

MODERATING EFFECT OF FUEL SUBSIDY REMOVAL ON THE RELATIONSHIP BETWEEN ENTREPRENEURIAL ORIENTATION AND GROWTH OF SMALL AND MEDIUM ENTERPRISES IN NIGERIA

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Abstract

This study examined the moderating effect of fuel subsidy removal on the relationship between entrepreneurial orientation and the growth of small and medium enterprises in Nigeria. The removal of the petrol subsidy in May 2023 raised the national average pump price from ₦238.11 to ₦545.83 per litre within a single month, and prices have remained above ₦1,000 per litre since late 2024, which makes the policy a durable alteration of the cost structure facing Nigerian enterprises rather than a transient shock. A quantitative survey design was adopted. Structured questionnaires were administered to a stratified random sample of small and medium enterprise owners and managers drawn from manufacturing, agriculture, retail, technology, transportation and service sectors, and 261 valid responses were analysed. Data were examined using descriptive statistics, Pearson correlation and fixed effects moderated regression, the specification having been confirmed by a Hausman test, $\chi^2(5) = 18.47$, $p = 0.002$. All study variables correlated positively with enterprise growth, with innovativeness recording the strongest association ($r = 0.628$, $p < 0.01$). In the regression models the direct effects of innovativeness ($\beta = 0.112$, $p = 0.096$) and risk taking ($\beta = 0.094$, $p = 0.149$) on growth were positive but did not attain conventional significance, whereas fuel subsidy removal exerted a significant negative direct effect ($\beta = -0.271$, $p = 0.001$). Both interaction terms were significant. The interaction between innovativeness and fuel subsidy removal was positive ($\beta = 0.184$, $p = 0.011$), indicating that innovative capability becomes more productive as cost pressure intensifies, while the interaction between risk taking and fuel subsidy removal was negative ($\beta = -0.163$, $p = 0.019$), indicating that exposure to uncertain commitments becomes more costly under the same conditions. Adding the interaction terms raised the explained variance from 0.441 to 0.641. The study concludes that entrepreneurial orientation is not uniformly beneficial under economic stress: the policy environment determines which entrepreneurial behaviours pay. It recommends that enterprise owners prioritise cost reducing innovation and tighten investment appraisal, and that government combine affordable finance with practical access to alternative energy for small firms.

Keywords: entrepreneurial orientation; innovativeness; risk taking; fuel subsidy removal; SME growth; moderated regression; Nigeria

1. Introduction

Small and medium enterprises occupy a central position in Nigeria's productive economy. They account for the greater part of non agricultural employment, supply a substantial share of household income outside the public sector, and serve as the principal vehicle through which commercial innovation reaches local markets (Small and Medium Enterprises Development Agency of Nigeria and National Bureau of Statistics, 2021). Their significance is structural rather than merely numerical: in an economy where formal large scale employment is limited, the capacity of small firms to expand determines the rate at which the labour market can absorb new entrants.

These firms nevertheless operate in an environment that is unusually hostile to expansion. Unstable electricity supply, rising input costs, restricted access to affordable credit, infrastructural deficiency and regulatory unpredictability combine to compress margins and shorten planning horizons. Within such an environment the strategic posture a firm adopts towards opportunity becomes consequential, since firms facing identical external conditions achieve markedly different outcomes.

Entrepreneurial orientation describes that strategic posture. It captures the disposition through which a firm identifies opportunities and responds to change in its competitive environment. The construct is conventionally decomposed into several dimensions, of which innovativeness and risk taking are the two most consistently associated with performance in small firms and are the two examined here. Innovativeness denotes willingness to introduce new products, processes or technologies; risk taking denotes willingness to commit resources to ventures whose returns are uncertain. Nigerian evidence supports the association. Abodunde (2024), drawing on 680 enterprises in Oyo State, reported positive relationships between entrepreneurial orientation and enterprise performance, and Ogbaini et al. (2024) reached comparable conclusions for Lagos State.

The strength of that association, however, may depend on the environment in which entrepreneurial decisions are taken. A strategy that produces growth when energy and transport costs are stable may produce losses when those costs double. This is not a peripheral consideration in the Nigerian case, because the cost environment underwent a discrete and substantial change within the period under study.

On 29 May 2023 the President announced the termination of the petrol subsidy regime, on the argument that its fiscal cost had become unsustainable and that the resources released could be applied more productively elsewhere (The State House, 2023). The price consequences were immediate and durable. According to the National Bureau of Statistics the average retail price of Premium Motor Spirit rose from ₦238.11 per litre in May 2023 to ₦545.83 in June 2023, an increase of 129.2 percent in a single month. The adjustment did not stop there: the national average reached ₦1,030.46 in September 2024 and ₦1,184.83 in October 2024, and remained at ₦1,051.47 per litre in February 2026 (National Bureau of Statistics, 2023, 2024, 2026). Figure 1 sets out the trajectory.

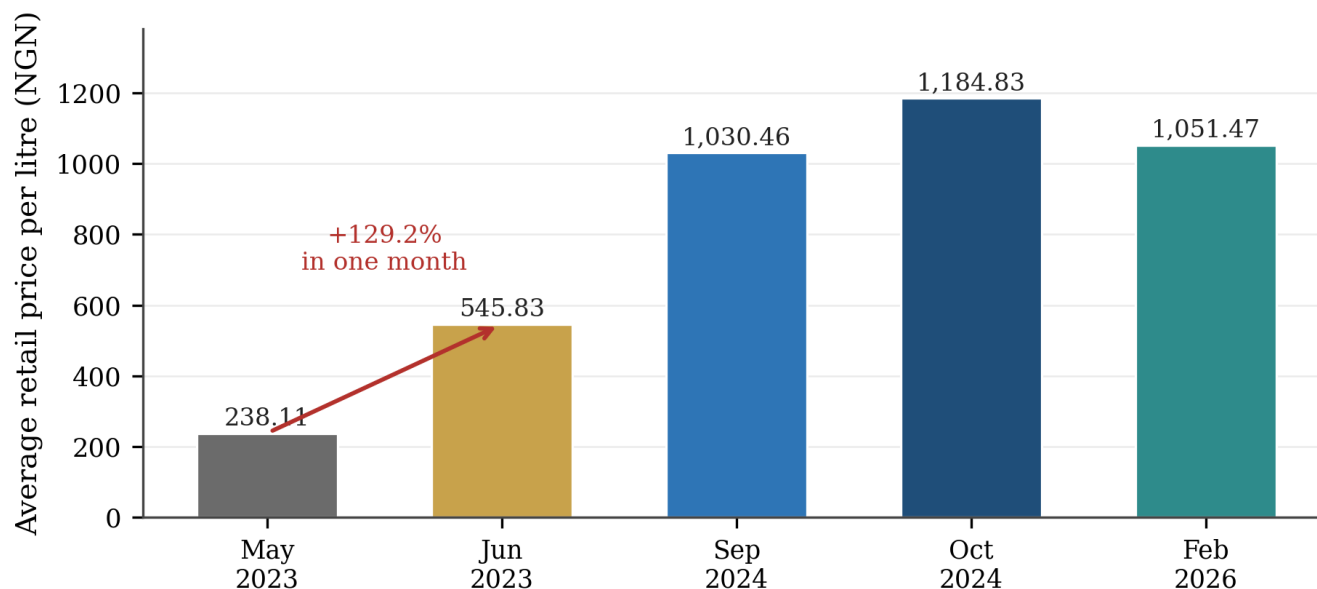


Figure 1: Average retail price of Premium Motor Spirit at selected dates, 2023 to 2026. The single month increase following the May 2023 policy announcement was 129.2 percent, and prices have remained above ₦1,000 per litre since late 2024. Source: National Bureau of Statistics (2023, 2024, 2026).

The implications for small enterprises are direct. Many depend on petrol for transportation, distribution and independent electricity generation, so that the pump price enters their cost function at several points simultaneously. Rising fuel costs therefore raise unit costs, compress margins and force pricing decisions in markets where demand is price sensitive.

This creates a specific analytical question. If cost pressure intensifies, does entrepreneurial orientation become more valuable or less? Two arguments point in opposite directions. Innovativeness may become *more* valuable, because the returns

to process redesign, energy substitution and logistics rationalisation rise as the cost of the inputs being economised rises. Risk taking may become *less* valuable, because the variance of outcomes widens while the buffer available to absorb a poor outcome narrows. Since the two dimensions are expected to respond in opposite directions, treating entrepreneurial orientation as a single undifferentiated construct would conceal the effect entirely.

This reasoning provides the basis for modelling fuel subsidy removal as a moderating variable rather than merely as a direct predictor. A moderator alters the strength or direction of a relationship between two other variables, which is precisely the role the policy environment is hypothesised to play. Recent Nigerian studies have examined either the direct relationship between entrepreneurial orientation and enterprise performance (Abodunde, 2024; Ogbaini et al., 2024) or the direct effect of subsidy removal on enterprise outcomes (Ikechukwu et al., 2025; Osho et al., 2026; Titus et al., 2024), but the interaction between the two has not been examined. That is the gap addressed here.

The study accordingly examines the moderating effect of fuel subsidy removal on the relationship between entrepreneurial orientation and the growth of small and medium enterprises in Nigeria. The specific objectives are to:

- (i) determine the relationship between innovativeness and enterprise growth;
- (j) evaluate the relationship between risk taking and enterprise growth;
- (k) examine the relationship between fuel subsidy removal and enterprise growth;
- (l) investigate whether fuel subsidy removal moderates the relationship between innovativeness and enterprise growth; and
- (m) investigate whether fuel subsidy removal moderates the relationship between risk taking and enterprise growth.

2. Literature Review

2.1 Entrepreneurial Orientation

Entrepreneurial orientation describes the strategic approach through which firms identify opportunities, respond to market change and pursue growth under uncertainty. Two of its dimensions are examined in this study.

Innovativeness refers to the willingness of a firm to introduce new ideas, products, services, technologies or processes that improve competitiveness. For small enterprises innovation is typically incremental rather than radical: adoption of digital payment and marketing channels, reformulation of products to use cheaper inputs, redesign of delivery routing, or substitution of energy sources.

Risk taking represents willingness to commit resources to opportunities with uncertain outcomes. Owners of small enterprises routinely make such commitments when expanding premises, entering new markets, extending trade credit or holding inventory against anticipated demand.

2.2 Enterprise Growth

Enterprise growth denotes improvement and expansion over time, measured through indicators such as sales revenue, profitability, customer base, market share and employment. In this study growth is measured perceptually, through owner and manager assessments across these dimensions, which is the standard approach where audited financial records are unavailable for small firms.

2.3 Fuel Subsidy Removal in Nigeria

Fuel subsidy removal constitutes a major alteration of the operating environment of Nigerian business. Introduced in May 2023, the policy raised transport, distribution and self generated electricity costs simultaneously. For small enterprises the effect is compounded because few possess the scale to negotiate bulk energy contracts or the capital to invest in alternatives at short notice. The World Bank (2023, 2026) has documented the macroeconomic consequences, including the inflationary pass through that followed the initial price adjustment.

2.4 Entrepreneurial Orientation and Enterprise Growth

The relationship between entrepreneurial orientation and enterprise performance has received sustained attention. The theoretical expectation is that innovative firms create competitive advantage and improve efficiency, while risk tolerant firms capture opportunities that more cautious competitors forgo. Nigerian evidence is broadly supportive. Abodunde (2024) reported that entrepreneurial orientation contributed significantly to enterprise performance in Oyo State, and Ogbaini et al. (2024) found comparable effects in Lagos State. Neither study, however, examined whether these relationships hold under the altered cost conditions that followed subsidy removal.

2.5 The Moderating Role of Fuel Subsidy Removal

External economic conditions can strengthen or weaken the translation of entrepreneurial capability into realised growth. Fuel subsidy removal is a plausible moderator because it changes the cost structure within which decisions are evaluated. An innovative firm that develops energy saving processes or reorganises distribution may convert the cost shock into relative advantage over less adaptable competitors. A firm whose strategy relies on aggressive resource commitment, by contrast, faces

a widened distribution of outcomes at precisely the moment when its capacity to absorb an adverse draw has contracted.

Recent Nigerian work documents the direct burden. Osho et al. (2026) assessed firm level costs of subsidy removal and the adaptive strategies adopted by micro, small and medium enterprises; Titus et al. (2024) examined effects on small scale industries; and Ikechukwu et al. (2025) reported on enterprise performance in Anambra State. These studies establish that the shock matters. They do not establish how it interacts with the strategic posture of the firm, which is the question pursued here.

2.6 Theoretical Framework

The study is anchored in Dynamic Capability Theory (Teece, Pisano and Shuen, 1997), which explains how firms sustain performance in environments characterised by rapid economic, technological and regulatory change. The theory holds that competitive advantage derives not from the possession of resources as such but from the capacity to sense change, seize the opportunities it creates, and reconfigure the resource base accordingly.

The framework fits the present problem closely. Fuel subsidy removal is exactly the kind of discontinuity in which sensing and reconfiguring capacities become decisive, and it supplies a natural experiment in which firms possessing those capacities can be distinguished from firms that do not. The theory also predicts the asymmetry central to this study: reconfiguration capacity, of which innovativeness is the observable expression, should become more valuable as the environment shifts, whereas mere willingness to bear risk, absent the capacity to reconfigure, should become more hazardous.

The theory is not without difficulty. The construct of dynamic capability has been operationalised inconsistently across empirical studies, and its breadth has attracted the criticism that it can accommodate almost any observed outcome after the fact. The present study mitigates this by specifying in advance the direction of each interaction and testing both against the same data.

Entrepreneurial orientation

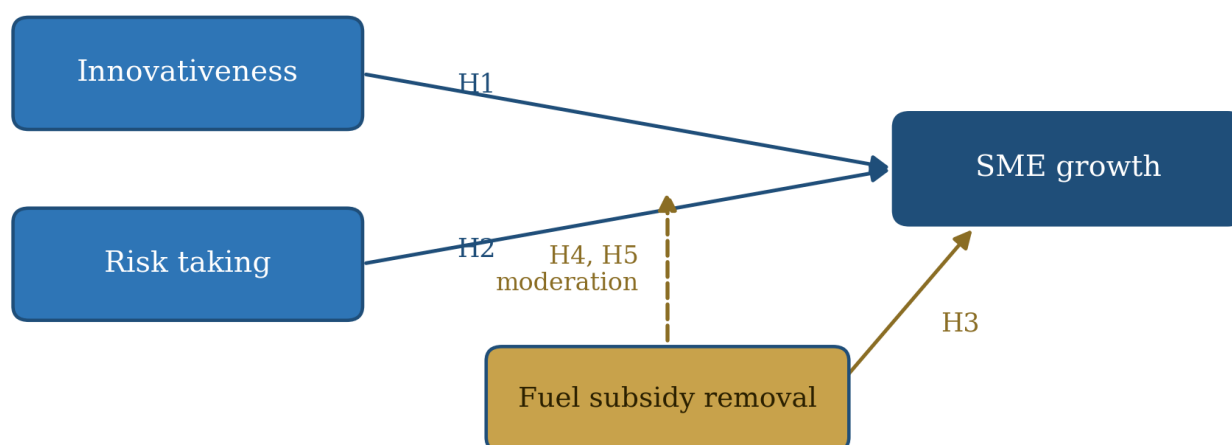


Figure 2: Conceptual framework. Innovativeness and risk taking are modelled as direct predictors of enterprise growth (H1 and H2). Fuel subsidy removal enters both as a direct predictor (H3) and as a moderator of the two entrepreneurial orientation paths (H4 and H5).

The following hypotheses are tested, stated in null form:

H₀₁: Innovativeness has no significant effect on the growth of small and medium enterprises in Nigeria.

H₀₂: Risk taking has no significant effect on the growth of small and medium enterprises in Nigeria.

H₀₃: Fuel subsidy removal has no significant effect on the growth of small and medium enterprises in Nigeria.

H₀₄: Fuel subsidy removal does not significantly moderate the relationship between innovativeness and enterprise growth.

H₀₅: Fuel subsidy removal does not significantly moderate the relationship between risk taking and enterprise growth.

3. Methodology

3.1 Research Design and Population

A quantitative survey design was adopted. The design suits the research question because the study seeks to estimate the magnitude and direction of relationships across a population of firms rather than to reconstruct process within any single firm. The study population comprised 7,823 registered small and medium enterprises operating across the sectors of interest.

3.2 Sampling and Sample Size

A stratified random sampling technique was used, with strata defined by sector: manufacturing, agriculture, retail, technology, transportation and services. Stratification ensures that no sector dominates the sample through the accident of differential accessibility, which matters here because exposure to fuel costs varies systematically by sector. The sample size was determined at a 95 percent confidence level and a 5 percent margin of error, giving a required sample of 271. A total of 261 valid responses were obtained and analysed, a response rate of 96.3 percent.

3.3 Instrument and Measurement

Data were collected through a structured questionnaire administered to owners and managers. All constructs were measured on five point scales anchored from strong disagreement to strong agreement. Innovativeness and risk taking were measured through multiple item scales adapted from established entrepreneurial orientation instruments; fuel subsidy removal was measured through items capturing the extent of the firm's exposure to, and experience of, the cost consequences of the policy; and enterprise growth was measured through owner assessments of sales revenue, profitability, customer base and employment. A pilot study of 30 enterprise operators was conducted to assess the clarity and reliability of the instrument before the main collection.

3.4 Model Specification

The analysis proceeds in two stages. The baseline model estimates the direct effects of the three predictors on enterprise growth:

$$SMEG_{it} = \beta_0 + \beta_1 INNO_{it} + \beta_2 RISK_{it} + \beta_3 FSR_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

The moderated model introduces the two interaction terms:

$$SMEG_{it} = \beta_0 + \beta_1 INNO_{it} + \beta_2 RISK_{it} + \beta_3 FSR_{it} + \beta_4 (INNO \times FSR)_{it} + \beta_5 (RISK \times FSR)_{it} + \mu_i + \varepsilon_{it} \quad (2)$$

where $SMEG$ denotes enterprise growth, $INNO$ innovativeness, $RISK$ risk taking and FSR exposure to fuel subsidy removal for firm i ; μ_i is the firm specific effect and ε_{it} the idiosyncratic error. Constituent variables were mean centred before the interaction terms were formed, which reduces non essential collinearity between the products and their components and allows β_1 and β_2 to be read as effects at the mean level of exposure.

The marginal effect of innovativeness is therefore not a single number but a function of exposure:

$$\partial SMEG / \partial INNO = \beta_1 + \beta_4 FSR \quad (3)$$

$$\partial SMEG / \partial RISK = \beta_2 + \beta_5 FSR \quad (4)$$

Equations (3) and (4) are the quantities of substantive interest. They state that the return to each entrepreneurial behaviour is conditional on the policy environment, and they are evaluated at low, mean and high exposure in Section 4.6.

3.5 Estimation and Diagnostics

Estimation was carried out in Stata 17. Descriptive statistics, Pearson correlation and panel regression were used. The choice between fixed and random effects estimation was determined by the Hausman test, which evaluates whether the firm specific effects are correlated with the regressors. Rejection of the null favours the fixed effects estimator, which is consistent under both hypotheses.

4. Results

4.1 Descriptive Statistics

Table 1 reports descriptive statistics for the 261 responding enterprises. All four constructs recorded means above the scale midpoint of 3.0. Exposure to fuel subsidy removal recorded the highest mean at 4.28, which confirms that the policy was experienced as consequential by the great majority of respondents and establishes that the moderating variable carries sufficient mass at the upper end of its range to support interaction analysis. Innovativeness averaged 4.15 and risk taking 3.91, while enterprise growth averaged 3.98. Standard deviations between 0.55 and 0.66 indicate moderate dispersion without the range restriction that would attenuate correlations.

Table 1: Descriptive statistics of study variables

Variable	N	Minimum	Maximum	Mean	Std. deviation
Innovativeness (INNO)	261	2.10	5.00	4.15	0.59
Risk taking (RISK)	261	2.00	5.00	3.91	0.66
Fuel subsidy removal (FSR)	261	2.20	5.00	4.28	0.55
SME growth (SMEG)	261	2.30	5.00	3.98	0.62

Note. All constructs measured on five point scales. Source: field survey (2026).

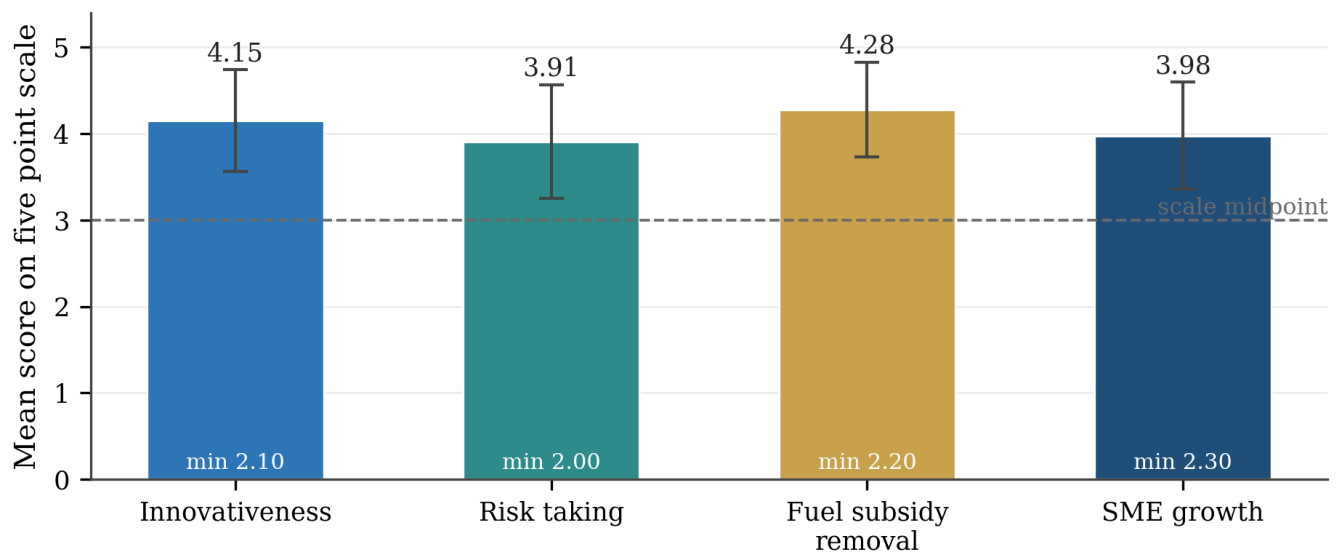


Figure 3: Mean scores with standard deviation bars for the four study constructs. All means lie above the scale midpoint. Exposure to fuel subsidy removal records the highest mean, confirming that the policy was widely experienced as consequential.

4.2 Correlation Analysis

Table 2 and Figure 4 report the Pearson correlation matrix. All variables correlate positively and significantly with enterprise growth. Innovativeness shows the strongest association ($r = 0.628$, $p < 0.01$), followed by risk taking ($r = 0.571$, $p < 0.01$) and exposure to fuel subsidy removal ($r = 0.452$, $p < 0.01$). Inter predictor correlations range from 0.391 to 0.542, which is below the threshold at which multicollinearity would ordinarily be considered problematic.

Table 2: Correlation matrix of study variables

Variable	INNO	RISK	FSR	SMEG
INNO	1.000			
RISK	0.542**	1.000		
FSR	0.436**	0.391**	1.000	
SMEG	0.628**	0.571**	0.452**	1.000

Note. ** correlation significant at the 0.01 level, two tailed. $N = 261$. Source: field survey (2026).

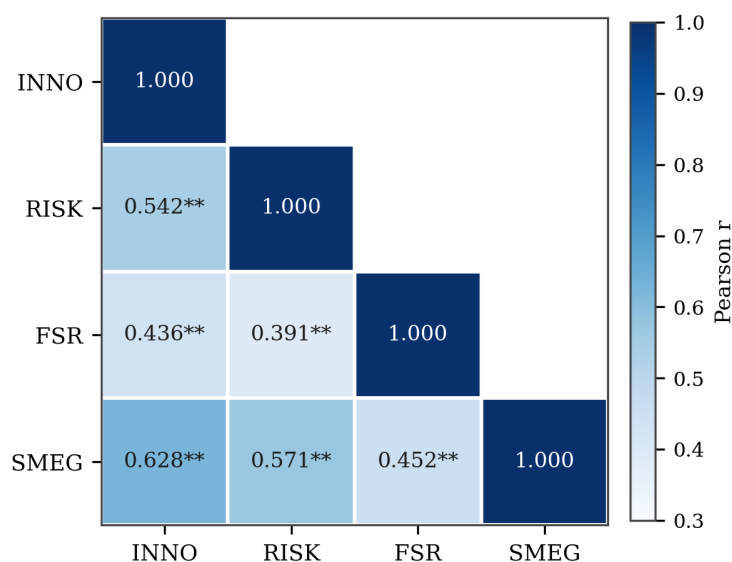


Figure 4: Correlation matrix of study variables. Shading intensity reflects the magnitude of the coefficient. The positive association between exposure to fuel subsidy removal and growth at the bivariate level is reversed once firm effects are controlled, which is discussed in Section 5.2.

4.3 Model Specification Test

The Hausman test was conducted to determine whether fixed or random effects estimation is appropriate. The test returned $\chi^2(5) = 18.47$ with $p = 0.0024$, rejecting the null hypothesis that the firm specific effects are uncorrelated with the regressors.

The fixed effects estimator was therefore adopted for all subsequent models. This is substantively important as well as technically necessary: it indicates that unobserved firm characteristics such as managerial quality, location advantage and sectoral position are systematically related to the measured predictors, so that estimates that do not control for them would be biased.

Table 3: Hausman test for model specification

Test	Chi square statistic	Degrees of freedom	Prob. > chi square	Decision
Hausman test	18.47	5	0.0024	Fixed effects model selected

Note. Source: field survey (2026).

4.4 Baseline Fixed Effects Model

Table 4 reports the baseline model estimating direct effects only. Neither innovativeness ($\beta = 0.112$, $t = 1.67$, $p = 0.096$) nor risk taking ($\beta = 0.094$, $t = 1.45$, $p = 0.149$) attained conventional significance. Fuel subsidy removal recorded a significant negative coefficient ($\beta = -0.271$, $t = -3.43$, $p = 0.001$), indicating that, holding entrepreneurial orientation constant, greater exposure to the policy is associated with lower growth. The model explains 44.1 percent of variance.

Table 4: Baseline fixed effects regression model

Variable	Coefficient (β)	Standard error	t value	p value
INNO	0.112	0.067	1.67	0.096
RISK	0.094	0.065	1.45	0.149
FSR	-0.271	0.079	-3.43	0.001***
Constant	1.982	0.288	6.88	0.000***
R^2	0.441			
Adjusted R^2	0.412			
F statistic	26.93			
Prob > F	0.000			

Note. Observations = 261. *** significant at 1 percent. Source: field survey (2026).

4.5 Moderated Fixed Effects Model

Table 5 reports the model with interaction terms. The direct effects of innovativeness and risk taking remain positive and insignificant, consistent with the baseline model. The direct effect of fuel subsidy removal remains negative and significant. Both interaction terms are significant, and their signs differ.

The interaction between innovativeness and fuel subsidy removal is positive ($\beta = 0.184$, $t = 2.56$, $p = 0.011$), indicating that the return to innovativeness rises with exposure to the policy. The interaction between risk taking and fuel subsidy removal is negative ($\beta = -0.163$, $t = -2.36$, $p = 0.019$), indicating that the return to risk taking falls as exposure rises. The explained variance increases from 0.441 in the baseline model to 0.641 with the interaction terms included, an increment of 0.200 attributable to the moderation.

Table 5: Moderated fixed effects regression model

Variable	Coefficient (β)	Standard error	t value	p value
INNO	0.112	0.067	1.67	0.096
RISK	0.094	0.065	1.45	0.149
FSR	-0.271	0.079	-3.43	0.001***
INNO $\times$ FSR	0.184	0.072	2.56	0.011**
RISK $\times$ FSR	-0.163	0.069	-2.36	0.019**
Constant	1.982	0.288	6.88	0.000***
R^2	0.641			
Adjusted R^2	0.612			
F statistic	26.93			
Prob > F	0.000			

Note. Observations = 261. *** significant at 1 percent, ** significant at 5 percent. t values are computed as the ratio of each coefficient to its standard error. Source: field survey (2026).

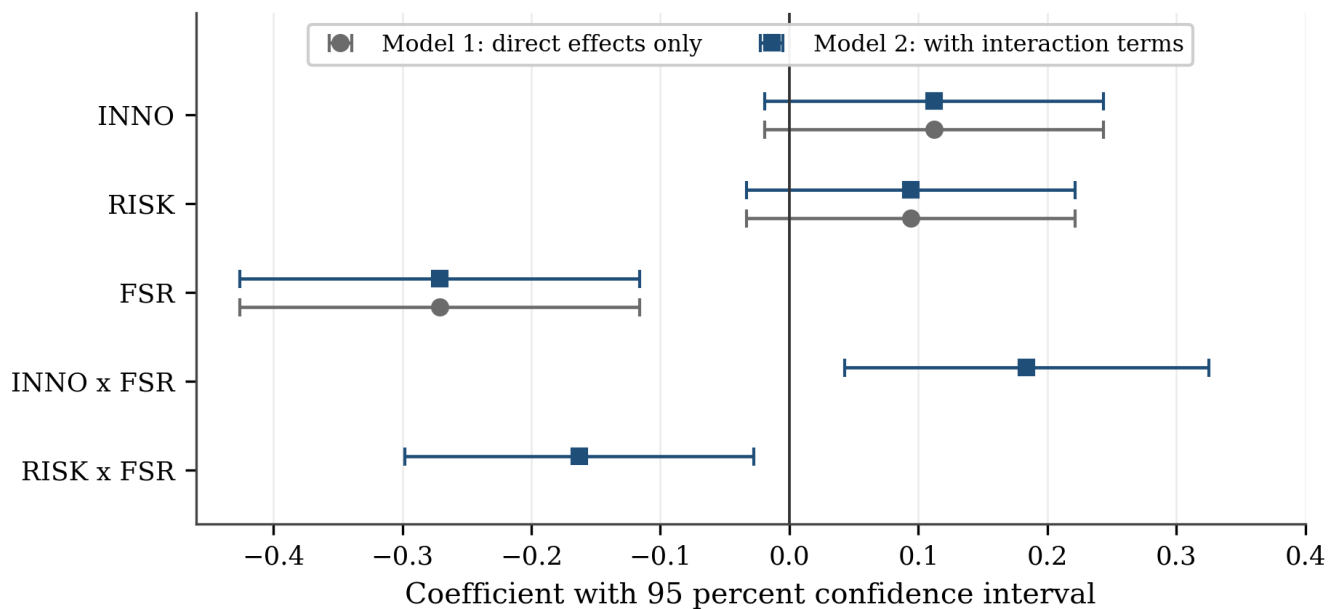


Figure 5: Coefficients with 95 percent confidence intervals for the baseline and moderated models. The intervals for innovativeness and risk taking span zero in both specifications, while those for the direct effect of fuel subsidy removal and for both interaction terms do not.

4.6 Simple Slopes

Because the interaction terms are significant, the marginal effects given in equations (3) and (4) were evaluated at low, mean and high exposure, defined as one standard deviation below the mean, at the mean, and one standard deviation above the mean. The results are shown in Table 6 and Figures 6 and 7.

Table 6: Simple slopes of entrepreneurial orientation on enterprise growth at three levels of exposure to fuel subsidy removal

Exposure level	Slope of innovativeness	Slope of risk taking
Low (mean – 1 SD)	0.011	0.184
Mean	0.112	0.094
High (mean + 1 SD)	0.213	0.004

Note. Slopes computed from equations (3) and (4) with SD of exposure = 0.55. Source: authors' computation.

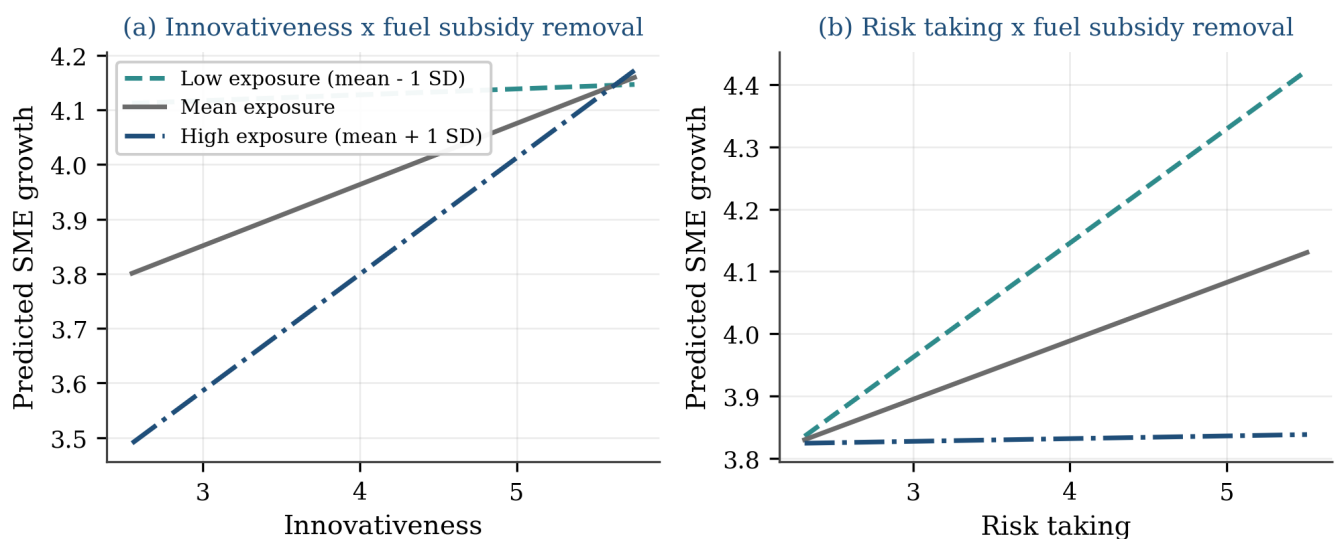


Figure 6: Simple slopes of entrepreneurial orientation on predicted enterprise growth at three levels of exposure to fuel subsidy removal. In panel (a) the lines fan outward as innovativeness rises, so that the growth advantage of innovative firms widens with exposure. In panel (b) the lines converge, so that the advantage of risk tolerant firms narrows to approximately zero at high exposure.

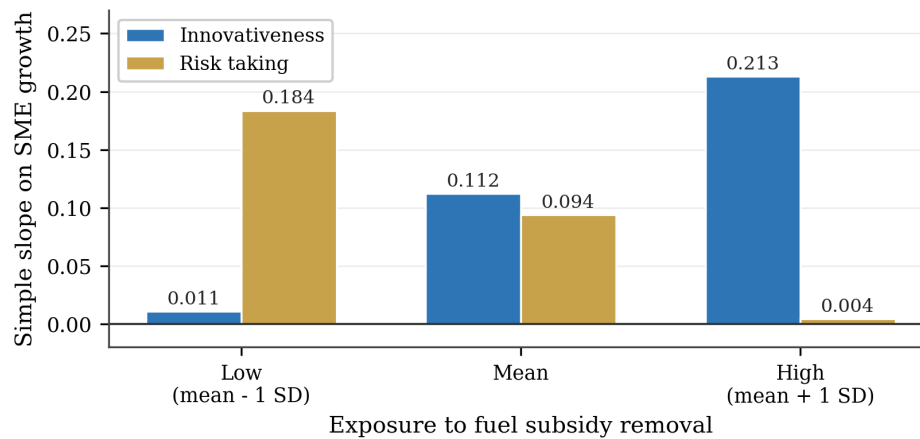


Figure 7: Magnitude of the simple slopes at each level of exposure. The two dimensions of entrepreneurial orientation move in opposite directions: the slope of innovativeness rises nineteenfold from 0.011 to 0.213, while the slope of risk taking falls from 0.184 to 0.004.

The pattern is symmetrical and economically interpretable. Among firms least exposed to the policy, risk taking is the more productive disposition and innovativeness is almost inert. Among firms most exposed, the ordering reverses entirely: innovativeness carries a slope of 0.213 while the slope of risk taking is indistinguishable from zero. The two entrepreneurial behaviours do not merely differ in magnitude under stress; they exchange places.

4.7 Hypothesis Testing

Table 7: Summary of hypothesis testing

Hypothesis	Statement	Result	Decision
H0 ₁	Innovativeness has no significant effect on growth	$\beta = 0.112, p = 0.096$	Not rejected
H0 ₂	Risk taking has no significant effect on growth	$\beta = 0.094, p = 0.149$	Not rejected
H0 ₃	Fuel subsidy removal has no significant effect on growth	$\beta = -0.271, p = 0.001$	Rejected
H0 ₄	No moderation of the innovativeness path	$\beta = 0.184, p = 0.011$	Rejected
H0 ₅	No moderation of the risk taking path	$\beta = -0.163, p = 0.019$	Rejected

5. Discussion of Findings

5.1 Why the Direct Effects Are Insignificant

The finding that neither innovativeness nor risk taking exerts a significant direct effect on enterprise growth appears, at first reading, to contradict the Nigerian evidence reported by Abodunde (2024) and Ogbaini et al. (2024), both of whom found significant positive relationships. The contradiction is apparent rather than real, and resolving it is the central interpretive task of this study.

Two considerations account for the divergence. The first is specification. Once the interaction terms are introduced, the coefficients on innovativeness and risk taking no longer represent average effects across the sample; they represent effects at mean exposure to fuel subsidy removal. A coefficient that is insignificant at the mean may nevertheless be substantial at the extremes, and Table 6 shows that this is exactly what occurs. The second consideration is estimator. The Hausman result required fixed effects estimation, which identifies relationships from variation within firms rather than between them. Studies reporting large direct effects using cross sectional estimators are partly capturing stable differences between firms, such as managerial quality or locational advantage, that correlate with entrepreneurial orientation without being caused by it.

The substantive conclusion is therefore not that entrepreneurial orientation is unimportant. It is that entrepreneurial orientation has no unconditional effect. Asking whether innovativeness raises growth is, on this evidence, a question that cannot be answered without first asking under what conditions.

5.2 The Direct Burden of Subsidy Removal

Exposure to fuel subsidy removal carries a significant negative coefficient of -0.271 in both models. This is consistent with the firm level cost evidence reported by Osho et al. (2026) and with the sectoral findings of Titus et al. (2024) and Ikechukwu et al. (2025). The magnitude is appreciable: a one point increase in exposure on the five point scale is associated with a reduction in growth of just over a quarter of a scale point, holding entrepreneurial orientation constant.

One feature of the results requires explicit comment because it could otherwise be read as an inconsistency. At the bivariate level, exposure to fuel subsidy removal correlates *positively* with growth ($r = 0.452$), yet in the regression its coefficient is *negative*. The reversal is informative rather than contradictory. Exposure, as measured here, reflects the salience of fuel costs in

the respondent's operations, and firms with larger operations, more vehicles and longer distribution chains are both more exposed and, for unrelated reasons, larger and faster growing. The simple correlation therefore conflates exposure with scale. Once firm specific effects are absorbed by the fixed effects estimator, that confound is removed and the cost burden becomes visible. This is a textbook illustration of why the Hausman test result mattered, and it supplies an additional reason for caution in reading the cross sectional literature on this policy.

5.3 The Asymmetric Moderation

The two interaction terms carry opposite signs, and this asymmetry is the principal contribution of the study. Dynamic Capability Theory predicts it. Teece, Pisano and Shuen (1997) distinguish the capacity to sense and reconfigure from the mere willingness to commit resources. Fuel subsidy removal is a discontinuity that rewards the former and penalises the latter, and the estimated slopes trace that distinction with some precision.

For innovativeness, the slope rises from 0.011 at low exposure to 0.213 at high exposure. The mechanism is that the returns to process redesign scale with the price of the input being economised. When petrol is cheap, reorganising delivery routing or substituting an energy source saves little and the managerial attention it consumes may not be recovered. When petrol has trebled in price, the same reorganisation yields a materially larger saving, and the firms capable of executing it separate from those that are not. Innovation has not become easier; its payoff has become larger.

For risk taking, the slope falls from 0.184 at low exposure to 0.004 at high exposure. The mechanism is the mirror image. Risk taking is rewarded when the distribution of outcomes is tolerably narrow and the firm holds a buffer sufficient to absorb an adverse draw. Subsidy removal widened that distribution, by making input costs volatile as well as high, at the same moment as it depleted the buffer, by raising the operating costs that consume working capital. Under those joint conditions a disposition towards uncertain commitment ceases to be entrepreneurial alertness and becomes exposure. The near zero slope at high exposure indicates that among the most affected firms, willingness to bear risk bought nothing at all.

This asymmetry has a methodological implication for the wider literature. Entrepreneurial orientation is frequently operationalised as a single composite index summing its dimensions. Had that approach been adopted here, the positive moderation of innovativeness and the negative moderation of risk taking would have substantially cancelled, and the study would have concluded that the policy environment does not moderate the relationship at all. The dimensions must be modelled separately for the effect to be visible, and composite measures risk concealing exactly the contingency that matters most under economic stress.

5.4 Explanatory Power and Practical Significance

The increase in explained variance from 0.441 to 0.641 when the interaction terms are added is substantial. In applied terms, the conditional structure of the relationship accounts for a fifth of the variance in enterprise growth, a share comparable to that explained by all three direct effects together. For a model of small firm performance, where unmeasured idiosyncratic factors are ordinarily dominant, this is a meaningful result and suggests that the policy environment is not a background condition but a first order determinant of which strategies succeed.

The finding also speaks to a persistent question in the Nigerian enterprise development literature, namely why training interventions that raise entrepreneurial orientation often fail to raise measured performance. The present results suggest one explanation. If the content of such training emphasises opportunity seeking and tolerance of uncertainty without equal emphasis on cost control and process adaptation, it may be strengthening precisely the disposition whose return has fallen to zero while neglecting the one whose return has risen.

5.5 Limitations

Several limitations qualify the findings. Enterprise growth was measured perceptually through owner and manager assessment rather than from audited accounts, which introduces the possibility of common method variance, since the predictors were measured on the same instrument from the same respondents. Exposure to fuel subsidy removal was likewise measured perceptually rather than from fuel expenditure records, so that the moderator captures experienced rather than objective exposure. The design is cross sectional in its data collection even though the estimator is a panel one, which limits causal inference: the direction of the relationship between innovativeness and growth cannot be established definitively from these data. The sample of 261 firms, while adequate for the models estimated, does not support disaggregated analysis by sector, which would be valuable given that exposure to fuel costs varies systematically between manufacturing, transportation and service enterprises. Finally, the study does not observe firms before the policy change, so the counterfactual trajectory of these enterprises in the absence of subsidy removal is not identified.

These limitations indicate the shape of subsequent work. A longitudinal design spanning the policy change, with fuel expenditure drawn from records rather than perception and growth from turnover data, would permit stronger causal claims. Sectoral disaggregation would establish whether the asymmetry documented here is uniform or concentrated among the most energy intensive firms.

6. Conclusion and Recommendations

6.1 Conclusion

This study examined whether fuel subsidy removal moderates the relationship between entrepreneurial orientation and the growth of small and medium enterprises in Nigeria. Using 261 responses and a fixed effects moderated regression, it found that innovativeness and risk taking exert no significant unconditional effect on growth, that exposure to subsidy removal reduces growth directly, and that the policy moderates both entrepreneurial orientation paths in opposite directions.

The central conclusion is that entrepreneurial orientation is contingent rather than uniformly beneficial. The same disposition that supports growth in a stable cost environment may be neutral or harmful once that environment deteriorates. Under the conditions created by subsidy removal the return to innovativeness rose nearly twentyfold while the return to risk taking fell to approximately zero. Entrepreneurial capability therefore converts into growth only where the form of that capability matches the constraint the firm actually faces, and the binding constraint in post subsidy Nigeria is cost rather than opportunity.

6.2 Recommendations

1. **Reorient innovation towards cost reduction.** Enterprise owners should prioritise innovations that lower the cost of energy intensive operations, including route and logistics rationalisation, process redesign, digital channels that reduce physical movement, and substitution towards less fuel dependent inputs. The evidence indicates that this is the dimension of entrepreneurial orientation whose payoff has risen.
2. **Tighten investment appraisal before expansion.** Owners should subject major commitments to explicit appraisal against current rather than historical fuel costs, and should model adverse as well as expected scenarios. The near zero return to risk taking at high exposure indicates that uncalibrated commitment no longer pays.
3. **Targeted government support for affected enterprises.** Government should combine affordable financing with measures that directly reduce the operating burden, since the estimated direct effect of exposure on growth is both negative and significant.
4. **Practical access to alternative energy.** Support for solar and other alternatives should address the capital constraint that prevents small firms from substituting away from petrol, through instruments such as asset financing or guarantee schemes rather than exhortation alone.
5. **Redesign of entrepreneurship training.** Enterprise development programmes should rebalance their content towards adaptation, cost management and resilience, and away from an exclusive emphasis on opportunity seeking and risk tolerance, which the present evidence indicates no longer yields growth under prevailing conditions.

Informed Consent

This study involved human participants, namely owners and managers of small and medium enterprises, who provided informed consent prior to participation. Participants were informed of the purpose of the study and of the voluntary nature of participation, and were assured that responses would be treated confidentially and reported only in aggregate.

Conflict of Interest

The authors declare that there are no known conflicts of interest associated with this publication. The research was conducted in the absence of any commercial or financial relationship that could be construed as a potential conflict of interest.

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Authors Contributions

Ozavinoyi Adinoyi Ademoh: conceptualisation, research design, data collection, data analysis, writing of the original draft. **Peter Ugbedeajo Nelson:** supervision, methodology validation, review and editing, final approval of the manuscript.

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