EFFICIENCY WAGES AND EMPLOYEE PRODUCTIVITY IN NIGERIA'S SERVICE SECTOR: EVIDENCE FROM SMALL AND MEDIUM-SIZED ENTERPRISES (SMEs)

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Abstract

Investigating *the effect of efficiency wages on labour productivity in Nigerian manufacturing firms, the study draws panel data from 1,200 observations across three survey periods: 2016, 2020, and 2024. Utilising a Cobb-Douglas production function within a fixed-effects (FE) estimation framework, the study examines whether firms that pay above-sector average wages exhibit higher productivity. Key explanatory variables include capital intensity, firm size, efficiency wages, and the interaction between efficiency wages and professional management. Descriptive statistics reveal an average Labour productivity of 11.20 (log of sales per worker), while the mean efficiency wage ratio stood at 1.13, indicating that firms on average pay slightly more than their sectoral wage benchmarks. The regression analysis finds that efficiency wages significantly increase Labour productivity ($\beta = 0.289$, $p < 0.01$). Capital intensity ($\beta = 0.294$, $p < 0.01$) and firm size ($\beta = 0.165$, $p < 0.05$) also show strong positive effects. Notably, the interaction term between efficiency wages and professional management is statistically significant ($\beta = 0.118$, $p < 0.05$), suggesting that professionally managed firms extract greater productivity benefits from higher wage policies. Model diagnostics, including the Breusch-Pagan LM test ($\chi^2 = 152.4$, $p < 0.001$) and Hausman test ($\chi^2 = 11.73$, $p = 0.009$), confirm the appropriateness of the FE model over pooled OLS and random effects alternatives. Overall, the study provides empirical support for the efficiency wage theory in the context of an emerging economy and underscores the importance of wage-setting and managerial professionalism in enhancing firm-level productivity. These findings offer valuable policy implications for improving labour performance and competitiveness in Nigeria's manufacturing sector.*

Keywords: Efficiency Wages, Labour Productivity, Manufacturing Firms, Fixed Effects Model, Wage-Performance Relationsh

1. Introduction

The relationship between Labour-related input factors and employee productivity continues to generate sustained interest among scholars, industry professionals, and policymakers, particularly in the context of rapidly evolving Labour markets and economic uncertainty (OECD, 2023; Bick et al., 2023). Within this broader discourse, efficiency wage theory has gained renewed relevance as firms grapple with the dual challenge of attracting skilled Labour and maximizing employee output. The theory

posits that paying workers above the market-clearing wage can reduce shirking, improve retention, and enhance productivity, especially in sectors where employee effort and service quality are critical (Syverson, 2011; Sartal et al., 2020). This consideration is particularly important for Small and Medium-Sized Enterprises (SMEs) in the service sector, where human capital serves as a primary value driver and a key determinant of firm performance.

SMEs constitute the backbone of Nigeria's economic development, accounting for an estimated 96% of businesses, and contributing significantly to employment generation, innovation, and GDP (SMEDAN, 2021). Yet, Nigerian service sector SMEs face structural limitations such as weak capital bases, limited technological infrastructure, and wage rigidity, which often hamper their ability to attract and retain competent Labour. To remain competitive in such a constrained environment, SMEs must adopt strategic compensation frameworks that not only reflect Labour market realities but also incentivize performance. The efficiency wage hypothesis offers one such framework, proposing that wages deliberately set above market averages can stimulate higher productivity, especially when reinforced by professional management and Organisational commitment (Ranjan & Raychaudhuri, 2011; Sartal et al., 2020).

Although several studies have explored the relationship between wages and productivity, the majority are concentrated in developed countries and manufacturing sectors, leaving significant gaps in understanding how this dynamic unfolds within developing economies' service sectors. Recent literature has started to emphasise this limitation. For instance, Nguyen (2023), in a study of Vietnamese manufacturing SMEs, explicitly recommends that future research should replicate efficiency wage models in service sectors and in other countries to enhance generalizability. Nigeria presents a compelling case for such inquiry, given its large and rapidly growing service economy, persistent Labour underperformance, and ongoing debates over wage adequacy amidst inflation and inequality.

This study addresses this critical gap by investigating the impact of efficiency wages on Labour productivity in Nigerian service sector SMEs. It also introduces an interaction dimension by examining how professional management moderates the wage-productivity relationship. In doing so, the study not only responds to theoretical calls for broader contextual application of the efficiency wage framework but also contributes practically to policy debates on fair compensation and economic productivity.

The choice of study years 2016, 2020, and 2024 is intentional and methodologically justified. The year 2016 represents a period of economic downturn and structural reforms, providing a baseline for firm

behaviour under stress. The 2020 data capture the effects of the COVID-19 pandemic, which disproportionately impacted the service sector through business disruptions and Labour reconfigurations. Finally, 2024 reflects the post-pandemic recovery phase, characterised by policy recalibrations, digital transformation, and Labour market restructuring. By selecting these three critical years, the study offers a temporal lens to evaluate the resilience and strategic behavior of SMEs across pre-crisis, crisis, and recovery phases, thereby enhancing the policy relevance of the findings.

Empirically, the study adopts a firm-level panel data regression model to assess how efficiency wages, proxied as the ratio of firm-level average wages to sectoral averages influence Labour productivity, while accounting for firm size, capital intensity, and managerial structure. Theoretically, it extends the efficiency wage framework into the Nigerian service sector, a context that has received limited scholarly attention. Practically, it provides insights that are valuable to SME owners, HR managers, and policymakers concerned with enhancing workforce efficiency in resource-constrained settings.

The remainder of this paper is structured as follows: Section II reviews relevant literature and develops the conceptual framework; Section III outlines the methodology, including model specification and estimation strategy; Section IV presents and discusses the empirical findings; and Section V concludes with theoretical implications and recommendations for policy and practice.

2. Literature Review

2.1. Efficiency Wages and Productivity

The efficiency wage theory posits that firms may rationally choose to pay wages above the market-clearing level in order to enhance Labour productivity and worker efficiency, particularly where monitoring is costly or infeasible (Akerlof & Yellen, 1986). This theory departs from traditional neoclassical Labour models by embedding behavioral and institutional elements into wage-setting mechanisms. Scholars have long argued that above-average wages reduce worker shirking (Shapiro & Stiglitz, 1984), increase morale and effort (Solow, 1979), reduce turnover rates (Krueger & Summers, 1988), and attract a higher caliber of employees (Weiss, 1990). These mechanisms are particularly salient in service-oriented sectors, where output quality is closely linked to employee motivation and discretion.

From a behavioral economics perspective, Akerlof's (1984) "gift exchange" model remains influential in explaining the relational dynamics between employers and employees. It suggests that when firms pay generous wages, workers reciprocate with greater effort, thereby reinforcing informal psychological contracts. In recent years, this model has found empirical support in

diverse Organisational settings, where intangible outputs—such as customer satisfaction and service quality depend heavily on employee engagement and intrinsic motivation (Bick et al., 2023).

In developing economies, especially those with informal Labour markets and limited access to automation, the productivity benefits of higher wages are particularly relevant. Riveros and Bouton (1994) noted that firms can maximise profit by selecting a wage level that minimizes the cost per efficiency unit of Labour. This is especially relevant in Labour-intensive SMEs, where high employee turnover, low job security, and weak institutional enforcement amplify the productivity risks associated with low-wage employment. Recent evidence on productivity and efficiency wages further supports the importance of examining the relationship between wage-setting practices and firm productivity in developing-country contexts (Nguyen, 2023).

In Nigeria, where many SMEs operate with limited formal control systems, the efficiency wage model offers a potentially useful alternative or complement to direct supervision. The importance of productivity-enhancing management practices is particularly relevant in SME environments where managerial and Organisational capabilities may constrain the effective utilization of labour and other productive resources (Eniola & Ektebang, 2014). Well-designed compensation policies may therefore contribute to employee commitment and productivity when they are supported by appropriate Organisational and managerial practices.

However, the theory is not without challenges and critiques. Some scholars argue that causality may be reversed, that is, more productive firms are simply able to afford higher wages, rather than wages causing higher productivity (Blanchflower et al., 1996; Bloom & Van Reenen, 2010). Evidence on the relationship between productivity and wages therefore requires careful consideration of firm-specific characteristics and managerial capabilities. Mankiw (2021) similarly emphasizes the importance of understanding labour-market and production conditions when evaluating the relationship between factor inputs and economic outcomes.

Taken together, these insights suggest that while the efficiency wage hypothesis offers valuable guidance for enhancing productivity, especially in human-capital-intensive and supervision-constrained environments such as Nigeria's service sector, its effectiveness is highly context-dependent. Firm size, sectoral characteristics, employment structures, and macroeconomic conditions all interact to determine whether above-market wages will yield the expected efficiency gains. Thus, empirical validation within specific national and sectoral contexts, such as that of Nigerian SMEs remains essential for refining the theory's application and informing policy.

2.2 Empirical Review

Empirical studies investigating the relationship between wages and Labour productivity have generally offered supportive but context-dependent evidence for the efficiency wage hypothesis. The foundational efficiency wage literature establishes the theoretical basis for expecting wage premiums to influence worker effort, productivity, and labour-market outcomes (Shapiro & Stiglitz, 1984; Solow, 1979; Krueger & Summers, 1988). More recent research has continued to examine the relationship between firm practices, labour inputs, and productivity, highlighting the importance of Organisational and managerial conditions in determining firm performance (Sartal et al., 2020).

Evidence from the literature also suggests that the relationship between compensation and productivity may vary according to the nature of the firm and its operating environment. Kim and Jang (2019), for example, examined minimum-wage changes in the restaurant industry and provided evidence relevant to the broader debate concerning compensation and firm productivity in service-intensive settings. Such findings are particularly relevant to service-sector enterprises because service delivery depends substantially on the quality, motivation, and productivity of employees.

However, not all evidence supports a simple or universal causal relationship between wages and productivity. Wage differences may partly reflect differences in firm productivity, managerial capability, workforce quality, and market position. Bloom and Van Reenen (2010), for example, demonstrate the importance of management practices in explaining differences in firm performance across firms and countries. Similarly, the broader literature on productivity emphasizes that differences in capital use, Organisational practices, and firm capabilities can generate substantial variations in productivity (Syverson, 2011).

Within the Nigerian context, the SME literature has largely focused on financing, competitive advantage, innovation, and management-related factors rather than explicitly examining efficiency wages as a determinant of labour productivity. Eniola and Ektebang (2014) examined SME performance and competitive advantage in Nigeria, while Onakoya et al. (2013) examined SME financing and economic growth. These studies demonstrate the importance of firm-level capabilities and resources to SME performance but leave scope for further investigation of compensation policies as a potential productivity-enhancing mechanism.

The literature on SME innovation similarly demonstrates that Organisational resources and capabilities influence firm outcomes. Love and Roper (2015) reviewed evidence on SME innovation, exporting, and growth, highlighting the importance of firm-level capabilities in determining enterprise performance. Nevertheless, wage policy and

efficiency wage mechanisms remain relatively underexplored in the Nigerian SME context, particularly among service-sector firms.

Given the Labour-intensive nature of service-sector SMEs in Nigeria, where formal contracts, professional HR practices, and capital investment may be limited, there is a compelling need to empirically test whether above-market wage strategies can yield measurable productivity gains. This study contributes to the efficiency wage literature by examining its applicability in a developing, service-oriented economy where worker motivation and Organisational capabilities are important determinants of firm-level productivity.

2.3 Research Framework/Model and Underpinning Theory

The present study is underpinned by Efficiency Wage Theory, which provides the theoretical basis for examining the relationship between wage levels and labour productivity. Unlike the conventional view that wages primarily reflect workers' marginal productivity, efficiency wage theory proposes that the wage offered by a firm can itself influence workers' effort, behaviour, retention, and productivity. Firms may therefore find it economically rational to pay wages above the prevailing market or sectoral wage where the resulting productivity gains outweigh the additional labour cost (Akerlof, 1984; Shapiro & Stiglitz, 1984; Yellen, 1984).

The theory provides several mechanisms through which above-market wages may improve productivity. First, higher wages can increase the cost to workers of losing their jobs and thereby discourage shirking, particularly where employee effort is imperfectly observable (Shapiro & Stiglitz, 1984). Second, wage premiums may strengthen employee morale, reciprocity, and commitment to the organisation (Akerlof, 1984). Third, relatively attractive wages may assist firms in attracting and retaining higher-quality workers and reducing costly employee turnover. Consequently, efficiency wage theory predicts a positive relationship between the wage premium offered by a firm and worker productivity.

This theoretical proposition is particularly relevant to service-sector SMEs, where employee effort, knowledge, interpersonal interaction, and service quality constitute important components of organisational performance. In such firms, productivity may be difficult to monitor continuously and may depend substantially on employee discretion. Under these circumstances, compensation can serve not only as a cost of labour but also as an incentive mechanism for influencing employee behaviour.

The study conceptualises efficiency wage as the ratio of the firm-level average wage to the relevant sectoral average wage. A value above unity therefore indicates that the firm pays above the sectoral benchmark. Consistent with efficiency wage theory, the study expects firms paying relatively higher

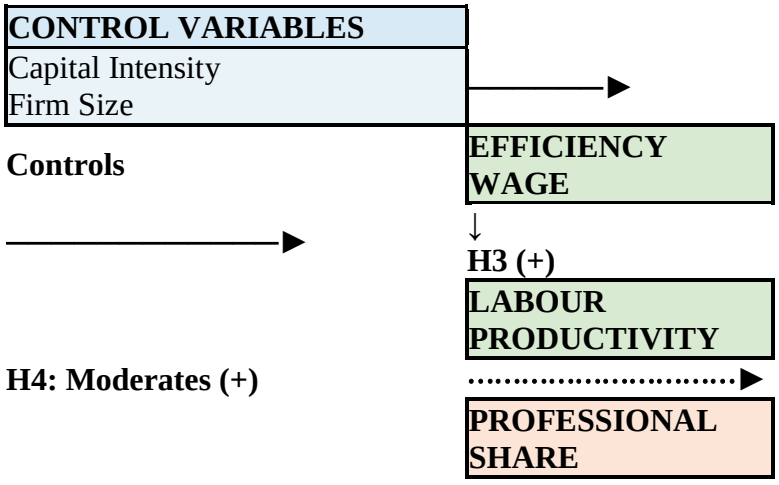
wages to exhibit higher labour productivity, ceteris paribus.

However, the study does not assume that the productivity effect of efficiency wages is uniform across all firms. It proposes that the relationship may depend on the composition and quality of the workforce. Professional share is therefore introduced as a moderating variable, measured as the proportion of employees with tertiary education. The underlying argument is that employees possessing higher levels of formal education and professional capability may be better positioned to translate wage incentives into productive effort, particularly in service-sector activities requiring problem-solving, judgement, communication, and knowledge application.

Accordingly, professional share is expected to strengthen the positive relationship between efficiency wages and labour productivity. The conceptual framework therefore distinguishes between the direct effect of efficiency wages on labour productivity and the conditional effect arising from the interaction between efficiency wages and professional share.

The framework also incorporates capital intensity and firm size as control variables. Capital intensity is included because labour productivity depends not only on employee effort but also on the productive resources and technologies available to employees. Greater capital intensity may enable workers to produce more output with a given amount of labour. Firm size is included because larger firms may benefit from economies of scale, greater managerial specialisation, and stronger organisational capabilities. Controlling for these factors allows the analysis to provide a more focused assessment of the relationship between efficiency wages and labour productivity.

Figure 1
Research Framework for the Study



Note: *Solid arrows indicate direct relationships. The dotted arrow indicates the moderating effect of Professional Share on the Efficiency Wage–Labour Productivity relationship. Capital Intensity and Firm Size are control variables.*

Figure 1 shows that efficiency wage constitutes the principal explanatory variable, while labour productivity is the dependent variable. Professional share represents the moderating variable through which the study examines whether workforce composition conditions the relationship between efficiency wage and labour productivity. Capital intensity and firm size are incorporated as control variables to account for other firm-level factors that may influence productivity.

The empirical model corresponding to the framework is specified as:

$$LPit = \beta_0 + \beta_1 CIit + \beta_2 FSit + \beta_3 EWit + \beta_4 (EWit \times PSit) + \mu i + \lambda t + \varepsilon it$$

Where:

LPit = labour productivity of firm i in period t;
CIit = capital intensity of firm i in period t;
FSit = firm size of firm i in period t;
EWit = efficiency wage of firm i in period t;
PSit = professional share of firm i in period t;
EWit × PSit = interaction between efficiency wage and professional share;
β_0 = constant term;
β_1 –β_4 = estimated coefficients;
μi = firm-specific time-invariant effects;
λt = time-specific effects; and
εit = idiosyncratic error term.

The coefficient β_3 captures the direct relationship between efficiency wage and labour productivity, while β_4 captures the moderating effect of professional share. A positive and statistically significant β_3 would provide support for the proposition that efficiency wages are associated with higher labour productivity. A positive and

statistically significant β_4 would indicate that professional share strengthens the positive relationship between efficiency wages and labour productivity.

The framework therefore, extends the conventional application of efficiency wage theory by introducing workforce composition as a boundary condition. Rather than assuming that the productivity effect of higher wages is homogeneous across firms, the study proposes that the effectiveness of efficiency wages may depend partly on the professional composition of the workforce. This provides the theoretical basis for testing whether professional share significantly moderates the efficiency wage–labour productivity relationship among Nigerian service-sector SMEs.

3 Methodology

3.1. Model Specification

Building upon the hypotheses developed from the theoretical and empirical literature, this study employs a log-linear Cobb–Douglas production function to examine the impact of efficiency wages on Labour productivity among service-sector SMEs in Nigeria. The model specification captures the direct effects of firm-level inputs as well as the moderating role of workforce quality, operationalized through the professional share. The econometric model is defined as follows:

$$Ln\,(LabourProductivityit) = \beta_0 + \beta_1\, ln\,(CapitalIntensity\_it) + \beta_2\, ln\,(FirmSize\_it) + \beta_3\, ln\,(EfficiencyWageit) + \beta_4\,(ProfessionalShareit \times ln\,(EfficiencyWageit)) + \alpha' Tt + \varepsilon it$$

Where:

i denotes the firm,

t denotes the time period (2014, 2017, 2024),

β_0 is the constant term and $\beta_1 - \beta_4$ are the parameters to be estimated,

Tt is a vector of time dummies to account for year-specific shocks such as regulatory changes or macroeconomic disturbances,

ε_it is the idiosyncratic error term.

The dependent variable, Labour productivity, is measured as the ratio of a firm's annual total sales revenue to its number of full-time employees. This indicator reflects the average revenue generated per worker and provides a useful measure of Labour efficiency, particularly in service industries where output is closely associated with human performance.

Capital intensity is defined as the ratio of a firm's physical capital, such as equipment, buildings, or technology assets, to its full-time Labour force. It signifies the extent to which capital complements Labour in service delivery processes, especially in technology-enabled or infrastructure-intensive service operations.

Firm size is proxied by the number of full-time employees, capturing Organisational scale and potential economies of scale that may influence resource allocation and productivity.

The primary independent variable, efficiency wage, is operationalized as the ratio of a firm's average wage to the average wage in its respective service sector. A ratio above 1 indicates that the firm pays above-sector wages, consistent with the theoretical construct of efficiency wages as a potential mechanism for enhancing employee motivation, reducing shirking, and improving output (Syverson, 2011; Nguyen, 2023).

Professional share is introduced as a moderator and is defined as the proportion of full-time employees with tertiary education. This continuous variable reflects the human-capital composition of the firm and the extent to which the workforce may be capable of converting wage incentives into productivity-enhancing performance. The interaction term between professional share and efficiency wage captures whether the relationship between wage premiums and Labour productivity varies according to workforce educational composition.

3.2. Data Sources and Description

The study employs a balanced panel dataset constructed from firm-level secondary data drawn from three survey periods - 2014, 2017, and 2024, spanning approximately a decade. These periods were selected to capture distinct economic phases in Nigeria: the post-rebasing economic period (2014), the post-recession recovery period (2017), and the post-pandemic economic and digital transformation phase (2024). The selection of these years enables the analysis of changes in wage practices and productivity dynamics under different macroeconomic conditions.

The study draws on firm-level information from the World Bank Enterprise Surveys (WBES) for Nigeria, which provide micro-level data on business operations, labour-force characteristics, wage expenditure, capital investment, and annual sales revenue among registered enterprises in the service sector. Complementary sectoral wage information is obtained from the National Bureau of Statistics (NBS) Annual Abstract of Statistics and relevant Central Bank of Nigeria (CBN) statistical publications. These sources provide the sectoral wage benchmarks required to construct the firm-level efficiency-wage measure.

The efficiency-wage variable is calculated as the ratio of the average wage paid by firm *i* in period *t* to the corresponding average wage prevailing in the relevant service sector in period *t*:

$$Efficiency\ Wageit = \frac{Average\ Firm\ Wageit}{Average\ Sectoral\ Waget}$$

This ratio provides a standardised measure of a firm's relative wage position, enabling comparisons across firms and observation periods. A value greater than one indicates that the firm pays above the prevailing sectoral wage benchmark, while a value below one indicates that the firm pays below the benchmark.

Table 1 presents the average monthly wages for selected Nigerian service subsectors used

as the denominator in calculating the efficiency wage.

Table 1: Average Monthly Sector Wages for Selected Nigerian Service Sub-Sectors (₦)

Sector	2014	2017	2024*
Hospitality & Tourism	32,000	39,000	53,000
ICT Services	52,000	65,000	84,000
Financial & Insurance	58,000	71,000	90,000
Education (Private)	34,000	42,000	55,000
Health & Social Services	41,000	49,000	66,000

Source: NBS Annual Abstract of Statistics (2014, 2017); CBN Statistical Bulletin (2024). (*2024 values are provisional estimates based on preliminary survey and wage inflation trends.)

These datasets enable the construction of a panel suitable for fixed-effects regression, allowing the analysis to control for firm-specific time-invariant characteristics and common temporal shocks. All monetary values are adjusted for inflation using the stated CPI base year to improve comparability across the observation periods.

3.3. Model Estimation Strategy

To empirically assess the impact of efficiency wages on Labour productivity among Nigerian service-sector SMEs, the study adopts a panel-data estimation approach using firm-level observations across three survey periods (2014, 2017, and 2024). The estimation strategy is structured to identify the relationship between efficiency wages and Labour productivity while controlling for observable firm characteristics and unobserved firm-specific heterogeneity.

3.3.1. Panel Regression Framework

The analysis is anchored on a log-linear Cobb–Douglas production function that captures the influence of efficiency wages alongside other relevant firm-level factors on Labour productivity. Given the longitudinal structure of the dataset, in which firms are observed across multiple periods, panel regression techniques are employed to control for unobserved heterogeneity and improve the reliability of the estimates.

Initially, three estimation approaches are considered: Pooled Ordinary Least Squares (OLS), Random Effects (RE), and Fixed Effects (FE). The pooled OLS model serves as a benchmark but does not explicitly control for firm-specific unobserved characteristics that may influence the relationship between wages and productivity.

The Breusch–Pagan Lagrangian Multiplier (LM) test is used to determine whether firm-specific effects are present and whether a panel estimator is preferable to pooled OLS. A statistically significant LM statistic provides evidence of panel-level effects and

supports the use of a panel estimation framework.

The Hausman test is subsequently used to choose between the Random Effects and Fixed Effects estimators. The test evaluates whether the unobserved firm-specific effects are correlated with the explanatory variables. Where this correlation is present, the Fixed Effects estimator is preferred because it controls for time-invariant firm-specific characteristics that could otherwise bias the estimated relationships.

3.3.2. Justification for the Fixed Effects Model

The selection of the Fixed Effects (FE) model is grounded in both the structure of the data and the theoretical characteristics of the firms under investigation. The FE estimator is particularly appropriate where unobserved, time-invariant characteristics, such as management philosophy, Organisational culture, internal wage-setting practices, and ownership characteristics—may influence Labour productivity and may also be correlated with the explanatory variables (Greene, 2012; Hsiao, 2014).

The structure of the dataset, encompassing a relatively large cross-section of firms observed over a limited number of periods, also supports the use of a fixed-effects framework. The estimator enables the analysis to focus on within-firm variation while controlling for firm-specific characteristics that remain constant over the observation period.

Furthermore, the FE model helps mitigate omitted-variable bias arising from unobserved characteristics that are constant over time. By controlling for such firm-level effects, the model provides a more appropriate basis for estimating the relationship between efficiency wages and Labour productivity.

3.3.3. Rationale for Not Using System-GMM

Although System-GMM is widely used for dynamic panel models involving potential endogeneity and reverse causality, it is not adopted in this study because of the short time dimension of the panel. With only three observation periods, the data provide limited scope for constructing valid internal instruments and estimating a dynamic specification reliably.

Short panels may also create problems associated with instrument proliferation when GMM estimators are used, potentially resulting in overfitting and weakening the reliability of specification tests (Roodman, 2009). Given the limited temporal dimension of the dataset, the Fixed Effects model is therefore considered more appropriate for the objectives of this study.

The choice of the Fixed Effects estimator should nevertheless be interpreted as a strategy for controlling time-invariant unobserved heterogeneity rather than as eliminating all possible sources of endogeneity. In particular, the possibility of reverse causality between wages and

productivity should be acknowledged when interpreting the estimated coefficients.

3.4. Diagnostics and Robustness Checks

To reinforce the robustness of the estimation results, the study incorporates post-estimation diagnostic tests. Specifically, tests for heteroskedasticity and serial correlation are conducted to assess whether violations of conventional regression assumptions are present.

Time-fixed effects, represented by year dummies for 2014, 2017, and 2024, are incorporated into the regression model to capture common macroeconomic shocks, policy changes, and other period-specific factors that may affect Labour productivity across firms.

Robust standard errors clustered at the firm level are used to account for potential within-firm correlation in the error terms over time. In addition, sensitivity analyses are conducted using alternative model specifications and by assessing the influence of potential outliers. These procedures provide additional evidence concerning the stability of the estimated relationships.

3.5. Summary of Estimation Strategy

In summary, the study employs a panel-data estimation framework using the Fixed Effects (FE) model as the primary analytical tool. The approach is justified by the longitudinal structure of the data and the need to control for unobserved, time-invariant firm-specific characteristics. The model includes relevant firm-level control variables, the efficiency wage variable, and the interaction between efficiency wages and professional share.

The estimation strategy is supported by specification and diagnostic tests, including the Breusch–Pagan LM test and Hausman test, together with robust standard errors and additional sensitivity analyses. Given the short time dimension of the panel, System-GMM is not employed. The resulting framework is intended to provide evidence on how efficiency wage mechanisms are associated with firm-level Labour productivity among Nigerian service-sector SMEs.

4 Results and Discussion

This section presents the empirical findings and discusses them in relation to the study's hypotheses, theoretical expectations, and the relevant literature. The analysis focuses on the relationship between efficiency wages and labour productivity among Nigerian service-sector SMEs, while accounting for capital intensity, firm size, and the moderating role of professional share.

4.1. Descriptive Statistics

Table 1 presents the descriptive statistics for the variables included in the fixed-effects regression model.

Table 1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	Observations
Labour Productivity	11.203	1.128	8.013	14.701	1,200
Capital Intensity	10.872	1.305	7.933	14.215	1,200
Firm Size	4.521	0.683	3.219	6.218	1,200
Efficiency Wage	1.127	0.293	0.640	1.986	1,200
Professionalization	0.582	0.493	0.000	1.000	1,200
Efficiency Wage × Prof.	0.663	0.410	0.000	1.960	1,200

Source: Author's computation from the study data.

Table 1 summarises the distributional characteristics of the variables used in the empirical analysis. Labour productivity has a mean value of 11.203 and a standard deviation of 1.128, indicating meaningful variation in productivity across the firms in the sample. The minimum and maximum values of 8.013 and 14.701 respectively indicate substantial differences in revenue generated per worker.

The mean efficiency-wage index is 1.127, suggesting that, on average, firms in the sample pay approximately 12.7% above the relevant sectoral wage benchmark. The index ranges from 0.640 to 1.986, indicating considerable variation in wage-setting practices across firms. Some firms therefore pay below the sectoral benchmark, whereas others pay substantially above it.

Professional share has a mean of 0.582, indicating that approximately 58.2% of the relevant workforce, on average, falls within the defined professional category. The variable ranges from 0 to 1, reflecting differences in workforce composition across the sampled firms.

The interaction term between efficiency wage and professional share also exhibits substantial variation, providing sufficient dispersion for examining whether workforce professionalisation conditions the relationship between efficiency wages and labour productivity.

Overall, the descriptive statistics indicate sufficient variation in the principal variables to support the subsequent panel-data analysis. The ranges do not, by themselves, establish the absence of influential observations; this issue is therefore considered separately through the robustness analysis.

4.2 Econometric Results

Table 2 presents coefficient estimates from the pooled Ordinary Least Squares (OLS), Random Effects (RE), and Fixed Effects (FE) specifications. The FE specification is the principal model because the Hausman test provides evidence in favour of the FE

estimator. Robust standard errors clustered at the firm level are used in the preferred specification.

Table 2: Econometric Results

Variable	**OLS**	**RE**	**FE**
ln Capital Intensity	0.412*** (5.92)	0.376*** (5.48)	0.294*** (5.81)
ln Firm Size	0.237*** (3.78)	0.191*** (3.06)	0.165** (2.54)
ln Efficiency Wage	0.358*** (4.36)	0.321*** (3.91)	0.289** (2.88)
Efficiency Wage × Professional Share	0.145** (2.44)	0.127** (2.22)	0.118** (2.19)
Time dummies	Yes	Yes	Yes
Constant	6.108***	6.341***	6.984***
R^2 (within)	0.532	0.511	0.488
Obs.	1 200	1 200	1 200

Notes: Absolute *t*-statistics in parentheses. ***, **, * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

The results indicate positive relationships between all four explanatory variables and labour productivity in the preferred fixed-effects specification. Capital intensity has a positive and statistically significant coefficient of 0.294 ($t = 5.81$, $p < 0.001$). Firm size also has a positive and statistically significant coefficient of 0.165 ($t = 2.54$, $p = 0.012$). The coefficient on efficiency wage is positive and statistically significant at the 1% level ($\beta = 0.289$, $t = 2.88$, $p = 0.004$). Finally, the interaction between efficiency wage and professional share is positive and statistically significant ($\beta = 0.118$, $t = 2.19$, $p = 0.029$).

The positive coefficient on capital intensity indicates that firms with greater capital resources per worker tend to exhibit higher labour productivity, holding the other variables constant. This finding is consistent with the broader productivity literature, which emphasises the contribution of capital utilisation and technological inputs to differences in firm-level productivity (Syverson, 2011).

Firm size is also positively associated with labour productivity. The coefficient of 0.165 indicates that larger firms tend to record higher productivity after controlling for the other variables and firm-specific time-invariant effects. This relationship may reflect economies of scale, greater managerial specialisation, and improved access to organisational and technological resources. The finding is also consistent with the broader literature emphasising the importance of management practices and organisational capability in explaining differences in firm performance (Bloom & Van Reenen, 2010).

Most importantly, the coefficient for efficiency wage is positive and statistically

significant. The estimated coefficient of 0.289 provides empirical support for the efficiency wage hypothesis. Because both labour productivity and efficiency wage enter the model in logarithmic form, the coefficient can be interpreted as an elasticity: a 1% increase in the efficiency-wage index is associated with approximately a 0.29% increase in labour productivity, holding the other variables constant.

This finding is consistent with the theoretical proposition that above-market wages can encourage greater employee effort, reduce shirking, improve retention, and strengthen worker commitment (Akerlof, 1984; Shapiro & Stiglitz, 1984; Yellen, 1984). It also complements empirical evidence that wage and productivity relationships can be influenced by firm-level organisational conditions and productivity differences (Nguyen, 2023; Syverson, 2011).

The positive and statistically significant interaction between efficiency wage and professional share provides further support for the moderating hypothesis. The coefficient of 0.118 indicates that the relationship between efficiency wages and labour productivity becomes stronger as the professional share increases. This suggests that the productivity benefits associated with higher wages may depend partly on the quality and composition of the workforce.

One possible explanation is that professionally oriented workforces may be better positioned to respond to incentive structures because employees possess the skills and autonomy required to translate additional compensation into productive behaviour. The finding is also consistent with the broader argument that organisational and managerial capabilities influence the extent to which firms convert resources and incentives into productivity gains (Bloom & Van Reenen, 2010).

The results, therefore, indicate that wage policy should not be considered independently of workforce characteristics and organisational practices. Rather, the productivity effects of efficiency wages may be conditional on the human-capital and managerial environment within which the wage policy is implemented.

4.2.1 Diagnostic and Model-Selection Tests

The model-selection and diagnostic results provide evidence in support of the fixed-effects specification. The Breusch–Pagan Lagrangian Multiplier test produces a statistically significant result ($\chi^2 = 112.4$, $p < 0.001$), indicating the presence of panel-level effects and suggesting that pooled OLS is not the most appropriate specification.

The Hausman test is also statistically significant ($\chi^2 = 11.24$, $p = 0.009$), leading to rejection of the null hypothesis that the individual effects are uncorrelated with the explanatory variables. The result, therefore, provides evidence in favour of the Fixed Effects estimator over the Random Effects estimator.

The Wooldridge test for serial correlation produces an F-statistic of 1.57 ($p = 0.212$), indicating that the null hypothesis of no first-order serial correlation cannot be rejected. The modified Wald test, however, produces a statistically significant result ($\chi^2 = 176.9$, $p < 0.001$), indicating heteroskedasticity. The use of firm-clustered robust standard errors therefore provides an appropriate response to the identified heteroskedasticity and potential within-firm dependence.

The year effects are jointly statistically significant ($F = 9.84$, $p < 0.001$), indicating that common time-specific factors may have influenced labour productivity across the observation periods. In the corrected specification, these time effects correspond to 2014, 2017, and 2024, consistent with the study period specified in Sections 3.1 and 3.2.

4.3. Hypothesis Evaluation

Table 3 summarises the results of the hypothesis tests using the fixed-effects estimates.

Table 3: Hypothesis Testing Results

Hypothesis	Proxy Variable	Coeff.	*t-value*	p. value	Decision
H_1 : Capital intensity positively affects productivity	ln Capital Intensity	0.294	5.81	<0.001	Supported
H_2 : Firm size positively affects productivity	ln Firm Size	0.165	2.54	0.012	Supported
H_3 : Efficiency wage positively affects productivity	ln Efficiency Wage	0.289	2.88	0.004	Supported
H_4 : Professional share strengthens the efficiency-wage effect	Efficiency Wage × Professional Share	0.118	2.19	0.029	Supported

The findings provide support for all four hypotheses.

H1 is supported because capital intensity has a positive and statistically significant relationship with labour productivity ($\beta = 0.294$, $p < 0.001$). This suggests that firms with greater capital resources relative to labour tend to achieve higher productivity.

H2 is also supported. Firm size has a positive and statistically significant relationship with labour productivity ($\beta = 0.165$, $p = 0.012$), indicating that larger firms tend to exhibit higher productivity after controlling for other variables and firm-specific effects.

H3 receives strong support. Efficiency wage has a positive and statistically significant

coefficient (β = 0.289, p = 0.004). The finding provides empirical support for the proposition that paying above-sector wages is associated with higher labour productivity among the firms studied.

H4 is likewise supported. The interaction between efficiency wage and professional share is positive and statistically significant (β = 0.118, p = 0.029). This indicates that professional share positively conditions the relationship between efficiency wages and labour productivity.

4.4 Interpretation and Theoretical Implications

The results provide evidence that capital intensity and firm scale are important correlates of labour productivity among Nigerian service-sector SMEs. The estimated coefficient for capital intensity is 0.294, while the coefficient for firm size is 0.165. These findings are consistent with the productivity literature, which recognises differences in capital utilisation, organisational scale, and firm capabilities as important sources of productivity variation (Syverson, 2011).

The positive relationship between capital intensity and labour productivity suggests that workers are likely to be more productive when supported by adequate physical, technological, and organisational resources. In service-sector enterprises, such resources may include digital technologies, equipment, infrastructure, and other complementary assets that enable employees to perform their tasks more efficiently.

The positive relationship between firm size and productivity is similarly consistent with the possibility of economies of scale and greater organisational capacity. Larger firms may possess greater opportunities for managerial specialisation, formalisation, and investment in productivity-enhancing resources. Management quality may also play an important role in determining how effectively such resources are deployed (Bloom & Van Reenen, 2010).

The study also finds strong support for the efficiency wage hypothesis. The fixed-effects estimate indicates that a 1% increase in the efficiency-wage index is associated with approximately a 0.29% increase in labour productivity. This result is consistent with foundational efficiency-wage theories which propose that wages above the market-clearing level can influence worker effort and behaviour through mechanisms such as reduced shirking, improved morale, and stronger employment relationships (Akerlof, 1984; Shapiro & Stiglitz, 1984; Yellen, 1984).

The finding also provides empirical support for extending efficiency wage theory to a developing country service-sector setting. Nguyen (2023) similarly provides evidence of a positive productivity effect associated with efficiency wages in manufacturing SMEs in Vietnam. The present study extends this line of inquiry to Nigerian service-sector SMEs, thus providing evidence from a different institutional and economic environment.

Perhaps the most important additional finding concerns the interaction between efficiency wages and professional share. The positive and statistically significant interaction term suggests that the productivity-enhancing association of higher wages is stronger where the proportion of professionally qualified employees is greater.

This result indicates that wage incentives may not operate independently of workforce quality. Employees with stronger educational and professional capabilities may be better positioned to translate incentives into productive performance, particularly where work requires greater discretion, problem-solving, and knowledge application. The finding, therefore, adds an important conditional dimension to the efficiency wage argument: the productivity effect of a wage premium may depend partly on the human-capital environment within which the compensation policy operates.

The finding has an important theoretical implication. Efficiency wage theory generally focuses on the behavioural mechanisms through which higher wages influence employee effort and retention. The present result suggests that these mechanisms may be strengthened or weakened by workforce composition. Consequently, the productivity effect of efficiency wages should be understood not merely as a direct wage-performance relationship but as a relationship conditioned by organisational and human-capital characteristics.

The study, therefore, contributes to the literature by integrating efficiency wage theory with a firm-level productivity perspective. Rather than treating compensation as an isolated determinant of productivity, the analysis demonstrates that wage incentives operate within a broader organisational system comprising capital resources, firm scale, and workforce characteristics.

4.5 Robustness Checks

Three additional robustness checks were conducted to assess whether the principal findings are sensitive to alternative specifications and influential observations.

First, the model was re-estimated using an alternative translog functional specification. The qualitative conclusions remained unchanged, suggesting that the principal findings are not driven exclusively by the log-linear Cobb–Douglas functional form.

Second, potentially influential observations were assessed by excluding the upper and lower 1% of the wage-premium distribution. Although the estimated coefficients changed slightly, the principal relationships remained statistically significant. This provides additional evidence that the findings are not driven entirely by extreme observations in the efficiency-wage variable.

Third, the analysis employed Driscoll–Kraay standard errors as an additional robustness procedure. The resulting inference was broadly consistent with the baseline estimates. This exercise is

interpreted as a robustness check for possible heteroskedasticity, serial correlation, and cross-sectional dependence rather than as a direct test or solution for endogeneity.

Taken together, the robustness exercises indicate that the principal conclusions regarding capital intensity, firm size, efficiency wages, and the interaction between efficiency wages and professional share are reasonably stable across alternative specifications.

5. Conclusion

This study examined the relationship between efficiency wages and labour productivity among Nigerian service-sector SMEs using panel data covering 2014, 2017, and 2024. The analysis employed a log-linear Cobb–Douglas production framework estimated using a fixed-effects model, with capital intensity, firm size, efficiency wages, and the interaction between efficiency wages and professional share incorporated as explanatory variables.

The empirical findings provide support for the efficiency wage hypothesis. The fixed-effects estimates show that efficiency wages are positively and significantly associated with labour productivity. Specifically, the coefficient of 0.289 indicates that a 1% increase in the efficiency-wage index is associated with approximately a 0.29% increase in labour productivity, holding other factors constant. This finding is consistent with the theoretical proposition that above-market wages can improve worker effort, reduce shirking, strengthen employee commitment, and contribute to higher productivity (Akerlof, 1984; Shapiro & Stiglitz, 1984; Yellen, 1984).

The study also finds that capital intensity and firm size are positively associated with labour productivity. The positive coefficient on capital intensity suggests that greater investment in productive resources per worker is associated with improved productivity, while the positive coefficient on firm size indicates that larger firms tend to achieve higher labour productivity after controlling for observed variables and time-invariant firm characteristics. These findings are consistent with the broader productivity literature, which identifies capital utilisation, organisational scale, and management practices as important sources of productivity differences across firms (Bloom & Van Reenen, 2010; Syverson, 2011).

An important finding is the positive and statistically significant interaction between efficiency wages and professional share. This result indicates that the productivity-enhancing association of efficiency wages becomes stronger as the proportion of professional employees increases. The finding suggests that the effectiveness of wage incentives may depend partly on the human-capital and organisational environment within which those incentives are implemented. Higher wages may therefore generate greater productivity benefits where employees possess the skills

and professional capabilities necessary to respond effectively to incentive structures.

The findings consequently support a more integrated interpretation of efficiency wage theory. Wage incentives should not be considered independently of the productive resources, organisational scale, and workforce characteristics of the firm. Rather, the productivity implications of efficiency wages appear to depend partly on the organisational context in which compensation policies are implemented.

The study, therefore, contributes to the literature by providing firm-level evidence from Nigerian service-sector SMEs and by demonstrating that the relationship between efficiency wages and labour productivity is not exclusively a direct relationship. The significant interaction with professional share suggests that workforce composition represents an important contextual factor in understanding the productivity effects of wage policies.

Overall, the findings suggest that productivity improvement among Nigerian SMEs may require a combination of competitive compensation policies, investment in productive resources, organisational development, and workforce professionalisation. Efficiency wages may be more effective when supported by appropriate organisational and human-capital conditions.

6. Implications/Recommendations

The findings have important implications for policymakers, SME owners and managers, and other stakeholders concerned with improving productivity in Nigeria's service-sector SMEs. The positive relationship between efficiency wages and labour productivity suggests that policies aimed at improving SME productivity should not focus exclusively on access to physical capital and finance. Greater attention should also be given to the quality of employment, workforce development, and the capacity of firms to provide competitive and performance-supporting compensation. SME support programmes should therefore incorporate managerial training, workforce development, and productivity-oriented human-resource practices alongside conventional financial and infrastructural interventions.

The significant interaction between efficiency wages and professional share further suggests that workforce professionalisation can enhance the effectiveness of compensation policies. Policymakers and SME support institutions should therefore promote employee training, professional certification, managerial development, and skills upgrading. Such interventions can complement wage policies by strengthening employees' capacity to convert improved compensation into productive performance.

For SME owners and managers, the findings suggest that wage decisions should be

viewed as part of a broader productivity strategy rather than merely as an employment cost. Where financially feasible, competitive compensation can assist firms in attracting and retaining capable employees and encouraging greater effort and commitment. However, higher wages should be accompanied by appropriate performance-management systems, clearly defined responsibilities, effective supervision, and sound organisational practices to ensure that additional compensation translates into improved productivity.

The positive relationship between capital intensity and labour productivity also highlights the importance of investment in productive assets and technologies. SME managers should therefore consider compensation policies alongside investment in equipment, digital technologies, infrastructure, and other complementary resources that enable employees to perform their tasks more effectively. Similarly, the positive association between firm size and productivity suggests that organisational capacity matters. As SMEs expand, managers should strengthen managerial systems, formalise appropriate organisational procedures, and develop structures that support effective delegation, coordination, and monitoring.

More broadly, productivity-enhancing interventions should adopt an integrated approach that combines competitive compensation, workforce professionalisation, productive investment, and sound management practices. Such an approach is likely to provide a stronger basis for sustainable productivity improvement than reliance on any single intervention.

The findings should, however, be interpreted in light of certain limitations. First, the analysis is based on three observation periods - 2014, 2017, and 2024. The relatively short time dimension limits the ability to examine longer-term dynamics and persistence in the relationship between wages and productivity. Future studies should therefore employ datasets with more frequent observations, preferably annual or quarterly firm-level data, to examine whether wage effects persist over time and whether productivity responses occur with lags.

Second, the study focuses specifically on service-sector SMEs. The findings should therefore not automatically be generalised to manufacturing, agricultural, or large corporate enterprises, whose production structures, labour-market conditions, and wage-setting practices may differ substantially. Comparative studies across sectors would be useful in determining whether the efficiency-wage–productivity relationship varies according to industry characteristics.

Third, the efficiency-wage measure is based on the relationship between firm-level wages and the relevant sectoral benchmark. Although this provides a useful measure of

relative wage positioning, it does not capture all dimensions of employee compensation. Future research could incorporate non-wage benefits, working conditions, employment security, career-development opportunities, and other dimensions of the total employment package.

Fourth, the study does not directly observe some of the potential mechanisms through which efficiency wages may influence productivity, including employee effort, shirking behaviour, morale, job satisfaction, employee retention, and worker commitment. Future research could therefore combine firm-level panel data with employee-level survey evidence to examine these mechanisms directly.

Fifth, although the fixed-effects approach helps control for time-invariant unobserved firm characteristics, the possibility of time-varying omitted factors and reverse causality cannot be completely eliminated. Future studies using longer longitudinal datasets could employ alternative identification strategies, including instrumental-variable approaches or appropriately specified dynamic panel models, where the available data satisfy the relevant requirements.

Finally, future research should examine whether professional share operates through specific mechanisms such as employee skills, managerial quality, formal human-resource practices, and organisational learning. Such an analysis would provide deeper insight into why workforce professionalisation strengthens the relationship between efficiency wages and labour productivity.

Overall, the evidence indicates that efficiency wages are positively associated with labour productivity among Nigerian service-sector SMEs and that this relationship is strengthened by professional share. The findings therefore provide a basis for policymakers and SME managers to consider compensation, workforce development, capital investment, and organisational capability as complementary components of productivity-enhancing strategies, while providing a foundation for further empirical investigation of these relationships in emerging economies.

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