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**Moderating Role of Alternative Finance on Firm  
Characteristics and Efficiency Nexus**



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## Moderating Role of Alternative Finance on Firm Characteristics and Efficiency Nexus



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### Abstract

**Purpose:** Scholarly endeavors to explore the moderating role of alternative finance on the firm operational characteristics - efficiency nexus has received little attention, despite a burgeoning need for funding, for Small and Medium-size Enterprises (SMEs) who have unique financial needs. To counter this conundrum, this study sought to explore how alternative finance influences the relationship between operational characteristics and efficiency of SMEs in the manufacturing sector in Kenya.

**Methodology:** The study targeted 171 SMEs members of Kenya Association of Manufacturers. The study used data envelopment analysis, multiple regression modeling and moderated multiple regression analysis techniques to measure efficiency, analyze direct relationships and for moderation analysis respectively. To test robustness of the results the study used Partial Least Squares Structural Equation Modeling.

**Findings:** The study found positive relationship between operational characteristics and efficiency of SMEs. Further, alternative finance demonstrated significant moderating role on the relationship between SME operational characteristics and efficiency.

**Unique Contribution to Theory, Policy and Practice:** Based on the findings this study, recommends that Intermediators, Government and SME advocacy organizations corroborate to operate on-line hybrid alternative finance-microfinance institutions to assist SMEs achieve higher efficiencies and accelerate economic growth.

**Keywords:** *SME, Efficiency, Alternative Finance, Operational Characteristics, moderation, financing*

## Introduction

Small and Medium-size Enterprises (SMEs) have special financial needs, since they do not have capacity to meet stringent requirements necessary to access formal finance. These stringent requirements include collateral, guarantors, audited financial statements and history of a stable income (Erick, 2014; Manasseh, 2007). This predicament forces the SMEs to rely heavily on alternative finance (AF).

Alternative finance is often the dominant source of funds for firms in fast-growing economies (Kihimbo, Ayako, Omoka & Otuya, 2012; Abdulsaleh & Worthington, 2013). Compared to traditional sources, alternative financing channels provide an equally important source of funds in developed and developing countries (Allen, Qian & Qian, 2005; IFC, 2010). In Kenya, even though SMEs play a major role in promoting economic growth, the problem of financing is still prevalent. Finance cost and, manufacturing cost factors are some of the major causes for SMEs failures in Kenya hence the need to focus more effort on these areas (Ruirie, 2010).

Compared to large firms, SMEs' financial decisions and behaviour are significantly unique (Abdulsaleh & Worthington, 2013; Forkuoh, Affum- Osei, & Quaye, 2015). According to financial growth cycle paradigm proposed by Berger and Udell (1998), firms require different financing strategies throughout the various phases of their life cycle. During start-up phase, SMEs depend heavily on alternative finance (Kim & Shin, 2007; IFC, 2010; Giannetti, Burkart, & Ellingsen, 2011; Abdulsaleh & Worthington, 2013). Murfin & Njoroge (2012) found out that the largest firms in the US are also net receivers of trade credits, a form of alternative finance.

Allen et al., (2005) demonstrated that China, currently the second largest economy in the world in terms of Nominal Gross Domestic Product (GDP), provides a significant counter-example to most of the existing research in law, institutions, finance, and growth. During China's transformation (1980-2010), neither its legal institutions nor its traditional financial systems were well developed, and the government was regarded as not only autocratic but also corrupt. However, its economy grew at the fastest pace in the world. This was because the most dynamic corporate sector, with various forms of private ownership (including joint ownership with local governments), relied mostly on alternative finance and provided the engine for its prodigious economic growth.

SMEs at inception entirely rely on alternative finance sources such as from personal saving, friends and Micro Finance Institutions (MFIs). They are therefore, almost entirely financially excluded as entities, safe for the Financial Inclusion (FI) of their owners and or investors. At this stage, they are mainly micro sized businesses. When a Micro-size enterprise survives and graduates into an SME, then it can plan in the medium term and can enjoy more FI for it can get trade financing, factoring, lease financing as well as formal bank financing (IFC, 2010).

Those SMEs which succeed to grow into medium-size enterprises must not only plan medium-term but also long term, according to WBG – IBRD, IDA & IFC (WBG 2010); IFC, IBRD & IDA (2014). In addition to enjoying more FI in the form of trade financing, factoring, lease financing and formal bank financing, they will also be able to venture into private equity capital market (WBG – IFC, 2010). Empirically, firm operational characteristics have a direct relationship with SMEs efficiency. Similarly, modes of financing be they formal or informal, may impact this characteristics - efficiency relationship.

### **Literature Review**

One of the key theories this study considered was the Theory of the Firm. Theory of the firm is that branch of Economic Theory that endeavors to determine important economic variables associated with the individual business unit. While it is imperative to endeavor to explain and predict the nature of the firm in relation to its reason for existence, behavior, structure and relationship to the market, (Coase, 1937), Neoclassical economics theorists (under the Theory of the Firm) suggests that an ideal proportion of labour, capital and technology may sustain a firms' economic growth rate.

Meanwhile the Baumol's cash management model helps in determining a firm's optimal cash balance under conditions of certainty. Baumol's argument is that cash and inventory management problems are similar. However, initial traditional Theory of the Firm studied supply of goods by profit-maximizing agents. Here, production costs played an important role. Coase, (1937), however, pointed out that in addition, transaction costs are vital in explaining a firm. This study delves into the question if SME characteristics drive their efficiency. In addition, we probe if alternative finance has a moderating role on such relationship.

That SMEs economic growth rate may well be determined by the proportions of major driving forces, which are labour, capital and technology, depending on how they are financed. If less costly AF is used, as compared to more expensive sources, then the economic growth rate of the SMEs will be higher and vice versa. It is important for this study to find out if those firms that employ more alternative finance end up more efficient than those that employ less of alternative finance. The Theory of the Firm therefore brings in a vital concept for consideration in this study.

Allen, Carletti, Qian, and Valenzuela, (2012) opine that globally, compared to traditional financing channels (financial markets and banks), which provide significant sources of funds in developed countries, AF channels provide an equally important source of funds in both developed and developing countries. Further, they found out that AF is frequently the leading source of funds for firms in fast-growing economies. They advocate for firm level data to show the importance of alternative finance in corporate finance.

Corporate finance determines the survival, growth and thrive of SMEs (Zhou & Wit, 2009; Jasra, Khan, Hunjira, Rehman, & Azam, 2011; Abdulsaleh & Worthington, 2013; Nangoli, Turinawe,

Kituyi, Kusemererwa, & Jaaza, 2013). Bowen, Morara & Mureithi (2009) while asserting that managerial competency's role in business success is primary while that of credit is secondary implies moderating role of alternative finance in the relationship between characteristics and efficiency of SMEs. To improve SMEs efficiency, firm operational characteristics should be boosted with the right amount of focus on beneficial sources of alternative finance.

Ayyagari, Beck & Demirguc-Kunt, (2007) identified lack of access to credit as one of the major challenges SMEs in Kenya face. As noted, one of the culprits in the lack of access to credit was lack of information on various sources of alternative finance. If SMEs obtained this information, even if at a fee, they would be better off. This relationship reinforces the credence of the moderating role of alternative finance on the development of SMEs which ultimately influences SME characteristics and hence efficiency, as demonstrated by Waweru (2017). Allen et al. (2005) and Giannetti et al., (2011) pointing to some of the determinants influencing choice of alternative financing mode for SMEs, in their discussion of formal versus informal finance for enterprises, underscored the importance of informal finance in firms.

Even though there is an accumulation of scholarly knowledge on operational characteristics - efficiency nexus, the impact of alternative finance on operational characteristics - efficiency nexus has received limited attention, more so its impact on small and medium-size enterprises (SMEs). This study is to counter this conundrum.

Various operational characteristics such as size, age, and managerial competency, influence SMEs efficiency (Anderson, 1983 and Bowen et al., 2009). International Federation of Accountants (2007) and Mwangi (2014) adds that suitable moderating variables such as alternative finance may influence this relationship.

The study tested the following hypothesis;

*H<sub>01</sub>: There is no significant relationship between operational characteristics and efficiency of SMEs in Kenya.*

*H<sub>02</sub>: Alternative finance has no significant moderating role on the relationship between operational characteristics and efficiency of SMEs in Kenya.*

## **Methodology**

This study used a structured approach and borrowed from Zikmund, Babin, Carr & Griffin, (2010). Hierarchical moderated multiple regression analysis was conducted to test the moderating role of alternative finance. To test the robustness of our results we also conducted Partial Least Squares Structural Equation Modelling (PLS-SEM)

This study adopted Data Envelopment Analysis (DEA) tool from Charnes, Cooper, & Rhodes, (1978), to measure relative efficiency of SMEs using equations 1 & 2.

$$E_i = \text{Maximize } \frac{\sum_{k=1}^m U_k Y_{ki}}{\sum_{j=1}^n V_j X_{ji}} \dots\dots\dots 1$$

Subject to:

$$E_i = \text{Maximize } \frac{\sum_{k=1}^m U_k Y_{ki}}{\sum_{j=1}^n V_j X_{ji}} = < 1, \text{ for } i = 1, \dots, n \text{ and } V_j \geq 0 \dots\dots\dots 2$$

Where:

- $m$  = number of outputs for each SME using  $n$  different inputs;
- $n$  = number of inputs used by each SME to produce  $m$  different outputs;
- $y_{ki}$  = is the amount of the  $k^{th}$  output for the  $i^{th}$  SME;
- $x_{ji}$  = is the amount of the  $j^{th}$  input used by the  $i^{th}$  SME;
- $u_k$  = is the output weight;
- $v_j$  = is the input weight.

We used Stepwise moderated multiple regression (MMR) as adapted from Fried, Lovell and Eeckaut, (1993) in our analysis. In stepwise multiple regression, the researcher provides a list of independent variables and then allows the programme to select which variables it will enter, and in which order they go into the equation, based on a set of statistical criteria. Multiple regression modeling was used to analyze relationships using equation 3 and hierarchical moderated multiple regression analysis used to test alternative finance moderation (equations 4 & 5). Aiken and West (1991) explain that the MMR approach involves the addition of interaction effects to a multiple regression model by comparing two different least square regression equations.

First, the relationship between operational characteristics and efficiency of SMEs was determined as in equation 3 (Adapted from Fried et al., (1993). This determination of relationship also served as the first step of the moderated multiple regression (MMR) to test the moderating effect of alternative finance on the relationship between firm characteristics and efficiency.

$$E_i = \alpha_i + \beta s_i S_i + \beta g_i G_i + \beta m_i M_i + \epsilon_i \dots\dots\dots (3)$$

Adapted from Helm, & Mark, 2012),

Where:

- $E_i$  = Efficiency of SME  $i$  (Where,  $0 \leq E_i \leq 1$ );
- $\alpha_i$  = Intercept, a sample-wide constant;

$S_i = \text{Log } S_i = \text{natural logarithm of total assets of SME}_i \text{ (size);}$

$G_i = \text{Age of SME}_i;$

$M_i = \text{Managerial competency of management of SME}_i;$

$\varepsilon_i = \text{error term; } \beta s_i, \beta g_i, \beta m_i = \text{coefficients for the respective determinants;}$

$i = 1 \text{ to } n \text{ where there are } n \text{ observations.}$

In step 2, the moderator, Alternative Finance, is introduced to equation one above, to form the following new equation (4). Here, at least one of the predictor variables should be significant.

$$Ei = \alpha_{21} + \beta s_{21}S_i + \beta g_{21}G_i + \beta m_iM_i + \beta af_{21}AF_i + \varepsilon_{21} \dots\dots\dots (4)$$

Where:

$Ei, S_i, G_i, M_i, = \text{as defined in equation 3}$

$\alpha_{21} = \text{Intercept, a sample-wide constant;}$

$AF_i = \text{Moderating variable – AF index of SME}_i;$

$\varepsilon_{21} = \text{error term}$

$\beta s_{21}, \beta g_{21}, \beta m_{21}, \beta af_{21} = \text{coefficients for the respective determinants.}$

In the final step in the Alternative Finance Moderated Multiple Regression Models for Efficiency on SME Characteristics, the moderator is sustained and further incorporated in each of the independent variables as an interaction variable to form equation five here below. In this step, the overall model should be significant in addition to the moderator and at least one of the predictor variables.

$$Ei = \alpha_{22} + \beta s_{22}S_i + \beta g_{22}G_i + \beta m_{22}M_i + \beta af_{22}AF_i + \beta saf(S_iAF_i) + \beta gaf(G_iAF_i) + \beta maf(M_iAF_i) + \varepsilon_{22} \dots\dots\dots (5)$$

Where:

$Ei, S_i, G_i, M_i, = \text{as defined in equation 4}$

$\alpha_{22} = \text{Intercept, a sample-wide constant;}$

$AF_i = \text{Moderating variable – AF index of SME}_i;$

$\varepsilon_{22} = \text{error term; } \beta s_{22}, \beta g_{22}, \beta m_{22}, \beta af_{22} = \text{coefficients for the respective determinants;}$

$\beta saf, \beta gaf, \beta maf, = \text{coefficients that indicate moderation.}$

Scholars such as Beck, Demirgüç-Kunt, Laeven and Maksimovic, (2005); (2008); Allen et al., 2012; Baeck, Collins & Zhang, (2014) view AF as the receipt of funds from non- bank and market sources. Adopting the same stance, this paper determined Alternative Finance as the average

annual total amount of all AF sources invested by the SME. Modes of alternative finance considered included personal savings, loan from family, retained earnings, microfinance institutions funding, SACCOs funding, table banking, hire purchase, lease finance, promissory notes, bills of exchange and trade credit. Others include invoice trading, accruals & debt based securities, factoring, venture capital, business angel financing, peer-to-peer business lending and peer-to-peer consumer lending (Kochan, Bezrukova, Ely, Jackson, Joshi, Jehn, Leonard, Levine, & Thomas, 2003; Rauch, Wiklund, Lumpkin, & Frese, 2009; Ruirie, 2010 Basterretxea & Martinez, 2012; Kihimbo et al., 2012 Degryse, Lu & Ongena, 2015; Khedhaouria, Gurău, & Torrès, 2015;; Petro, Annastazia, & Robert, 2014).

Representative firm characteristics were size, age and managerial competency. Average turnover, total assets, and number of employees were used to determine size of the firm (Brown & O'Connor, 1995 and Charoenrat, Harvie, & Amornkitvikai 2013). Age was measured by taking the base year 2016 subtract the year of registration (Zhou & Wit, 2009; Banerjee, 2014). Managerial competencies were evaluated using the level of education, years of experience and level of innovation, as supported by Industry Canada, (2003) and Sanda, Sackey, & Falholm, (2011). For efficiency values using DEA), inputs used were production costs, staff costs and operating expenses while production, gross profit and ROI, were applied as outputs.

Some data obtained in the managerial competency construct had to be converted into a continuum from ordinal. It is possible to have spurious results even where strict Linear Programming (LP) assumptions on normality have been met. A robustness test of models adopted was therefore necessary, to eliminate possibility of spurious correlations. Partial Least Squares Structural Equation Modelling (PLS-SEM) was applied. PLS-SEM normally uses an LP analysis approach, but relaxes the strict Ordinary Least Squares (OLS) requirements, while retaining its relevance (Kline, 2011). The two-step approach for SEM incorporating the confirmatory measurement model and the confirmatory structural model as given by Anderson and Gerbing (1988), further supported by Byrne (2010) and Ndung'u, Wanjau, Gichira and Mwangi (2014), was used.

### **Summary Statistics and Descriptive Results**

For demographics, variables and constructs, the study targeted the manufacturing SMEs in Kenya. The questionnaire obligated respondent owner/manager to specify their age bracket among three taxonomies: 18-30 years, 31-50 years and above 50 years. Majority (60 per cent) of the respondents were in the 31-50 years' age-group. Those above 50 years were a minority at 33 per cent while 18 to 30 years formed only 7 per cent of the respondents. These results indicate that majority of manufacturing SME owner/manager were aged between 31 and 50 years.

Romano, Tanewski and Smyrnios (2001); Abdulsaleh and Worthington (2013), argue that the effect of the owner/manager's age on the financial behaviour of SMEs is such that unlike older entrepreneurs' younger entrepreneurs are more likely to invest additional finance into their firms.



Clarifying the connection between the financial growth cycle of SMEs and the owner–manager’s life cycle, Briozzo and Vigier (2009) holds that as the firm and its owner age, information asymmetries decrease, granting easier access to debt, while the owner’s risk aversion and personal costs of bankruptcy increase with age. Conversely, their appetite to borrow dwindles.

The firm’s level of alternative finance was fairly distributed about the mean at 141.56 million shillings with a standard deviation of 101.75 million shillings, a positive moment coefficient of Skewness of 0.95, a moment coefficient of Kurtosis of 0.25, indicative of a platykurtic peak. The firm with the highest level of alternative finance had 526.52 million shillings while the one that had the lowest held 17.86 million shillings.

The SME operational characteristics construct composed of three sub-constructs – Firm Size, Managerial Competency, and Firm Age. Managerial competency composed of three constructs, owner/manager innovation, level of education and years of experience. SME manager/owner’s level of innovation was measured using average number of new branches opened and new products launched over the period 2012 to 2016. The study observed a close to normal distribution of new branches/products about the mean of 1.77, with a standard deviation of 0.44. A 0.0 moment coefficient of Skewness indicating perfect symmetry and a moment coefficient of Kurtosis of 0.22. The SME with the highest innovation had 2.9 while the one with the lowest had a score of 0.4. The study found out that on average, all the SMEs had at least opened a new branch or launched a new product over the period.

Owner/manager education measurement used a five level Likert scale. Up to primary school, a score of 1; up to high school, a score of 2; up to Diploma level, a score of 3; up to first degree, a score of 4; then master’s degree and above, score of five. Owner/manager experience measurement used a five level Likert scale. Below 1 year - a score of 1; 1 year and less than 3 years - a score of 2; 3 years and less than 6 years - a score of 3; 6 years and less than 10 years - a score of 4; 10 years and above - with a score of 5. We converted ordinal data for owner/manager education and experience into continuous data for compatibility (Table 1).

Education had a mean of 3.99, a standard deviation of 0.93, skewness of -0.15, kurtosis of -1.5, minimum of 2 and a maximum of 5. On the other hand, experience had a mean of 3.92, a standard deviation of 0.96, skewness of -0.04, kurtosis of -1.54, minimum of two (2) and a maximum of five (5).

Averaging experience and education, a few 2.9% of the top management of the SMEs had low education/experience, while 22.1% had average education/experience. A further thirty five point three percent (35.3) of the respondents had high education/experience level and thirty-nine -point seven per cent (39.7%) of the respondents had very high education/experience level. Therefore a cumulative majority of 75% had above average education/experience level.

While Storey (1994) found out that entrepreneurs with higher levels of education exude more confidence in dealing with bankers and other funders when applying for loans, Cole (1998) found out that experience enhances the availability of credit. Still, Nofsinger and Wang (2011) conclude that the experience of the entrepreneur is a factor in explaining the difference in external financing levels available to SMEs. Lenders therefore factor experience into the process of evaluating creditworthiness of SMEs, since more experienced entrepreneurs are viewed as better performers, compared to less experienced entrepreneurs.

**Table 1: Summary Statistics for Alternative Finance and Managerial Innovation**

Statistic	AF	Innovation	Education	Experience
N	136	136	136	136
Mean	141.56	1.77	3.99	3.92
Std. Deviation	101.75	0.44	0.93	0.96
Skewness	0.95	0	-0.15	-0.04
Kurtosis	0.25	0.22	-1.5	-1.54
Minimum	17.86	0.4	2	2
Maximum	526.52	2.9	5	5

### The author(s)

The Firm Size construct composed of total assets, turnover, number of employees (Table 2). Log of total assets was fairly distributed about the mean 8.03 with a standard deviation of 0.33 log and a slight positive moment coefficient of

Skewness of 0.014, the degree of asymmetry of the distribution around the mean. With a moment coefficient of Kurtosis of -1.11, indicative of a flat peak. The firm with the highest assets has 8.72 while the one having the lowest holds 7.34. Banerjee (2014) agrees that the survival of SMEs heavily depends on the availability of resources.

SMEs turnover is fairly distributed about the mean 64.39 with a standard deviation of 29.53 and a positive moment coefficient of 0.78, the degree of asymmetry of the distribution around the mean. With a moment coefficient of Kurtosis of 0.36, indicative of a platykurtic peak (DeCarlo, 1997). The firm with the highest turnover has 165.21 while the one having the lowest had 19.14. European Commission (2011); EIS (2005); World Bank Group - IBRD and IDA (2017), indicate turnover as a reliable measure of size of a firm.

On number of employees across the study found out that cumulatively, a majority (99 per cent) had up to 125 employees while only a few, 1 per cent, had more than 125 employees. The number of employees is distributed about a mean of 54 with a standard deviation of 32 and a positive moment coefficient of Skewness of two, a moment coefficient of Kurtosis of ten, indicative of a

Leptokurtic peak. The SME with the highest number of employees had two hundred forty five while the one with the least number of employees has seven employees.

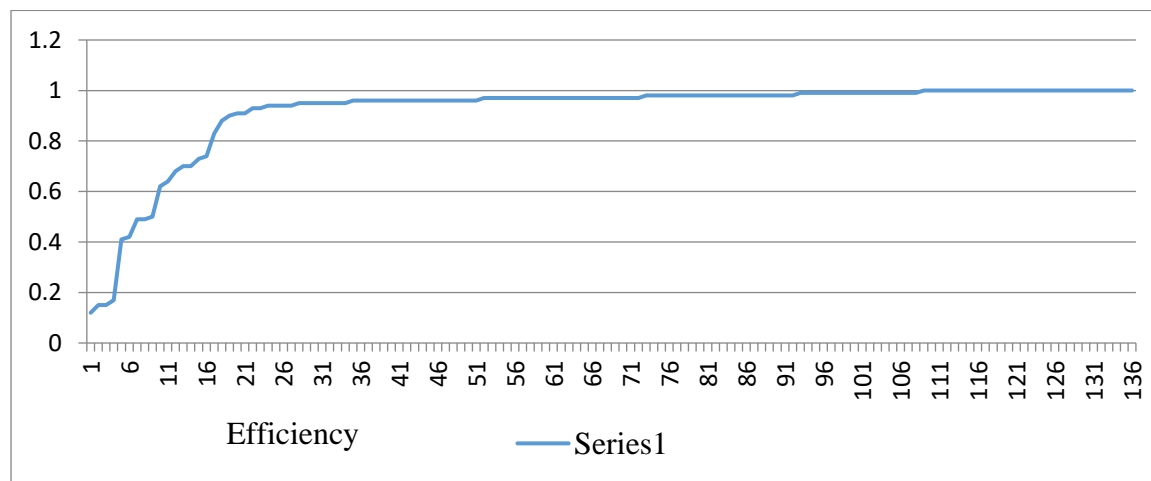
**Table 2: Alternative Finance, Turnover & Employees Descriptive Statistics**

	Total assets Log (T)	Turnover	Employees	Firm Age
N	136	136	136	136
Mean	8.03	64.39	54	19.09
Std. Deviation	.33	29.53	32	18.60
Skewness	.014	0.78	2	2.81
Kurtosis	-1.11	0.36	10	9.71
Minimum	7.34	19.14	7	2.0
Maximum	8.72	165.21	245	119

**The author(s)**

The firm age data has a mean of 19.90 years with a standard deviation of 18.60 years and a positive moment coefficient of Skewness of 2.81, a moment coefficient of Kurtosis of 9.71, indicative of a Leptokurtic peak. The oldest firm is 119 years while the youngest is 2 years. Table two.

Outcome of Data Envelopment Analysis shows that sampled SMEs had relative efficiency levels ranging between 0.12 and one (1). Notice the curvilinear trajectory rises steeply from the outset, such that within the first quartile observations, the curve levels out with efficiency levels of above 0.85. Therefore, only a few 2.2 per cent of the SMEs have their efficiency levels below 0.315. Most of the SMEs (86 per cent) have efficiency of above 0.89. The efficiency mean was 0.92, standard deviation at 0.18 points, a Skewness of -1.15, and Kurtosis level of 1.72, Figure 1.



**Figure 1: SMEs Efficiency Distribution Curve**

**The author(s)**

## Inferential Results and Discussions

We present inferential results in terms of the study's hypotheses by presenting the results and discussion of the various regressions. For model summary, ANOVA and t-test coefficients, we begin with the results on the direct relationship between SME operational characteristics and efficiency, then the results on the moderating influence of alternative finance on the relationship between SME operational characteristics and efficiency.

### Model Summary for Regression of Efficiency on Operational Characteristics and for Alternative Finance Moderated Multiple Regression of Efficiency on SME Operational Characteristics

Table 3 shows the archetypes of the model summary for testing multiple regression on the relationship between SME operational characteristics and efficiency and moderated multiple regression of alternative finance on the relationship between SME operational characteristics and efficiency of SMEs in Kenya. The results of the multiple regression of efficiency on SME operational characteristics, and those of steps two and three of alternative finance moderated multiple regression of efficiency on SME operational characteristics in archetypes 1R, 2R and 3R respectively.

Of importance here is the strength and direction of R, and the adjusted  $R^2$  value. From Table three model .1R for regression of efficiency on operational characteristics, the study observed a strong positive correlation coefficient R of 0.764. Further, observe that an adjusted model can explain about 57.4 per cent of the variations in level of efficiency in SMEs, given adjusted  $R^2 = 0.574$ .

Table three archetype 2R is a model summary of a moderated multiple regressions run for effect of alternative finance on operational characteristics - efficiency relationship. A strong positive correlation coefficient R of 0.801 is observed, while an adjusted model can explain about 63.1 per cent of the variations in the level of efficiency in SMEs. The model summary Table 3 archetype 3R presents outcome of step 3 of a moderated multiple regression run for alternative finance moderated multiple regression of efficiency on SME operational characteristics. From the model summary in Table 3, archetype 3R, this study observes a strong positive correlation coefficient R of 0.833. An adjusted model can explain about 67.9 per cent of the variations in level of efficiency in SMEs.

**Table 3: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1(R) <sup>a</sup>	.764	.584	.574	.11589
2(R) <sup>b</sup>	.801	.642	.631	.10798

3(R)<sup>c</sup> .833 .693 .679 .10065

### The author(s)

### Analysis of Variance (ANOVA) and t-test Coefficients Output for Multiple Regression of Efficiency on SME operational Characteristics and Alternative Finance Moderated Multiple Regression of Efficiency on SME operational Characteristics

Table 4 illustrates The ANOVA results of a multiple regression of efficiency on SME operational characteristics, and ANOVA of steps two and three of alternative finance moderated multiple regression of efficiency on SME operational characteristics in archetypes ANOVA 1R, ANOVA 2R and ANOVA 3R respectively. Two-way analysis of variance (ANOVA) isolates systematic data variability from random variability in data sets. It establishes the type of relationships between and among multiple data sets by use of the systematic variability. The imperative in an ANOVA table is the significance of the F Statistic.

From Table 4, archetypal ANOVA 1R, the linear regression F-test has the null hypothesis that the model explains zero variance in the dependent variable, (Thus,  $R^2 = 0$ ). The study found out that the F-test statistic (61.75) is highly significant, since P-value  $< 0.05$ . The study therefore, reject the null hypothesis  $H_0$  and accept the alternative that the model significantly explains the variance in the dependent variable.

From Table 4 archetypal ANOVA 2R, the study finds that the F-test statistic (58.612) is highly significant, since P-value  $< 0.05$ . The study therefore, may conclude that the model has moderating power, since it explains to a significant level, the efficiency level of an SME. Further, Table 4, archetypal ANOVA 3R the linear regression F-test has the null hypothesis that the model explains zero variance in the dependent variable, (Thus,  $R^2 = 0$ ). We find that the F-test statistic (41.651) is significant, since P-value  $< 0.05$ . Therefore, the model has predictive power, explains to a significant level, the efficiency level of SMEs.

**Table 4: Analysis of Variance (ANOVA)**

Model	Variable	Sum of Squares	Df	Mean Square	F	Sig.
(1R) <sup>a</sup>	Regression	2.488	3	0.82871	61.75	.000 <sup>b</sup>
	Residual	1.773	132	0.01342		
	Total	4.261	135			
(2R) <sup>b</sup>	Regression	2.734	4	0.68283	58.612	.000 <sup>b</sup>
	Residual	1.527	131	0.01165		
	Total	4.261	135			
(3R) <sup>c</sup>	Regression	2.954	7	.422	41.651	.000 <sup>b</sup>
	Residual	1.307	129	.010		

Total	4.261	136
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### The author(s)

Table 5, t-test Coefficients section shows the t-test coefficients for relationship between firm operational characteristics and efficiency of SMEs as well as testing moderating influence of alternative finance on the relationship between firm operational characteristics and efficiency of SMEs in archetypes t-test Coefficients 1R, t-test Coefficients 2R and t-test Coefficients 3R respectively

In Table 5, Archetypal t-test Coefficients 1R, observe that for all the three-predictor variables, the t-values are significant, since P-value observed  $< 0.05$  the tabulated critical P-value. Specifically: Firm age regression coefficient was positive and significant as well ( $\beta = 0.003$ , t-value =5.346,  $P < 0.05$ ); Firm size regression coefficient was positive and significant as well ( $\beta = 0.176$ , t-value =5.389,  $P < 0.05$ ); competency regression coefficient was positive and significant as well ( $\beta = 0.118$ , t-value =8.639,  $P < 0.05$ ). Therefore, then the null hypothesis of no relationship is rejected, accepting the alternative  $H_{15, R}$ . Consequently, the study concluded that a positive relationship between the predictor variables and the dependent variable does exist. Consequently, the study concluded that a positive relationship between predictor and the dependent variable does exist

In Table 5, Archetypal t-test Coefficients 2R, it is observed that for the moderator and all the three predictor variables, the t-values are significant, since P-value observed  $< 0.05$  the tabulated critical P-value. Specifically, firm age regression coefficient is positive and significant with ( $\beta$  – value = .361; t-value =6.450,  $P < 0.05$ ); Firm size regression coefficient is positive and significant with ( $\beta$ – value = .907; t-value =6.209,  $P < 0.05$ ); management competency regression coefficient is positive and significant with ( $\beta$ –value = .458; t-value =7.957,  $P < 0.05$ ); Alternative finance regression coefficient is positive and significant with ( $\beta$ –value = .770; t-value =4.588,  $P < 0.05$ ); Therefore, then the null hypothesis of no relationship is rejected accepting the alternative  $H_{15, R}$ . Consequently, the study concluded that, the null hypothesis that the moderator has no relationship with the dependent variable is rejected, accepting the alternative  $H_{15, R}$ . Consequently, this study concludes that the moderator has a strong positive relationship with the dependent variable and has moderating capability.

From Table 5 Archetypal t-test Coefficients 3R, observe that for all the three predictor variables and two of the three moderated variables, and the moderator, the t-values are significant, since P-value observed  $< 0.05$  the tabulated critical P-value. Specifically: Firm age regression coefficient was positive and significant as well ( $\beta = 0.003$ , t-value =3.796,  $P < 0.05$ ); firm age  $\times$  Alternative finance regression coefficient was negative statistically not significant ( $\beta = -0.001$ , t-value = -0.847,  $P > 0.05$ ); firm size (SI) regression coefficient was positive and significant as well ( $\beta = 0.487$ , t-value =5.719,  $P < 0.05$ ); firm size  $\times$  alternative finance (SI  $\times$  AF) regression coefficient was positive and significant as well ( $\beta = 0.019$ , t-value =2.396,  $P < 0.05$ ); competency regression

coefficient was positive and significant as well ( $\beta = 0.172$ ,  $t$ -value =5.195,  $P < 0.05$ ); competency  $\times$  Alternative finance ( $M \times AF$ ) regression coefficient was positive and significant as well ( $\beta = 0.060$ ,  $t$ -value =4.557,  $P < 0.05$ ).

**Table 5: Regression Coefficients**

Model	Variable	Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
(1R) a	(Constant)	-1.031	.253		-4.074	.000
	Firm Age	.003	.001	.316	5.346	.000
	SI Log	.176	.033	.324	5.389	.000
	Competency	.118	.014	.519	8.639	.000
(2R) b	(Constant)	-4.265	.743		-5.738	.000
	Firm Age	.003	.001	.361	6.450	.000
	Firm Size	.584	.094	.907	6.209	.000
	Competency	.104	.013	.458	7.957	.000
	Alternative Finance	.136	.030	.770	4.588	.000
(3R) c	(Constant)	-3.337	.675		-4.946	.000
	Firm age	.003	.001	.273	3.796	.000
	SI Log	.487	.085	.898	5.719	.000
	Competency	.072	.014	.319	5.195	.000
	AF	.142	.070	.411	2.043	.043
	AF x Firm age	-.001	.001	-.087	-.847	.399
	AF x SI	.019	.008	.885	2.396	.018
	AF x Competency	.060	.013	.740	4.557	.000

**The author(s)**

The predictive power of alternative finance on the relationship between operational characteristics and efficiency was as obtained below. From Table five, the study recorded significant overall predictive power (R-Square) increase of 10.50per cent from 57.40per cent to 67.90per cent with  $P < 0.05$ . This implies that alternative finance has a moderating role on efficiency of SMEs, since it increases the equation variables predictive power by 10.50 per cent the stepwise increase of the predictive power is 57.40 per cent in step 1, 5.70 per cent in step two and 4.80 per cent in step three.

**Table 6: Moderation Summary of Change of Predictive Power**

Step	R-Square	Change	Is Variable Significant? Sig $P < 0.05$
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			Age	Size	Managerial Competency
<b>Adjusted R-Square</b>					
1	57.40%	57.40%	Yes	Yes	Yes
2	63.10%	05.70%	Yes	Yes	Yes
3	67.90%	04.80%	No	Yes	Yes
<b>R-Square</b>					
1	58.40%	58.40%	Yes	Yes	Yes
2	64.20%	5.60%	Yes	Yes	Yes
3	69.30%	5.10%	No	Yes	Yes

**The author(s)**

The second research objective was to establish the moderating role of AF on the relationship between SME operational characteristics, (size, age, managerial competency) and operational efficiency. Our model was:

$$E_i = \alpha_{22} + \beta s_{22} S_i + \beta g_{22} G_i + \beta m_{22} M_i + \beta af_{22} AF_i + \beta saf(S_i AF_i) + \beta gaf(G_i AF_i) + \beta maf(M_i AF_i) + \epsilon_{22} \dots\dots\dots (5)$$

Imputing the coefficients as computed, new equation to predict efficiency becomes:

$$E_i = -3.337 + 0.487 S_i + 0.003 G_i + 0.172 M_i + 0.142 AF_i + 0.019(S_i AF_i) - .001(G_i AF_i) + 0.060(M_i AF_i) + \epsilon_{22} \dots\dots\dots (5)$$

Where:

$E_i$ : Efficiency

$S_i$ : Firm size

$G_i$ : Firm age

$M_i$ : Managerial competency

$\alpha_{22}$  = Intercept, a sample-wide constant;

$AF_i$  = Moderating variable – AF index of SME<sub>i</sub>;

$\epsilon_{22}$  = error term;

$\beta s_{22}, \beta g_{22}, \beta m_{22}, \beta af_{22}$  = coefficients for the respective determinants;

$\beta saf, \beta gaf, \beta maf$  = coefficients that indicate moderation.

**Test of Robustness of results**

To test robustness of our results, we conducted PLS SEM. Mburiah (2017) supports this approach. Results of the direction and strength of the relationship and test of significance were consistent



with those of the multiple linear regression (MLR) model. Results relating to influence of managerial competency on efficiency regression were, R-square =43.90, t-value>1.96 and p-value < 0.05, while results for moderation of alternative finance through interaction with predictor variables were R-square =50.50. t-values >1.96 and p-values < 0.05. Test results for robustness were as given in Table 7.

**Table 7: Comparison of MLR/SEM Models Results**

<b>t-value Influence of Managerial Competency on Efficiency</b>			<b>t-values of the interaction of Alternative Finance with Predictor Variables</b>		
<b>Variables</b>	<b>Models</b>		<b>Variables</b>	<b>Models</b>	
	<b>LR</b>	<b>SEM</b>		<b>MLR</b>	<b>SEM</b>
Managerial Competency	10.20***	7.54***	Education × AF	2.19**	1.88*
			Experience × AF	2.86***	3.45***
			Innovation × AF	2.11**	2.06**

(\*\*\*), (\*\*), (\*) Results significant at 1 per cent, 5 per cent and 10 per cent level of significance respectively

<b>R- square result for the Influence of Managerial Competency on Efficiency</b>			<b>R- square result for the interaction of Alternative Finance with Predictor Variables</b>	
<b>Models</b>	<b>Models</b>		<b>Models</b>	
	<b>LR</b>	<b>SEM</b>	<b>MLR</b>	<b>SEM</b>
	43.90%	43.90%	50.90%	50.50%

**The author(s)**

### Conclusion

To accomplish the objectives of the study, a multiple regression of efficiency on SME operational characteristics as well as an alternative finance moderated multiple regression of efficiency on SME operational characteristics were performed. Overall findings on both indicate that there exists positive significant relationship between firm operational characteristics and efficiency. Further, alternative finance has a moderating role on the relationship between efficiency and some SME operational characteristics. Therefore, those firms that employ more alternative finance end up more efficient than those that employ less of alternative finance. This study concludes that alternative finance does moderate the firm operational characteristics – efficiency nexus. These findings support the Theory of the Firm, confirms the conceptual framework and contribute to expand the body of knowledge. Based on the initial objectives, findings, and conclusions this study, recommends that Intermediators, Government and SME advocacy organizations corroborate to operate on-line hybrid alternative finance-microfinance institutions to assist SMEs achieve higher efficiencies and accelerate economic growth.

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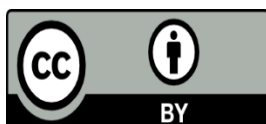
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