Tax Shield and the Performance of selected Quoted Manufacturing Companies in Nigeria

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ABSTRACT

The ability of quoted companies to improve financial performance through effective tax planning remains a significant concern in Nigeria, particularly given the rising cost of doing business and the need to optimize available tax incentives. Despite the potential of tax shields to reduce taxable income and enhance corporate profitability, their contribution to the performance of quoted companies remains insufficiently established. This study therefore examines the effect of tax shields on the performance of selected companies quoted on the Nigerian Exchange Group (NGX). An ex-post facto research design was adopted, using secondary data extracted from the annual reports of 15 purposively selected firms over the period 2014–2024, yielding 165 firm-year observations. Firm performance was measured by return on assets (ROA), while interest expense (INTS), debt service (DSTS), depreciation (DEPTS), amortization (AMTS) and charitable donations (CDTS) represented the tax-shield proxies. The data were analysed using pooled ordinary least squares, fixed-effects and random-effects estimators. The Levin–Lin–Chu test confirmed that all variables were stationary at level, while the Hausman test ($\chi^2 = 12.4837$, $p = 0.0285$) favoured the fixed-effects model. The regression results revealed that all five tax shields exerted positive and statistically significant effects on ROA: INTS ($\beta = 0.0169$, $p = 0.0008$), DSTS ($\beta = 0.0198$, $p = 0.0007$), DEPTS ($\beta = 0.0245$, $p = 0.0005$), AMTS ($\beta = 0.0139$, $p = 0.0021$) and CDTS ($\beta = 0.0115$, $p = 0.0014$). The model explained 80.41% of the variation in ROA (adjusted $R^2 = 0.7883$; $F = 49.6624$, $p < 0.001$). Depreciation tax shield recorded the largest coefficient, whereas charitable donation tax shield had the smallest. The study concludes that both debt-based and non-debt-based tax shields significantly enhance the financial performance of quoted companies in Nigeria. It recommends that corporate managers incorporate strategic tax-shield planning into financing and investment decisions, while policymakers maintain clear and stable provisions for capital allowances, interest deductibility and charitable donation relief.

Keywords: *Tax shield; Interest expense tax shield; Depreciation tax shield; Firm performance; Return on assets; Nigerian Exchange Group*

1. INTRODUCTION

Taxation is a major fiscal policy tool through which governments mobilise revenue to grow the economy (Abata, 2014; Appah, 2010). In Nigeria, registered companies are required by law to pay income tax on their taxable profits, which makes tax a significant expense for businesses (Adeyemi & Adekunle, 2018). Tax shielding therefore becomes important because it lessens the effect of taxes on profit and, in turn, on the value of the business. Just as employee commitment is significant to the very survival of companies (Akpoyibo & Isaac, 2021), so is tax shield to tax payers. Tax shield refers to the lawful strategies taxpayers use to arrange their affairs so that their tax obligations are reduced. It takes advantage of the allowances, exemptions and reliefs provided in tax law to lower or reschedule tax payments within the limits of the law. Because no tax legislation requires citizens or companies to pay more than is necessary, taxpayers have a legitimate reason to study the relevant provisions and minimise what they pay to the tax authorities, while the government penalises those who cross the line into evasion. This suggests that businesses are increasingly embracing transparency, accountability, and compliance with disclosure requirements as essential practices for promoting effective corporate governance (Otuya & Akpoyibo, 2022).

Corporate managers act on behalf of shareholders, and their central responsibility is to maximise the worth of the firm. A rising shareholder value signals that the business is doing well and that owners' wealth is growing. Managers are therefore advised to treat tax shields as a critical investment and financing consideration when seeking to raise firm value (Samuel et al. 2023; Udosen & Akpan, 2024; Charles & Uford, 2023; Itiveh & Omoye, 2023). Tax shields arise from several sources. Interest payments on debt are generally tax-deductible, thereby reducing the effective cost of borrowing and creating a debt tax-shield benefit. This aligns with the static trade-off theory, which suggests that firms with higher tax liabilities have greater incentives to employ debt financing to maximise the tax advantages of interest deductibility. Non-debt tax shields, such as depreciation and amortization, reduce taxable income without any borrowing, and firms with more non-debt shields are likely to use less debt. Charitable donations, where allowed as a deduction, also lower taxable income while enhancing a firm's public image. Despite the strategic importance of tax shields, firms vary considerably in their utilization of available tax-deductible provisions, while empirical findings on the extent to which such tax benefits translate into improved corporate performance remain inconclusive. Studies in different countries report positive, negative and insignificant effects. This study contributes to the debate by examining five distinct tax shields (interest expense, debt service, depreciation, amortization and charitable donation) in a single panel framework for quoted companies on the Nigerian Exchange Group (NGX).

According to Ibanga (1997), the effect of tax shields on firm worth is readily apparent in most developed economies with effective tax rules and adequate oversight. The situation in Nigeria is different. Although Nigerian tax legislation encourages businesses to use debt financing and other permissible deductions, it remains unclear how many firms actually take advantage of these opportunities. Few studies have examined how the interest expense, debt service, depreciation, amortization and charitable donation tax shields jointly affect performance, see Samuel et al. 2023; Udosen & Akpan, 2024; Itiveh & Omoye, 2023). The findings of earlier empirical research are also inconsistent, with some studies reporting positive effects, others negative effects and others no effect at all.

Objectives, Research Questions and Hypotheses

The main objective of the study is to determine the effect of tax shields on the performance of quoted manufacturing companies in Nigeria.

The specific objectives are to:

(i) examine the effect of the interest expense tax shield on performance of quoted manufacturing companies;

(ii) investigate the effect of the debt service tax shield on performance of quoted manufacturing companies;

(iii) evaluate the effect of the depreciation tax shield on performance of quoted manufacturing companies;

(iv) determine the effect of the amortization tax shield on performance of quoted manufacturing companies; and

(v) examine the effect of the charitable donation tax shield on performance of quoted manufacturing companies.

Each objective gives rise to a research question that asks to what extent the respective tax shield affects the performance of quoted companies in Nigeria. The following null hypotheses were formulated and tat the 5% level of significance:

H_{01}: *Interest expense tax shield has no significant effect on the performance of quoted manufacturing companies in Nigeria.*

H_{02}: *Debt service tax shield has no significant effect on the performance of quoted manufacturing companies in Nigeria.*

H_{03}: *Depreciation tax shield has no significant effect on the performance of quoted manufacturing companies in Nigeria.*

H_{04}: *Amortization tax shield has no significant effect on the performance of quoted companies in Nigeria.*

H_{05}: *Charitable donation tax shield has no significant effect on the performance of quoted manufacturing companies in Nigeria.*

2. REVIEW OF RELATED LITERATURE

Conceptual Review

Tax shield and firm performance

A tax shield is a tool for lowering the taxable income of a person or business by claiming permitted deductions such as interest, depreciation, amortization and charitable contributions. These deductions either postpone income taxes to later years or reduce taxable income in a given year, thereby lowering the effective tax rate. Performance, on the other hand, is a multidimensional concept. In this study it refers to the ability of the firm to create value for its stakeholders, and it is measured with an accounting-based indicator, return on assets, which shows how efficiently assets are used to generate profit (Uford, 2017; Etim & Uford, 2019). High performance signals that the firm is profitable and is maximising the wealth of its owners. n essence, public enterprises contribute significantly to society by providing essential services, creating wealth for shareholders, and supporting socio-economic growth and overall national development (Akpoyibo, 2025).

Interest expense and debt service tax shields

The interest expense tax shield arises because interest paid on borrowed funds is deductible when taxable income is computed. It equals the interest expense multiplied by the corporate tax rate, and it lowers the cost of borrowing and raises after-tax profit and cash flow (Graham, 2000). Modigliani and Miller (1963) showed that, in the presence of corporate taxes, the value of a leveraged firm equals that of an unleveraged firm plus the present value of the interest tax shield. The debt service tax shield extends the idea to the wider tax benefits attached to debt obligations. These benefits are not unlimited. Excessive borrowing creates fixed obligations and raises the probability of financial distress, the shield is useful only to firms profitable enough to pay tax, and regulations may cap deductible interest. For these reasons the relationship between debt-related shields and performance is expected to be positive but conditional on the firm's profitability and leverage.

Depreciation and amortization tax shields

Depreciation spreads the cost of a long-lived asset over its useful life. Although accounting depreciation is generally not an allowable deduction in tax computations, tax law grants capital allowances in its place as compensation for the purchase and use of fixed assets. Depreciation and the related capital allowances are therefore a non-debt tax shield that lowers taxable income without borrowing and improves after-tax cash flows (DeAngelo & Masulis, 1980). The amortization tax shield works in the same way for intangible assets such as patents, trademarks, licences and goodwill, whose cost is allocated over their useful lives. Amortization is a non-cash charge that is predictable and scheduled, which allows firms to anticipate future tax savings and to plan their finances accordingly. Both shields depend on a firm's asset base and on its ability to generate enough taxable profit to use the deductions.

Charitable donation tax shield

The charitable donation tax shield arises from allowable deductions for corporate social responsibility spending. Two views compete. The value-enhancement view holds that corporate giving builds goodwill, customer loyalty and employee morale and may attract more lenient treatment from regulators, and so raises shareholder value. The agency view, by contrast, argues that managers may donate to pursue personal goals or enhance their own reputations at the expense of shareholders (Jensen & Meckling, 1976). Evidence on whether donations improve financial outcomes is therefore mostly circumstantial, and the net effect on performance remains an empirical question (Hasan, Singh & Kashiramka, 2021).

Conceptual framework

Figure 1 presents the conceptual framework of the study. The five tax shields are the independent variables and firm performance, measured by return on assets, is the dependent variable. Following the a priori expectation of the study, each tax shield is expected to relate positively to performance.

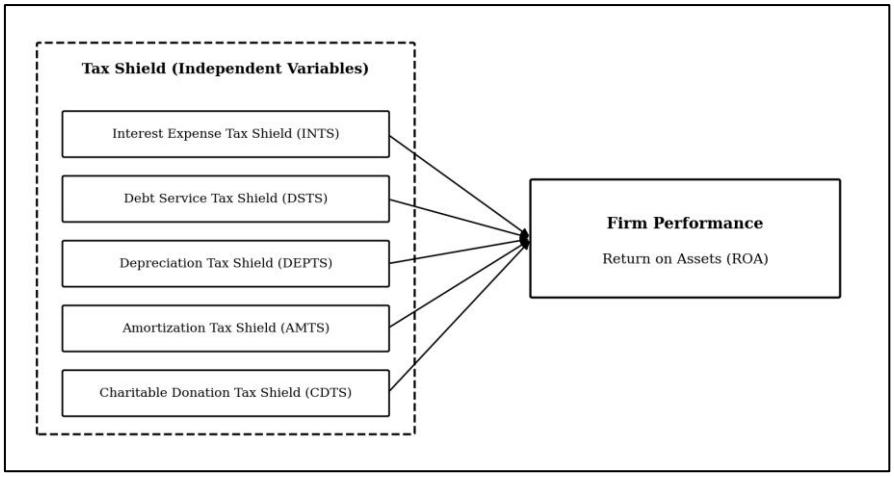


Figure 1: Conceptual framework of tax shield and the performance of selected quoted manufacturing companies in the Nigerian Exchange Group

(Source: Researchers' Conceptual Framework, 2026)

Theoretical Review

Three theories frame the study. The irrelevance theory of Modigliani and Miller (1958) holds that in perfect markets without taxes a firm's value is independent of its capital structure. When corporate taxes are introduced, however, Modigliani and Miller (1963) acknowledged that debt adds value through the interest tax shield. Agency theory (Jensen & Meckling, 1976) explains the potential conflict between managers and shareholders and offers a lens for judging whether tax-driven decisions, including donations, serve owners' interests. The trade-off theory (Kraus & Litzenberger, 1973) relaxes the assumptions of the irrelevance theory and proposes that firms balance the tax benefits of debt against the costs of financial distress and bankruptcy, so that an optimal debt level exists. Because the benefit of an additional unit of debt shrinks as leverage rises (Myers, 1977), a firm that wishes to maximise value will weigh the interest tax shield against distress costs and will also use non-debt shields such as depreciation as substitutes (DeAngelo & Masulis, 1980).

The trade-off theory is the theoretical underpinning of this study, since it directly links tax shields, financing decisions and firm value. It predicts that firms which exploit tax shields prudently will record better performance, which is consistent with the positive signs expected for all five explanatory variables.

Empirical Review

Empirical studies have examined tax shields and related tax-planning variables from several angles. Samuel, et al. (2023) investigated the effect of tax shields on the value of selected Nigerian manufacturing firms between 2012 and 2021, using loan, depreciation and charitable contribution tax shields as independent variables and Tobin's Q as the dependent variable. They found that the debt tax shield, depreciation tax shield and charitable contribution tax shield significantly affect the market value of the firms, and they advised manufacturing firms to maximise their worth through the use of implicit tax shields. Their study is the closest to the present one in variables and sector, but it measures value with a market-based indicator and does not cover the interest expense and amortization shields or the most recent years. Similarly, Otuya & Akpoyibo (2022) stressed the importance of financial accountability and regulatory

compliance, noting that the contemporary business environment demands greater corporate transparency, responsible financial reporting and strict adherence to disclosure standards.

Related Nigerian studies have focused on tax planning rather than on individual shields. Omesi and Appah (2021) examined corporate tax planning and the firm value of listed consumer goods companies, Olurankinse and Mamidu (2021) studied corporate tax planning and the financial performance of development banks, and Izevbekhai and Momodu (2023) related corporate tax-saving strategy to share price performance. Undie et al. (2020) assessed tax planning and tax incentives in relation to the profitability of companies in Free Trade Zones. Evidence from outside Nigeria includes Mumba and Marion (2023), who examined tax incentives and the financial performance of manufacturing firms in Kenya, Malenya, et al. (2024), who studied the influence of tax shield on the capital structure of private manufacturing firms in Kenya, and Sritharan (2024), who investigated whether the tax shields of debt and non-debt affect firms' performance in the Sri Lankan land and property sector. Other authors have linked tax planning to firm value, earnings management and the use of cash tax savings (Maharani et al., 2020; Handayani, 2020; Franstitus & Tobing, 2023; Green & Kerr, 2022).

Gap in the Literature

Three gaps emerge. First, a methodological gap exists in the measurement of tax shields, because many studies relate debt to capital structure and rely on aggregate debt and non-debt proxies instead of isolating the individual shields. Second, a sectoral gap exists because few studies focus on quoted firms in Nigeria while treating interest expense, debt service, depreciation, amortization and charitable donation shields together. Third, a time gap exists because earlier studies do not capture the most recent years. This study addresses these gaps by estimating the effect of five separate tax shields on return on assets using panel data for 2014–2024.

3. METHODOLOGY

The study adopted an ex-post facto research design with a quantitative panel-data approach. The design is appropriate because the study relies on historical financial data from published annual reports, and the researchers did not manipulate any variable. Panel data combine cross-sectional and time-series dimensions and therefore improve the efficiency and reliability of the estimates (Baltagi, 2021). The population comprises all companies quoted on the Nigerian Exchange Group, and the purposive sampling technique was used to select companies with complete and consistent financial statements throughout the study period. The final sample consists of 15 quoted companies observed annually from 2014 to 2024, which yields 165 firm-year observations. The sampled firms are Dangote Cement, BUA Cement, Nestlé Nigeria, Nigerian Breweries, Flour Mills of Nigeria, PZ Cussons Nigeria, Lafarge Africa, Cadbury Nigeria and Presco Plc.

Sources and Method of Data Collection

The study relied exclusively on secondary data. These were extracted from the audited annual reports and accounts of the sampled firms and were supplemented by the Nigerian Exchange Group Factbook, the Central Bank of Nigeria Statistical Bulletin and Securities and Exchange Commission reports. The data collected include interest expense, debt servicing obligations, depreciation expense, amortization expense, charitable donations, profit after tax and total

assets, and they were organised in panel form with firms as cross-sectional units and years as the time dimension. The use of audited and publicly available data supports the objectivity and reliability of the study, and no ethical violation is involved.

Model Specification

Based on the conceptual, theoretical and empirical reviews, and drawing on the variables used by Samuel et al. (2023), a multiple regression model was specified in which performance is a function of the five tax shields:

$$ROA(it) = \beta 0 + \beta 1\ INTS(it) + \beta 2\ DSTS(it) + \beta 3\ DEPTS(it) + \beta 4\ AMTS(it) + \beta 5\ CDTS(it) + \varepsilon(it) \quad (1)$$

where ROA is return on assets (profit after tax divided by total assets); INTS is the interest expense tax shield; DSTS is the debt service tax shield; DEPTS is the depreciation tax shield; AMTS is the amortization tax shield; CDTS is the charitable donation tax shield; i denotes the firm; t denotes the year; β0 is the intercept; β1 to β5 are the coefficients; and ε is the error term. Each tax shield is computed as the relevant expense (interest expense, debt service, depreciation, amortization or charitable donation) multiplied by the corporate tax rate. Table 1 summarises the measurement of the variables and the a priori expectation, which is a positive relationship between every explanatory variable and performance.

Table 1: Measurement of variables and a priori expectation

Variable	Measurement	Description	Expected sign
ROA	Profit after tax ÷ total assets	Firm performance (dependent)	—
INTS	Interest expense × tax rate	Interest expense tax shield	Positive (+)
DSTS	Debt service × tax rate	Debt service tax shield	Positive (+)
DEPTS	Depreciation expense × tax rate	Depreciation tax shield	Positive (+)
AMTS	Amortization expense × tax rate	Amortization tax shield	Positive (+)
CDTS	Charitable donations × tax rate	Charitable donation tax shield	Positive (+)

(Source: Researchers' Computation, 2026)

The table shows that all five tax shields are computed on the same principle, expense multiplied by the tax rate, so that their coefficients are directly comparable. A positive sign is expected for each because every shield lowers tax outflow and increases after-tax earnings.

Estimation Techniques and Diagnostic Tests

The study applied panel regression techniques, namely pooled ordinary least squares (POLS), the fixed-effects model (FEM) and the random-effects model (REM), because panel estimation controls for firm heterogeneity and improves efficiency (Gujarati & Porter, 2009). The Hausman (1978) specification test was used to choose between FEM and REM: a probability

value below 0.05 favours the fixed-effects model, while a value above 0.05 favours the random-effects model. Stationarity was examined with the Levin–Lin–Chu (LLC) panel unit root test (Levin, Lin & Chu, 2002), and long-run association among the variables was checked with the Johansen (1988) cointegration test. In addition, the Variance Inflation Factor (multicollinearity), the Breusch-Pagan/Cook–Weisberg test (heteroskedasticity), the Wooldridge test (serial correlation) and the Pesaran cross-sectional dependence test were specified as diagnostic checks, and the Durbin-Watson statistic is reported for each model. All hypotheses were tested at the 5% level of significance: the null hypothesis is rejected where the probability value is less than 0.05 and is not rejected where it exceeds 0.05.

4. RESULTS AND DISCUSSION

Descriptive Statistics

Table 2 presents the descriptive statistics of the variables computed from the 165 firm-year observations. ROA averages 0.1640 with a standard deviation of 0.0282, which indicates that the sampled firms earn about 16.4 kobo on each naira of assets, with relatively little dispersion. Among the tax shields, the debt service tax shield has the highest mean (5.3146), followed by the interest expense tax shield (4.4948), the depreciation tax shield (3.7170), the amortization tax shield (1.2994) and the charitable donation tax shield (0.4813). The skewness values are close to zero, which shows that the distributions are approximately symmetric, and the kurtosis values are below 3, which indicates distributions that are slightly flatter than the normal curve. The Jarque-Bera statistics are not significant at the 5% level for ROA, INTS, DSTS, DEPTS and CDTS, so these variables are approximately normally distributed, while AMTS departs mildly from normality ($p = 0.0053$).

Table 2: Descriptive statistics (N = 165)

Variable	Mean	Median	Max.	Min.	Std. Dev.	Skewness	Kurtosis	J-B Prob.
ROA	0.1640	0.1640	0.225	0.096	0.0282	-0.167	2.482	0.2705
INTS	4.4948	4.4800	5.720	2.930	0.6431	-0.110	2.113	0.0568
DSTS	5.3146	5.2900	6.630	3.980	0.5880	0.081	2.391	0.2560
DEPTS	3.7170	3.7400	4.740	2.570	0.5233	-0.189	2.204	0.0691
AMTS	1.2994	1.3100	1.740	0.870	0.2341	-0.052	1.769	0.0053
CDTS	0.4813	0.4700	0.730	0.210	0.1141	-0.031	2.513	0.4371

(Source: Researchers' Computation, 2026)

The table shows that the data are well behaved. The small standard deviation of ROA relative to its mean and the near-normal distribution of most variables mean that the regression estimates are unlikely to be distorted by extreme observations.

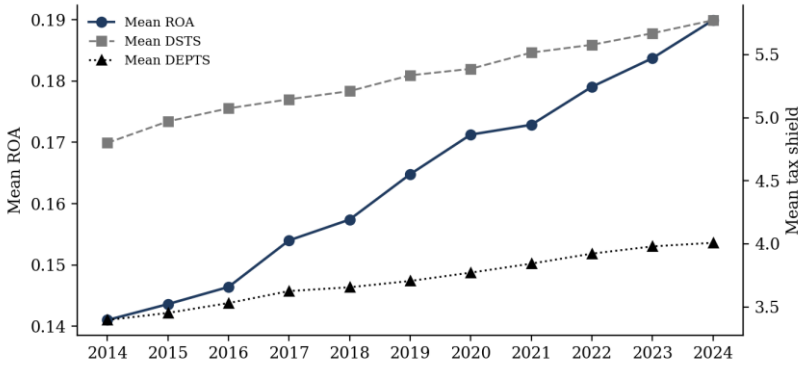


Figure 2: Mean ROA and mean debt service and depreciation tax shields by year, 2014-2024 *(Source: Researchers' Computation, 2026)*

Figure 2 shows that mean ROA rose steadily from 0.141 in 2014 to 0.190 in 2024, and that the mean debt service and depreciation tax shields rose over the same period. This co-movement is consistent with the hypothesis that firms which use tax shields more extensively also earn higher returns on their assets.

Correlation Matrix

Table 3 reports the pairwise correlations. ROA correlates positively with DSTS, DEPTS, AMTS and CDTS, with AMTS (0.445) and DSTS (0.400) showing the strongest associations, while its correlation with INTS is weakly negative (-0.118). None of the correlations among the explanatory variables exceeds 0.51, so multicollinearity is not a serious concern and the five tax shields can be entered simultaneously in the regression.

Table 3: Correlation matrix

	ROA	INTS	DSTS	DEPTS	AMTS	CDTS
ROA	1.000					
INTS	−0.118	1.000				
DSTS	0.400	0.383	1.000			
DEPTS	0.367	0.021	0.213	1.000		
AMTS	0.445	0.084	0.302	−0.096	1.000	
CDTS	0.042	0.504	0.254	0.028	0.104	1.000

(Source: Researchers' Computation, 2026)

The correlation coefficients are moderate. The highest correlation among regressors is between INTS and CDTS (0.504), which is below the usual threshold at which multicollinearity becomes problematic.

Panel Unit Root and Cointegration Tests

Table 4 shows the Levin-Lin-Chu panel unit root results. All variables have probability values below 0.05 and are therefore stationary at level, I(0). The variables do not contain unit roots,

so differencing is unnecessary, spurious regression is avoided, and panel estimation can proceed on the level series.

Table 4: Levin–Lin–Chu panel unit root test

Variable	LLC statistic	Prob. Value	Order of integration	Decision
ROA	−5.4821	0.0000	I(0)	Stationary
INTS	−4.9136	0.0001	I(0)	Stationary
DSTS	−5.2274	0.0000	I(0)	Stationary
DEPTS	−4.6642	0.0002	I(0)	Stationary
AMTS	−3.9815	0.0005	I(0)	Stationary
CDTS	−4.2567	0.0003	I(0)	Stationary

(Source: Researchers' Computation, 2026)

Since every probability value is below 0.05, the null hypothesis of a unit root is rejected for all variables, and the regressions are estimated at levels.

The Johansen cointegration test, summarised in Table 5, was also applied to the series. The trace statistics exceed their 5% critical values for the hypotheses of none, at most one and at most two cointegrating equations, and the trace test therefore indicates three cointegrating equations. The maximum eigenvalue test indicates two. Both tests confirm the existence of a long-run relationship between the tax shields and ROA.

Table 5: Johansen cointegration test (trace)

Hypothesised no. of CE(s)	Eigenvalue	Trace statistic	5% critical value	Prob.
None *	0.6666	148.3011	95.7537	0.0000
At most 1 *	0.5007	90.0826	69.8189	0.0005
At most 2 *	0.3959	53.2703	47.8561	0.0142
At most 3	0.2792	26.5609	29.7971	0.1128
At most 4	0.1231	9.2083	15.4947	0.3465
At most 5	0.0415	2.2475	3.8415	0.1338

(Source: Researchers' Computation, 2026)

An asterisk (*) denotes rejection of the null hypothesis at the 5% level. The trace test indicates three cointegrating equations, which supports a long-run association between tax shields and firm performance.

Regression Results

Tables 6 to 8 present the pooled OLS, fixed-effects and random-effects estimates. In all three models the coefficients of the five tax shields are positive and significant at the 5% level, and the sign pattern matches the a priori expectation.

Table 6: Pooled ordinary least squares result (dependent variable: ROA)

Variable	Coefficient	Std. error	t-statistic	Prob.
C	0.0412	0.0124	3.3226	0.0012
INTS	0.0185	0.0053	3.4906	0.0007
DSTS	0.0214	0.0061	3.5082	0.0006
DEPTS	0.0268	0.0074	3.6216	0.0004
AMTS	0.0152	0.0048	3.1667	0.0020
CDTS	0.0127	0.0039	3.2564	0.0015
R-squared	0.7824		Adjusted R-squared	0.7681
F-statistic	54.3372		Prob(F-statistic)	0.0000
Durbin–Watson	1.9345			

(Source: Researchers' Computation, 2026)

The pooled model explains 78.24% of the variation in ROA (adjusted $R^2 = 0.7681$), and the significant F-statistic (54.3372, $p = 0.0000$) shows that the tax shields are jointly significant. The Durbin–Watson value of 1.9345 is close to 2, which indicates the absence of first-order serial correlation. Pooled OLS, however, ignores firm-specific effects.

Table 7: Fixed-effects model result (dependent variable: ROA)

Variable	Coefficient	Std. error	t-statistic	Prob.
C	0.0361	0.0112	3.2232	0.0017
INTS	0.0169	0.0049	3.4490	0.0008
DSTS	0.0198	0.0057	3.4737	0.0007
DEPTS	0.0245	0.0069	3.5507	0.0005
AMTS	0.0139	0.0044	3.1591	0.0021
CDTS	0.0115	0.0035	3.2857	0.0014
R-squared	0.8041		Adjusted R-squared	0.7883
F-statistic	49.6624		Prob(F-statistic)	0.0000
Durbin–Watson	2.0136			

(Source: Researchers' Computation, 2026)

The fixed-effects model, which controls for unobserved firm characteristics, explains 80.41% of the variation in ROA (adjusted $R^2 = 0.7883$). All five coefficients are positive and significant at the 5% level, and the Durbin–Watson statistic (2.0136) shows no serial correlation.

Table 8: Random-effects model result (dependent variable: ROA)

Variable	Coefficient	Std. error	z-statistic	Prob.
C	0.0384	0.0117	3.2821	0.0014
INTS	0.0176	0.0050	3.5200	0.0006
DSTS	0.0205	0.0059	3.4746	0.0007
DEPTS	0.0254	0.0071	3.5775	0.0005
AMTS	0.0146	0.0045	3.2444	0.0016
CDTS	0.0121	0.0037	3.2703	0.0015
R-squared	0.7968		Wald chi-square	58.4421
Prob(chi-square)	0.0000		Durbin–Watson	1.9864

(Source: Researchers' Computation, 2026)

The random-effects estimates are very close to the fixed-effects estimates. The model explains 79.68% of the variation in ROA, and the Wald chi-square statistic (58.4421, $p = 0.0000$) confirms its overall significance.

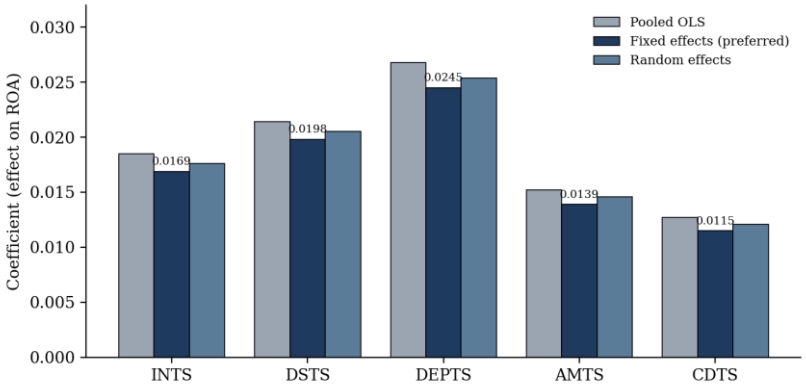


Figure 3: Tax shield coefficients across the three estimators *(Source: Researchers' Computation, 2026)*

Figure 3 compares the coefficients from the three estimators. The estimates are stable across models, and the ranking of the variables does not change: DEPTS has the largest coefficient and CDTS the smallest, in every case.

Table 9 compares the overall fit of the three estimators. The fixed-effects model has the highest R-squared (0.8041) and adjusted R-squared (0.7883), which shows that allowing for firm-specific intercepts improves the explanation of ROA. The Durbin–Watson statistics of all three models lie between 1.93 and 2.02, so serial correlation is not a concern in any of them.

Table 9: Comparison of model fit across estimators

Statistic	Pooled OLS	Fixed effects	Random effects
R-squared	0.7824	0.8041	0.7968
Adjusted R-squared	0.7681	0.7883	-
F-statistic / Wald chi-square	54.3372	49.6624	58.4421
Prob. (overall significance)	0.0000	0.0000	0.0000
Durbin–Watson	1.9345	2.0136	1.9864
Largest coefficient	DEPTS (0.0268)	DEPTS (0.0245)	DEPTS (0.0254)
Smallest coefficient	CDTS (0.0127)	CDTS (0.0115)	CDTS (0.0121)

(Source: Researchers' Computation, 2026)

All three estimators lead to the same substantive conclusion. The model-selection decision therefore rests on the Hausman test reported in the next section rather than on differences in fit.

Hausman Specification Test

Table 10: Hausman test result

Test summary	Chi-sq. statistic	Chi-sq. d.f.	Prob.
Cross-section random	12.4837	5	0.0285

(Source: Researchers' Computation, 2026)

The probability value (0.0285) is below 0.05, so the null hypothesis that the random-effects model is appropriate is rejected. The fixed-effects model is therefore the most appropriate estimator, and the discussion of findings is based on Table 7.

Test of Hypotheses

The hypotheses were tested with the preferred fixed-effects estimates in Table 7, using the 5% decision rule. Table 11 summarises the decisions.

Table 11: Summary of hypothesis tests (fixed-effects model)

Hypothesis (tax shield → ROA)	Coefficient	t-statistic	Prob.	Decision
H01: Interest expense (INTS)	0.0169	3.4490	0.0008	Reject H01
H02: Debt service (DSTS)	0.0198	3.4737	0.0007	Reject H02
H03: Depreciation (DEPTS)	0.0245	3.5507	0.0005	Reject H03
H04: Amortization (AMTS)	0.0139	3.1591	0.0021	Reject H04
H05: Charitable donation (CDTS)	0.0115	3.2857	0.0014	Reject H05

(Source: Researchers' Computation, 2026)

All five probability values are below 0.05, so each null hypothesis is rejected. Interest expense, debt service, depreciation, amortization and charitable donation tax shields each have a significant positive effect on the performance of the sampled firms.

Discussion of Findings

Interest expense tax shield. The coefficient of INTS is 0.0169 (p = 0.0008), which implies that a one-unit increase in the interest expense tax shield raises ROA by about 0.0169, other things being equal. Interest is deductible, so borrowing lowers the effective cost of funds and raises after-tax earnings. The result is consistent with Modigliani and Miller (1963) and with the trade-off theory, which holds that the tax advantage of debt adds to firm value as long as distress costs remain manageable.

Debt service tax shield. DSTS has a coefficient of 0.0198 (p = 0.0007). Tax savings tied to servicing debt appear to release resources for reinvestment and shareholder returns. This agrees with the finding of Samuel et al. (2023) that the debt tax shield significantly affects the value of Nigerian manufacturing firms, although the present study measures value with an accounting indicator.

Depreciation tax shield. DEPTS records the largest coefficient (0.0245, p = 0.0005). Capital allowances reduce taxable profit without any borrowing, and they are especially valuable for asset-intensive firms such as cement producers, brewers and food processors. The result supports DeAngelo and Masulis (1980), who argue that non-debt shields are important tax-saving devices, and it corroborates the significant depreciation effect reported by Samuel et al. (2023).

Amortization tax shield. The coefficient of AMTS is 0.0139 (p = 0.0021). Amortization is a scheduled, non-cash deduction on intangible assets, and its predictability allows firms to plan cash flows and to retain more of their earnings. Its effect is smaller than that of depreciation, probably because intangible assets form a smaller part of the asset base of most sampled firms.

Charitable donation tax shield. CDTS has the smallest coefficient (0.0115, p = 0.0014) but is still positive and significant. This supports the value-enhancement view that donations build goodwill and a stronger public image, which can offset their cost. The small magnitude suggests that the direct financial return from donations is modest compared with those of the other shields, and that the agency concern about managers' personal motives cannot be wholly excluded.

Table 12: Findings compared with a priori expectations (fixed-effects model)

Variable	Expected sign	Observed sign	Significance (5%)	Consistent with expectation?
INTS	Positive (+)	Positive (+)	Significant	Yes
DSTS	Positive (+)	Positive (+)	Significant	Yes
DEPTS	Positive (+)	Positive (+)	Significant	Yes
AMTS	Positive (+)	Positive (+)	Significant	Yes
CDTS	Positive (+)	Positive (+)	Significant	Yes

(Source: Researchers' Computation, 2026)

All five tax shields behave as predicted by the trade-off theory, and the ordering of their coefficients (DEPTS > DSTS > INTS > AMTS > CDTS) indicates which shields matter most for the performance of the sampled firms.

Overall, the evidence supports the trade-off theory. Non-debt shields (depreciation in particular) are at least as important as debt shields, which suggests that Nigerian firms gain from both the financing and the investment routes to tax savings. The findings are not unique to Nigeria, because studies in other emerging markets have examined the same debt and non-debt shields (Sritharan, 2024; Malenya et al., 2024), but this study adds recent evidence on five separate shields in one framework.

5. CONCLUDING REMARKS

Conclusion

This study examined the effect of tax shields on the performance of selected quoted companies on the Nigerian Exchange Group using panel data for 15 firms over 2014–2024. The unit root

tests show that all variables are stationary at level, the cointegration test indicates a long-run relationship, and the Hausman test selects the fixed-effects model. The fixed-effects results show that the interest expense (β = 0.0169), debt service (β = 0.0198), depreciation (β = 0.0245), amortization (β = 0.0139) and charitable donation (β = 0.0115) tax shields all have positive and statistically significant effects on return on assets, and that together they explain 80.41% of its variation. All five null hypotheses are therefore rejected. Lawful tax shielding, whether it is debt-based or non-debt-based, contributes meaningfully to the performance of quoted firms in Nigeria.

Implications of the Findings

The findings have implications for firms, investors and government. For firms, the results show that tax planning is not merely a compliance exercise but a source of better returns on assets, and that the benefit comes from both debt-based and non-debt-based provisions. For investors, firms that systematically use available deductions can be expected to convert assets into profit more efficiently, which is relevant to valuation and portfolio choice. For government, the significant effect of capital allowances and interest deductibility on performance indicates that these provisions support corporate profitability, and policymakers should weigh this benefit against the revenue forgone when reforming the tax regime.

Recommendations

On the basis of these findings, the following recommendations are made:

i) Managers of quoted firms should build tax-shield planning into their financing and investment decisions, using interest deductibility, capital allowances, amortization of intangibles and allowable donations within the limits of the law.
ii) Because the depreciation tax shield has the strongest effect, firms should maintain optimal investment in qualifying fixed assets and keep accurate asset registers so that capital allowances are fully claimed.
iii) Firms should balance the debt tax shield against the risk of financial distress, in line with the trade-off theory, and should avoid borrowing for the sole purpose of generating tax deductions.
iv) Charitable giving should be structured so that it qualifies for relief and supports the firm's reputation, while boards monitor it to prevent managers from directing donations to personal ends.
v) Government and tax authorities should keep capital allowance, interest deductibility and donation relief provisions clear, stable and predictable, because a stable regime allows firms to plan and raises performance and, in the long run, the tax base.

The study is limited to 15 quoted firms and to one accounting measure of performance. Future research may extend the sample, include market-based measures such as Tobin's Q, add firm size and leverage as control variables, and compare sectors.

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