both above the 5% threshold, indicating no serial correlation. For this, the heteroskedasticity test gives an F-statistic value of 1.758756 with a p-value equal to 0.3115, which clearly shows that the regression is homoskedastic. The results of the CUSUM and CUSUM of squares tests corroborate the structural stability during the sample period and, thus, support the findings that the detected relationships are not statistical artefacts.

Table 4.5: Results of the Diagnostic Tests

Test	F-statistic	Prob. Value	Remarks
Serial Correlation Test (2 lags)	1.471350	0.4046	No serial correlation
Serial Correlation Test (3 lags)	0.497132	0.7489	No serial correlation
Heteroskedasticity Test	1.758756	0.3115	No heteroskedasticity

Source: Author's computation, 2026

Cointegration Results: Competitiveness Model

The competitiveness model was tested with bounds as shown in Table 4.6. The computed F-statistic of 6.042627, with four regressors, exceeds the upper bound critical values at all conventional levels, 3.09 at 10%, 3.49 at 5%, 3.87 at 2.5% and 4.37 at 1%. This validates long-run cointegration between competitiveness and trade openness, foreign direct investment, inflation and institutional quality, which shows a strong long-run relationship between them, thus confirming the validity of the ARDL model used to analyse long-run stable relationships and short-run dynamics of competitiveness.

Table 4.6: Co-integration Test Result (ARDL Bounds Testing Technique)

Bounds test result		
F-statistic	**No. of Regressors (K)**	
6.042627	4	
Significance	**I(0)**	**I(1)**
10%	2.20	3.09
5%	2.56	3.49
2.5%	2.88	3.87
1%	3.29	4.37

Source: Author's computation, 2026

Long-Run and Short-Run Estimates: Competitiveness

The long-run estimates in Table 4.7 show a quite different picture than that of the productivity model. The coefficient of trade openness is found to be -0.205075, which is significant at 10% level (p = 0.0569), suggesting that competitiveness is reduced on average by 20.51% with a one-unit increase in trade openness. This implies that greater participation in global markets has made Nigeria's manufacturing export performance worse, likely due to the fact that, while export volumes have increased, domestic industries have been hit with import competition, but export capacity has not. The overall relationship with foreign investment inflows is negative, with FDI having a significant negative long-run effect (coefficient = -0.139945, p = 0.0473), meaning that the technology transfer and capacity-building spillovers that were expected have not materialised, and foreign investment inflows may have crowded out domestic firms. Inflation (-0.034452, p = 0.1528) and institutional quality (-0.299540, p = 0.7495) are both negative but statistically insignificant.

The sign of the coefficients in the error correction model in Table 4.8 is negative, with the value of the coefficient at -3.375376, and significant at the 5% level (t = -5.469985), suggesting that a disequilibrium in competitiveness is corrected by around 337.5% one year later, which is an over-adjustment, and hence very volatile short-run dynamics.

This error-correction coefficient is not necessarily a sign of model misspecification because the error-correction term can have an absolute value greater than one in the presence of oscillatory or overshooting behaviour of the underlying series, as in the case of smooth convergence (Pesaran et al., 2001). In terms of the magnitudes of the coefficients, such a value indicates that Nigeria's manufacturing exports have a strong tendency to deviate from their long-run equilibrium when shocks occur, such as when the exchange rate moves, oil prices fluctuate or government policy changes, but then quickly reset within the subsequent year. It is not uncommon in the volatile trade regime of Nigeria, where export competitiveness can fluctuate rather than adjusting incrementally over time, in a country that has a very narrow export base with a high share of commodity exports.

The first lag of trade openness has a positive and significant effect (D(TO(-1)) = 0.783432, p = 0.0323), whereas the second lag has a negative effect. The contemporaneous coefficient on FDI is negative, whereas the lagged coefficients are positive, suggesting a longer adjustment process. The model fits the data well (R-squared = 0.953116; F-statistic = 7.175011, p = 0.011159).

Table 4.7: Estimated Long-Run Coefficients

Dependent Variable: Competitiveness (CP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	27.92723	15.67824	1.781274	0.2168
@TREND	0.072085	0.090415	0.797272	0.5089
TO	-0.205075*	0.051123	-4.011387	0.0569
FDI	-0.139945**	0.031558	-4.434563	0.0473
INF	-0.034452	0.015280	-2.254752	0.1528
INST	-0.299540	0.818521	-0.365953	0.7495

Source: Author's computation, 2026
Notes: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%.

Table 4.8: Error Correction Model (ECM) Estimates

Dependent Variable: Competitiveness (CP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	27.92723**	5.188804	5.382210	0.0328
@TREND	0.072085**	0.012357	5.833724	0.0281
D(CP(-1))	1.943502**	0.433282	4.485533	0.0463
D(CP(-2))	0.311553	0.175988	1.770309	0.2187

D(CP(-3))	0.476196*	0.161131	2.955336	0.0980
D(TO)	0.170985	0.059378	2.879575	0.1024
D(TO(-1))	0.783432**	0.144416	5.424830	0.0323
D(TO(-2))	-0.357776	0.164554	-2.174212	0.1617
D(FDI)	-0.116204*	0.035745	-3.250891	0.0830
D(FDI(-1))	0.198227*	0.057891	3.424154	0.0757
D(FDI(-2))	0.112781*	0.034533	3.265908	0.0823
D(INF)	-0.018319	0.009877	-1.854696	0.2048
D(INF(-1))	0.086340**	0.015847	5.448187	0.0321
D(INF(-2))	0.046758**	0.010479	4.462042	0.0467
D(INST)	0.063671	0.297365	0.214118	0.8503
D(INST(-1))	0.939792	0.453829	2.070808	0.1742
D(INST(-2))	-0.390018	0.291768	-1.336737	0.3131
CointEq(-1)**	-3.375376	0.617072	-5.469985	0.0318
R-squared: 0.953116	Mean dependent var: 0.009167			
Adjusted R-squared: 0.820278	S.D. dependent var: 0.231440			
F-statistic: 7.175011	Prob(F-statistic): 0.011159			
Durbin-Watson stat: 3.159551	Akaike info criterion: -1.691628			

Source: Author's computation, 2026
Notes: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%.

Diagnostic Tests

Table 4.9 shows that the diagnostic results reveal no evidence of serial correlation (Breusch-Godfrey LM p-values of 0.1180 and 0.1301) and no evidence of heteroskedasticity (heteroskedasticity test p = 0.5949). The parameter stability test (CUSUM) indicates that the parameters are stable within critical bounds throughout the sample period (1986–2023), while the CUSUM of squares test reveals a few excursions from the critical bounds over a portion of the sample period, which means that the short-run dynamics of the competitiveness model should be interpreted with caution.

Table 4.9: Results of the Diagnostic Tests

Test	F-statistic	Prob. Value	Remarks
Serial Correlation Test (2 lags)	14.75409	0.1180	No serial correlation
Serial Correlation Test (3 lags)	8.949778	0.1301	No serial correlation
Heteroskedasticity Test	1.059865	0.5949	No heteroskedasticity

Source: Author's computation, 2026

DISCUSSION

The results show a significant non-symmetric effect of trade openness on the productivity of the Nigerian industries and their competitiveness. Trade openness has not affected productivity significantly, but it has significantly reduced competitiveness. This divergence helps explain why, over the decades, decades of trade liberalisation, structural transformation in Nigeria hasn't resulted, despite the fact that trade integration has not appreciably increased nor decreased manufacturing efficiency in Nigeria, but it has definitely significantly reduced the sector's competitiveness in domestic and foreign markets.

The positive productivity effects of trade openness reported by Atoyebi et al. (2023), and Malefane (2020) for other developing economies are in contrast to this insignificant long-run effect, but in line with Omoke and Opuala-Charles (2021), who suggested that the relative productivity loss in Nigeria was 6%, due to poor institutional quality that limits the uptake of benefits of trade openness, and Madichie et al. (2018), who reported less than 1% productivity gain from trade liberalisation in the Nigerian manufacturing sector. The conclusion that the quality of institutions rather than the degree of openness of trade matters most for productivity lends

further support to the Gandjon-Fankem and Feyom (2024) argument that governance institutions play a crucial role in development performance for Sub-Saharan Africa.

The magnitude of the negative impact on competitiveness is consistent with the results of the studies in Nigeria by Adegoke et al. (2020), Chabi and Saygılı (2024) and Umoru and Eborieme (2013), which found losses between 5 and 10% in these countries as a result of import competition. This finding contradicts the theoretical expectations, yet supports Ajayi and Araoye (2019) and Madichie et al. (2018), who reported that foreign investment in Nigeria has failed to generate the expected spillovers in its weak institutional environment. The findings imply that trade openness has been a polarising force in Nigeria's industrial sector, with a favourable impact on manufacturing efficiency on the whole and a detrimental effect on export competitiveness, which is a very different effect than that of trade integration on the East Asian industrial sector, documented by Betts et al. (2017), where the former increased productivity and the latter increased competitiveness.

The results showing that FDI has a significant negative long-run effect on competitiveness, as well as trade openness, suggest that it should be further examined, as it contradicts the textbook view that foreign capital inflows bring technology and managerial skills to the host economy. This may be attributed to the historical concentration of FDI inflows into extractive, telecommunications and financial services sectors, as opposed to manufacturing sectors in Nigeria, thereby reducing the possibility of horizontal and vertical spillovers to industry sectors that could be export driven (Ajayi and Araoye, 2019). Foreign investment when it does come to manufacturing can also compete with domestic manufacturing firms with respect to the limited inputs available for manufacturing, such as skilled labour, foreign exchange, and infrastructure capacity, but without the transfer of export capability, as in the market-displacement channel discussed in Section 4.4. FDI inflows should therefore not be seen automatically as an alternative to an industrial policy; without a conscious FDI linkage programme, without local content requirements, or without explicit sector targeting, the positive effects of FDI on competitiveness loss due to trade openness might be null and may even be negative. This has special significance under the African Continental Free Trade Area (AfCFTA), which is projected to boost trade and investment within the continent; however, without policies that attract investment to manufacturing and improve the backward linkages of manufacturing with local suppliers, the Agreement may further replicate the trend of capital inflows without competitiveness benefits as observed in this study.

CONCLUSION

The effect of trade openness on industrial productivity and competitiveness in Nigeria (1986–2023) was investigated in this study by applying two different ARDL models. There are long-run cointegrating relationships in both models. The long-run impact of trade openness on industrial productivity is positive, although statistically non-significant; institutional quality appears to be the only statistically significant productivity determinant. In contrast, trade openness and FDI have large long-run negative impacts on competitiveness, and the short-run error correction process is unusual in terms of its speed and over-adjusting nature. The findings suggest that trade liberalisation has not been paralleled by institutional and absorptive capacity reforms to boost productivity from the integration with the world market, but rather by a level of exposure to competition that domestic producers are not prepared for. Policy measures should thus be geared towards improving institutional quality as a prerequisite for increased productivity from trade, and supportive industrial policies aimed at export expansion and FDI linking should be developed to stave off the continued decline in Nigeria's manufacturing competitiveness.

Given the unusually high error-correction coefficient derived for the competitiveness model, these results have to be interpreted in conjunction with the limitation that this study did not examine alternative model specifications. The findings should be subjected to robustness testing to see if the over adjustment dynamic observed in this study is a structural property of the manufacturing export sector in Nigeria or is a result of a few extreme years, such as using alternative lag-selection criterion, alternative proxies of competitiveness, and a structural-break or sub-sample analysis for the pre-AfCFTA (1986–2019) and post-AfCFTA (2020–2023) periods.

This analysis can be expanded to the sectoral level in future research to determine which manufacturing sub-sectors are most impacted by competitiveness losses due to trade.

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