

Investment in Research and Development and Firms' Productivity in Manufacturing Sector: the Case of SMEs in Southwest Nigeria

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Abstract

The study investigated the relationship between investment in research and development (R&D) and SMEs' performance in Southwest Nigeria. The study concentrated on the activities of SMEs in the industrial and manufacturing industry, using Manufacturing Association of Nigeria Classification (MAN). Using the survey design method, the multi-staged sampling technique was employed to select respondents from the study. Data were collected from both primary and secondary sources. Secondary data were obtained from annual reports/publications with relevant information on R&D in SMEs. Primary data were collected through the use of questionnaire. A sample size of 365 SMEs across the six states of the geo-political zone was used while a total of 208 sets of questionnaire were returned. Both descriptive and analytical techniques were used to analysis the results. The analytical technique employed was basically multivariate regression analysis with dummy variables using the Ordinary Least Square (OLS) approach. The results showed that external support for SMEs investment in R&D remains a challenge. The outcome of R&D and innovation showed that in most cases, one to two (1-2) new products, improved products, new technology, new business plan and innovative ideas were added to firms under investigation. Hypothesis was formulated. The regression model showed that SMEs which invested in R&D have four points (4.095) higher on productivity scales compared to those which did not, and the relationship is statistically significant with $p\text{value} < 0.05$. The study, therefore, concluded that investment in R&D has positive significant relationship with SMEs' productivity. The study recommended that government and other stakeholders should extend the research-industry-extension services to SMEs. In this case, research grants to R&D inclined SMEs like the manufacturing industry would be most appropriate.

Keywords:

Research and
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Innovation, Small
and Medium Scale
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Background to the Study

The contribution of Small and Medium Scale Enterprises (SMEs) to innovation-led growth and job creation is of importance in recent years. A large body of evidence shows that SMEs, particularly in the manufacturing industry contribute greatly and significantly to the innovation system by introducing vast array of new products and improving existing ones, thus enhancing their economic relevance and competitiveness in the global market (OECD, 2000;Ussahawanitchakit, 2012 and Keizer & Halman, 2002). Modern entrepreneurs and indigenous technology therefore could probably create job and better positioned over bigger firms provided they can enhance their capacity to be innovative through research and development (R&D) activity.

Investment in innovative behaviours strengthens employees' creativity and organizations' drive to create new products and processes that are considered germane for improved performance and competitiveness in the market place (Rukevwe, 2015). Barriers to innovation however, which include lack of capital investment, infrastructural deficit, poor education and training systems, difficulty in utilizing technology which results in low productivity and in general, deficiencies in know-how and skills acquisition are more challenging to the SMEs than bigger firms (OECD, 2004; Andy and Jasper, 1989; Dark and Hanna 2012). Among these challenges, finance dilemma is grimmer and more daunting in the Nigerian case. The above notwithstanding, the importance of R&D on firm's productivity cannot be overemphasized. Failure to undertake product research could place the business where much of their success would depend on luck rather than market strategy (Berghoff, Philip and Uwe, 2012).

Investments in research and development (R&D) and innovation like any investment projects have finance implications. In principle, there are two sources for financing innovation projects. External sources such as bank loans, venture capital or other debt instruments, and internal sources, which include retained earnings and equity finance. R&D, however, is characterized by high, and usual riskiness, and low collateral value. As a result of its perceived riskiness and cost implications, SMEs may be thought of as having nothing to do with R&D (Dirk and Hanna, 2012). The above notwithstanding, recent evidences suggest that SMEs play important role in research and development activity. However, the nature and outcome of R&D activities have been largely unexplored (Yahaya, Marwan, and Muna 2004; Rukevwe, 2015; Terziovski, 2010).

It is worthwhile to discover that, research and development, innovations and SMEs' performance are intertwined. Besides, it is interesting to note that R&D is distinct from innovation however, it is a reliable precursor to generating innovation both technological and non-technological innovation (Siyabola, 2016).

Technological innovation includes process and product innovation while non-technological innovation includes marketing and organizational innovation (OECD, 2005). Innovations typically result from investment in R&D and R&D activities of firms can be seen as private investments in the creation of knowledge and improved ways of achieving creativity and productivity which often stems from implementation of newly generated knowledge and

technological discoveries into new products, improvement of existing products and production processes (Hall and Mairesse, 1995). Unarguably, the nexus is intuitive and appealing. The study therefore attempts to investigate the relationship between investment in research and development (R&D) and firms' productivity.

The paper is divided into five sections. Section 1 deals with the introduction. Section 2, literature review and empirical evidences while section 3 is concerned with research method. Section 4 presents analysis of result and discussion of findings. Conclusion and recommendations are presented in section 5.

Statement of the Problem

Berghoff, Philip & Uwe (2012), in a study on the benefits of R&D asserts that failure to undertake product research could place the business where much of their success would be dependent on luck rather than market strategy. In Nigeria, SMEs' drive for R&D is at a low ebb consequently, their potentials are not fully exploited thus, leading to poor performance. Studies relating to R&D in SMEs and finance implications, unlike large firms, are relatively scarce going by the literature. The financing structure of R&D in SMEs demands investigation in order to identify the various stakeholders and the extent of their interest. On the other hand, the nature of the outcome of R&D and innovative activities of SMEs is sparsely documented. By nature, we mean impact analysis on improved products, new products, new technology, new business plan and SMEs innovation potentials. Thus, the extent which R&D activities are crucial for the innovation success of SMEs, particularly manufacturing SMEs, remains an important consideration in this study. Thus, to the best of author's knowledge, very few empirical studies are documented on SMEs investment in R&D and innovation and its effect on SMEs performance in Nigeria, particularly in the manufacturing sector. This study, therefore, attempts to fill these research gaps.

Research Questions

The paper attempts to answer the following research questions

- (i) To what extent does investment in R&D contributes to manufacturing SMEs' productivity?
- (ii) How do SMEs in the manufacturing industry fund investment in R&D?
- (iii) What is the outcome of R&D activities in manufacturing SMEs?

Objectives of the Study

The objectives of this study are to:

- (i) Evaluate the relationship between investment in R&D and productivity in manufacturing SMEs.
- (ii) Identify the means of financing R&D in manufacturing SMEs and the extent of their interest.
- (iii) Analyze the outcome of R&D and innovation in manufacturing SMEs.

Hypothesis

Investment in R&D does not significantly contribute to SMEs' productivity.

Literature Review

The concept of SMEs varies from sector to sector and country to country. It is based on certain parameters and common indices such as sales volume (turnover), number of employees, fixed assets, total assets, capital employed, size, among others (Jamil and Mohammed 2011; Bala-Subrahmanya, 2005). Ramachandran (2002) however, argued that SMEs in the Nigerian context are best defined as those with fewer than 100 employees and below N50 million in assets.

Research and Development (R&D) is an intangible asset of a firm that is closely related with firm innovation. Innovation on the other hand results from investments in R&D (Czacrnitzki and Hottenrot 2011). Research and Development (R&D) initiatives of any firm are investigative activities associated with the invention of new products or improvement of existing ones. Mohd, Peox & Ali (2010) defined R&D as a set of activities resulting from the use of mental abilities in a scientific and logical way to create necessary knowledge needed to sustain and develop various organizations.

The concept of innovation has been severally defined in the literature. According to Philippe (2006), innovation generally refers to changing or creating more effective processes, products and ideas that enhances firm's opportunity to succeed. Kutin & Marisck (2010) classified innovation as process of translating an idea or a discovery into a good or service that creates value, and is capable of meeting and satisfying the needs and expectations of the customers. Innovation is the process of development of new product by implementing new methods of working and product development in order to enhance the value of the firm and meet the taste of the consumers (Orlikowski 2010). In a related view, Rogers (1995) opined that an innovation is an idea, practice, or project that is perceived as new by an individual or other unit of adoption.

OECD, (2005) classifies innovation into four types. These are product, process, organization and marketing innovations. Product innovation refers to the introduction of new or improved product, or service to the market with a marked difference from previously produced product/service by the firm. Example is the introduction of new OMO detergent and 'improved bournvita' drink. Process innovation on the other hand entails the implementation of new or enhanced manufacturing or distribution process, or a new improved method of creating and delivering services. Organizational innovation however, results in new ways of categorizing internal associations, directing and empowering employees, molding careers and rewarding work with pay and benefits (Ottenbacher and Gnoth, 2005). This leads to more effective use of human resources that are of importance to the successful utilization of ideas (Andy and Jasper, 1998). One of the aims of organizational innovation is to reduce administrative overheads in order to cut cost and enhance firm's performance. Marketing innovation on the other hand, engages in the improvement of marketing methods or implementation of a new marketing method, representing a departure from the existing marketing strategies. The objective of marketing innovation is to bring about major changes in product design and/or packaging, placement and promotion. Thus, according to Van de Ven (1986) 'innovation is intrinsically about identifying and using opportunities to create new products, services or work practices'.

According to Namasonge, Willy & Olawoye (2016), innovativeness portrays organizational willingness and tendency to achieve the desired innovation demonstrated in terms of behaviours, strategies, activities and processes. Consequently, innovativeness usually results in new product/services or changes in services/product lines, developing new R&D processes and new methods of production. In summary, innovation is the transformation of ideas by creativity into new/improved products, processes and services with the aim of gaining a competitive advantage and improving firm's performance.

Theoretical Framework

The theoretical foundation for this work is based on R&D, innovative production processes for product development that can yield competitive advantage for SMEs (Mansfield, 1968; Baily, 1972). According to Rogers (2005) low investment in R&D reduces innovation and knowledge creation, which in turn reduces productivity as well as investment in both physical and human capital.

Empirical Literature: R&D and Firm's Performance

The impact of R&D and innovation on SMEs performance is variously documented in the literature. Essentially, the key reasons for innovation is the desire of firms to obtain increased competitive advantage and invariably increased business performance. In a study in Australia, Terziovski (2010) considered innovation practices and its effects on performance of SMEs. With an investigation of 600 firms in the manufacturing sector, the results showed that, innovation strategy is a key driver to performance of SMEs.

Yahya, Marwan & Muna (2004) carried out an integrated innovation-performance analysis on 184 manufacturing firms operating in Turkey, the effect of organizational, product, process and marketing innovation was explored on different aspects of firm performance-innovation, product, market and financial. The results showed an evidence of a positive relationship of innovations on firm's performance. Rukevwe (2015) investigated how innovation affects business performance in small and medium-sized enterprises (SMEs) in Nigeria. The study demonstrated that there is high correlation among factors used to measure innovation. And secondly, innovation was found to influence business performance.

Isaya, Humphrey & Lucy (2015) assessed the influence of product research in enhancing performance of Small and Medium Enterprise in Nyeri town, Kenya. The study employed a survey research design. Using correlation coefficient and multiple regression analysis, the finding of the study revealed positive and statistically significant results for the relationship between product research and performance of SMEs. Yusuf, Adeyemi & Michael (2009) examined the impact of research and development (R&D) expenditure, product and process innovations on small and medium scale enterprises (SMEs) performance in the manufacturing industry in Nigeria, using a survey research design. The result with least squares method showed that R&D spending by firms as well as product and process innovation has significant impacts on the firm's performance. In a related study, Rehman (2016) investigated the impact of internal and external research and development (R&D) on the innovation performance of SMEs in India and Pakistan. The result showed that internal

and external research positively affects product and process innovations. However, this effect is stronger for Indian SMEs.

Methodology

The study adopted a survey design method. Primary and secondary sources of data collection were used. Productivity was used as proxy for performance. Likert scale was used to capture the construct for Firms' Productivity, a measure of the efficiency of production and the use of resources in SMEs. Out of 365 sets of questionnaires distributed, 208 were returned. To ascertain the validity and reliability of the study instrument, the questionnaire was pilot-tested in Akure metropolis in Ondo State. Using Stata version 13.0, the Cronbach Alpha reliability test provided satisfactory score of 0.954 which is excellent. The data generated for the study were analyzed using both descriptive and inferential analytical techniques. The analytical technique used in estimating the model is multiple regression analysis.

Sampling Size and Sampling Technique

Given a population of 6953 SMEs operating in the manufacturing sector in Southwest Nigeria SMEDAN (2010), a sample size of 365 SMEs across the six states of the geo-political zone was used. The Bartlett, Kotrlik & Haggins (2001) model for determining the minimum returned sample size for any given population was adopted. The multi-stage sampling technique was employed. In the first stage, the purposive sampling technique was used to select the choice of Southwest due to the familiarity of the researcher with the terrain. The second stage employed stratified sampling technique. Since both banks and SMEs are mostly concentrated in cities, 50% of the questionnaire was distributed in the capital cities of the six states in the region namely: Lagos, Oyo, Ogun, Ondo, Osun and Ekiti State. In the third stage, two local governments with the highest number of SME outside the state capital of each state considered were selected while random sampling technique was used to distribute the remaining 50% among SMEs and banks outside the state capital. A total of 208 sets of questionnaire were returned.

Model Specification

Following the work of Fasoranti (2006), the relationship between firm's productivity and R&D is modelled as follows, using linear probability model with some modifications.

$$Y = f(OX, FX, R\&D) \dots\dots\dots (1)$$

$$Y = \alpha_0 + \alpha_1 OX_{it} + \alpha_2 FX_{it} + \alpha_3 R\&D_{it} + U \dots\dots\dots (2)$$

Where;

Y = FPD = Firm's Productivity.

Likert scale was used to capture the construct for Firms' Productivity

OX = Owners Characteristics Variables

FX = Firm Characteristics Variables

R&D = R&D Expenditure

OX = AE ED BE

FX = BLITp

Therefore,

$$Y = \text{FPd} = \alpha_0 + \alpha_1 \text{AE} + \alpha_2 \text{ED} + \alpha_3 \text{BE} + \alpha_4 \text{BL} + \alpha_5 \text{ITp} + \alpha_6 \text{R\&Di} + \mu_1 \quad (3)$$

Explicitly,

$$\ln \text{FPd}_{it} = \alpha_0 + \alpha_1 \text{AE}_{it} + \alpha_2 \text{ED}_{it} + \alpha_3 \text{BE}_{it} + \alpha_4 \text{BL}_{it} + \alpha_5 \text{ITp}_{it} + \alpha_6 \text{R\&Di}_{it} + \mu_1 \quad (4)$$

$\alpha_0 =$ intercept, $\mu =$ Error term

Where;

FPd = Firm's productivity; AE = Age of Entrepreneur; ED = Entrepreneur Education; BE = Business Experience; BL = Business Location; ITp = IT Peripherals; R&Di = Research and Development Expenditure;

Results and Analysis

Distribution of SMEs in the Manufacturing Sector

The study covered SMEs in the industrial and manufacturing sector, using Manufacturing Association of Nigeria (MAN) Classification. The study equally classified respondents in terms of nature of business. The result shows that Agro-allied takes a total number of 14 (representing 6.7%); Food, Drinks, Beverages & Tobacco, 87 (41.8%); Chemical and Pharmaceuticals, 22 (10.6%); Metal, Iron and Steel Fabrication, 10 (4.8%); Electrical and Electronics, 13 (6.3%); Pulp and Paper Products, 6 (3.0%); Textile, Leather, Foot Wears and Carpets, 9 (4.3%); Building and Construction, 22 (10.6%); Wood Products and Furniture, 9 (4.3%) and Others, 16 (7.7%).

Table 1: Distribution of Questionnaire by SMEs

Nature of Business	Frequency	Percentage
Agro allied	14	6.7
Food, drinks, Beverages & Tobacco	87	41.8
Chemical & Pharmaceuticals	22	10.6
Metal, Iron & Steel fabrication	10	4.8
Electrical & Electronics	13	6.3
Pulp & Paper products	6	3.0
Textile, leather, footwear & carpets	9	4.3
Building & Construction	22	10.6
Wood products & furniture	9	4.3
Others (artistic work, mechanical engineering, among others)	16	7.7
Total	208	100

Source: Source: Field Survey, 2016

Table 1 shows that SMEs is dominated by Food, Drinks, Beverages & Tobacco. It shows that about 2 in every 5 (41.8%) of SMEs deal in Food, Drinks, Beverages & Tobacco. This is not unexpected as report shows that firms which are in the category of food processing, drinks and other liquors dominate the manufacturing sector in Nigeria (SMEDAN 2010).

Table 2: Distribution of Questionnaire by States

State	Frequency	Percentage
Ekiti	15	7.2
Lagos	46	22.11
Ogun	40	19.23
Ondo	31	14.90
Osun	9	4.33
Oyo	67	32.22
Total	208	100

Source: Source: Field Survey, 2016

With respect to the distribution of the questionnaire in all the six states of Southwest, Oyo, Lagos and Ogun states have relatively higher representatives with 32%, 22% and 19% respectively. Ekiti state has 7% while Osun State has 4%. The above supports a report on the distribution of formal sector of small and medium scale enterprises in Southwest Nigeria, however with the exception of Lagos (SMEDAN, 2010).

Financing Research and Development (R&D) in SMEs

The analysis from the study provides information regarding research and development (R&D) activities in manufacturing SMEs with emphasis on means of financing R&D. This is as reported in Table 3.

Table 3: Financing Research and Development (R&D) in SMEs

Characteristics	Frequency	Percentage
Firm has R&D unit		
Yes	137	66.2
No	71	33.9
Firm invest in R&D for innovation		
Yes	142	68.2
No	66	31.8
Firm receive bank loan for R&D		
Yes	74	35.6
No	134	64.4
Other means of financing R&D		
Percentage of loan received from bank	9	10.5
Retained earnings/internal sources	61	70.9
Venture capital	11	12.8
Others	5	5.8

Source: Field survey, 2016

Table 3 indicates that majority of the SMEs (66.2%) surveyed have a research & development (R&D) unit while about the same proportion (68.2) invested in R&D. However, the survey shows that 64.4% of respondents do not have access to bank loans for R&D. This supports

earlier findings that banks are averse to funding R&D. SMEs tend to use internal funds over external funds when financing innovation projects while SMEs main source of finance is the entrepreneurs' wealth and retained earnings. R&D and innovation funding therefore follows the same pattern as SMEs funding (Guariglia, 2008; Ughetto, 2008; Czarnitzki and Hottenrot 2011).

Likert Scale Distribution on the Impact of Financing R&D on Productivity

This section employs likert scale construct in order to investigate the impact of R&D on the performance of SMEs, using productivity as a surrogate for performance. The report is presented in Table 2.

Table 4: Likert Scale Distribution on the Effects of Investment in R&D on Productivity

Items	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	Mean
Investment in R&D enhances productivity	29(15.2%)	94(49.2%)	54(28.3%)	11(5.8%)	3(1.6)	3.7(0.9)
R&D enhances product design, packaging and market value of SMEs products	34(17.8%)	80(41.9%)	64(33.5%)	12(6.3%)	1(0.5%)	3.7(0.9)
Lack of R&D is responsible for low product image	19(10.0%)	55(28.8%)	84(44.0%)	23(12.0%)	10(5.2%)	3.3(0.9)
Investment in R&D enhances product development as well as export competitiveness	18(9.4%)	67(35.1%)	91(47.6%)	12(6.3%)	3(1.6%)	3.4(0.8)
Investment in R&D improves on productivity and export	14(7.3%)	77(40.3%)	84(44.0%)	12(6.3%)	4(2.1%)	3.4(0.8)
Investment in IT peripherals enhances firm's productivity	25(13.1%)	78(40.8%)	72(37.7%)	15(7.9%)	1(0.5%)	3.6(0.8)
Several innovative projects that enhance firms' products were hampered by finance	25(13.1%)	75(39.3%)	72(37.7%)	18(9.4%)	1(0.5%)	3.5(0.9)
R&D in SMEs is capital intensive hence, it requires external financing like bank loan	24(12.9%)	62(33.3%)	68(36.6%)	22(11.8%)	10(5.4%)	3.4(1.0)

Source: Field survey, 2016

Table 4 indicates that respondents acknowledged that investment in R&D enhances firm's productivity. The respondents agree that R&D aids product design, packaging and market value of SMEs products, and that investment in IT peripherals enhances firms' productivity. However, respondents do not agree that investment in R&D is responsible for low product image as well as export competitiveness of SMEs products. Respondents however, acceded to the fact that finance hampers innovative projects needed to enhance firms' productivity.

Outcome of R&D Activities by SMEs

The section deals with the distribution of sample firms base on the outcome or result of R&D activities carried out by some SMEs in the manufacturing sector, particularly in products improvement, new technology and innovation. The report is presented in the Table 3.

Table 5: Outcome of R&D Activities by SMIs

Outcome	0	1-2	3-4	5-6	7-8	9-10
Improved products	7(3.6%)	53(27.5%)	34(17.6%)	14(7.3%)	16(8.3%)	16(8.3%)
New products	13(6.8%)	45(23.4%)	36(18.8%)	22(11.5%)	8(4.2%)	14(7.3%)
New technology	13(6.7%)	48(24.9%)	36(18.7%)	20(10.4%)	13(6.7%)	11(5.7%)
New business plan	13(6.7%)	40(20.7%)	45(23.3%)	13(6.7%)	17(8.8%)	8(4.2%)
Innovation						
Packaging	12(6.3%)	46(24.0%)	34(17.7%)	15(7.8%)	12(6.3%)	13(6.8%)
Marketing	8(4.2%)	56(29.0%)	29(15.0%)	15(7.8%)	13(6.7%)	14(7.3%)
Organizational	10(5.2%)	36(18.7%)	41(21.2%)	17(8.8%)	15(7.8%)	11(5.7%)

Source: Field survey, 2016

Table 5 indicates SMEs consider R&D activities to have some moderate outcomes in improved products 53 (27.5%), new products 45 (23.4%), new technology 48 (24.9%), new business plan 40 (20.7%) as well as innovative ideas in packaging 46 (24.0%), marketing 56 (29.0%) and organizational innovation 36 (18.7%). The outcome however, is moderately pronounced in one to two (1-2) improved products, new products, new technology, new business plan and innovative ideas. This shows that as a result of R&D activities, firms under investigation in most cases, added one to two (1-2) improved products, new products, new technology, new business plan and innovative ideas, particularly in packaging, marketing and organizational innovation.

Multiple Regression Result (Linear Probability Function)- Impact of Investment in R&D on Firms' Productivity. The multivariate regression analysis with dummy independent variables was adopted to examine the extent which investment in R&D affects productivity, informed by the scale of continuous scores as the dependent variable (scores on scale of productivity). This is as presented in Table 4.

Table 6: Multiple Regression Result (Linear Probability Function) on the Impact of Financing R&D on Firms' Productivity.

F (31, 72) = 4.75 Prob > F = 0.000 R-squared = 0.6717 Adj R-squared = 0.5304

Productivity	Coeff	Std Err	T	P> t	[95% CI]	
Age of entrepreneur						
Below 25yrs	RC	-	-	-	-	-
25-34yrs	2.084	2.238	0.930	0.355	6.545	2.378
35-44yrs	2.185	2.132	1.030	0.309	6.434	2.064
45-54yrs	2.028	2.389	0.850	0.399	6.790	2.733
Above 54yrs	2.947	2.782	1.060	0.293	8.493	2.600
Education of entrepreneur						
No formal education	RC	-	-	-	-	-
Elementary	4.666	3.079	1.520	0.134	1.472	10.804
Secondary	2.910	2.967	0.980	0.330	3.005	8.825
MSc/MBA	4.412	2.771	1.590	0.116	1.111	9.935
Nat Diploma/NCE	4.315	2.617	1.650	0.104	0.902	9.532
HND/BSc	3.663	2.760	1.330	0.189	1.840	9.165
Business experience						
Below 1980	RC	-	-	-	-	-
1980-1989	0.569	1.143	0.500	0.620	1.709	2.848
1990-1999	1.064	1.385	0.770	0.445	1.697	3.826
2000-2009	2.511	1.784	1.410	0.163	1.044	6.067
>2009	0.483	1.846	0.260	0.794	3.196	4.162
Location of business						
Ekiti	RC	-	-	-	-	-
Lagos	0.058	1.700	0.030	0.973	3.330	3.446
Ondo	0.980	1.621	0.600	0.547	2.252	4.212
Ogun	1.836	1.547	1.190	0.239	1.247	4.919
Osun	0.367	3.153	0.120	0.908	5.918	6.652
Oyo	0.457	1.493	0.310	0.760	2.519	3.433
IT Peripherals						
No	RC	-	-	-	-	-
Yes	4.861	1.013	4.800	0.000	2.841	6.881
Expenditure/Investment in R&D						
No	RC	-	-	-	-	-
Yes	4.095	1.129	3.630	0.001	1.845	6.346
Constant	26.092	6.327	4.120	0.000	13.479	38.705

Source: Field survey, 2016

The regression model as presented in Table 6 shows that all age groups including the oldest age group, with higher point (2.947), have twice the points of ages below 25 on scale of productivity. Although with inconsistent pattern, all educational levels of entrepreneur have higher points on the scale of productivity compared with those with no formal education. Also, with inconsistent pattern of outcome is the effect of

experience on productivity. Only businesses located in Ogun state have points (1.836) on productivity scales compared to those in Ekiti. SMEs which invest in R&D has four points (4.095) higher on productivity scales compared to those which do not. This is not unexpected as it is consistent with previous studies on the impact of R&D on productivity (Hall and Mairesse 1995; Isaya, Humphrey and Lucy 2015; Yusuf, Adeyemi and Michael, 2009).

The coefficient of determination (R^2) is 0.67 and when it was adjusted for the degree of freedom, the adjusted coefficient of determination (R^2) was 0.53. This means that about 67% of total variation in the dependent variable, Firm's Productivity (FPr) is accounted for by the explanatory variables.

Hypothesis Testing

The regression model shows that SMEs which invest in R&D have four points (4.095) higher on productivity scales compared to those which do not. Since the p value $0.000 < 0.05$ level of significance, it implies that the null hypothesis should be rejected while the alternative hypothesis is accepted. The model therefore is statistically significant. We now conclude that financing/investment in R&D has significant impact on SMEs performance proxy by firm's productivity.

Conclusion

The general objective of the study was to investigate the impact of investment in R&D on manufacturing SMEs' productivity. Empirical investigation revealed that financing/investment in R&D has significant impact on SMEs productivity. The study further showed that banks are averse to funding R&D. SMEs tend to use internal funds over external funds when financing innovation projects while R&D and innovation funding follows the same pattern as SMEs funding. Thus, external support for SMEs investment in R&D remains a challenge. The outcome of R&D and innovativeness in manufacturing SMEs, is favourable. It showed that through R&D activities, firms under investigation in most cases, added one to two (1-2) improved products, new products, new technology, new business plan and innovative ideas, particularly in packaging, marketing and organizational innovation.

Recommendations

1. Judging by the result, SMEs rely more on internally generated funds for financing R&D and innovative projects. Yet, the financing scope of SMEs cannot support the huge investment required for R&D. However, in view of its perceived impact on productivity, product improvement and innovation, the government and other stakeholders should extend the research-industry-extension services to manufacturing SMEs. In this case, research grants to R&D inclined SMEs would be most appropriate.
2. Policies should be designed in ways that generate better and viable inducement for manufacturing SMEs that are R&D and innovative inclined. Such may include tax holidays and other fiscal incentives or considerations. Without incertitude, this will further boost their productivity.

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