

THE IMPACT OF GREEN INNOVATION ON THE COMPETITIVENESS OF SMALL AND MEDIUM ENTERPRISES IN LAGOS STATE, NIGERIA

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Abstract

Green innovation has emerged as a pivotal strategy for enhancing the competitiveness of Small and Medium Enterprises (SMEs) globally. In Lagos State, Nigeria, SMEs are increasingly recognizing the importance of integrating environmentally sustainable practices to bolster their market position and ensure long-term viability. This paper examines the impact of green innovation on the competitiveness of SMEs in Lagos State, focusing on aspects such as green entrepreneurial initiatives, green finance, and sustainable entrepreneurship. The study synthesizes findings from recent research to provide a comprehensive understanding of how green innovation influences SME competitiveness in this region.

Keywords: *Green Innovation, SMEs, Lagos State.*

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1. INTRODUCTION

The world changes from sustainability have made businesses to adopt environmentally friendly practices. For SMEs in Lagos State, green innovation brings about the opportunity to make use of competitiveness by aligning with the world sustainability trends in order to meet the developing preferences of environmentally conscious consumers. This paper explores the relationship between green innovation and SME competitiveness, and made emphasis on the role of green entrepreneurial and its initiatives, green finance, and sustainable entrepreneurship. Environmental crises such as degradation and resource scarcity are now becoming increasingly severe in current years, this made pollution to control and sustainable resource use critical global challenges. The introduction of sustainable development resulted to the environmental protection being an integral part of economic development for countries in the world. Scholars have the believe that green technology development and diffusion are fundamental to improving energy efficiency, achieving energy savings, reducing emissions, and realizing sustainable economic and environmental development. Firms make use of green innovation not only to react to environmental and social challenges but also to achieve long-term sustainable economic growth, most especially in the developing economy such as Lagos. Furthermore, the Nigeria government has sent different policy on green innovation in other to encourage those companies so as to pursue the green and sustainable development paths, guiding economic growth from high speed to high quality. Compared to traditional innovation, green innovation faces a double externality problem. The conventional view is that environmental regulations are an expensive burden that governments impose on firms. Firms must invest in unproductive activities to reduce pollution to the environment, which reduces their profitability. Meanwhile, Porter and Vanderlinde (2022) maintain that the appropriateness of a designed environmental standards will stimulate firms to innovate, offset compliance costs, and enhance their competitiveness. This can be called “Porter hypothesis”. Yu et al.(2018), says that environmental regulations can make the firms to accrued more higher cost, and still respond effectively to green innovation encompasses either green technological innovations, which involve new or improved products and processes, and non-green technological innovations, such as new management or business models that improve environmental sustainability. The explicit focuses of this study are on green technological innovation. In the past studies, they make use of green innovation to refer to green technological innovation and, therefore, in this study, it is used to refer to green technological innovation. Scholars reveals that the firms are made up of several components and that

assessing a firm based on a single dimension is flawed. Baah et al., also explained the need to integrate financial and non-financial dimensions in order to assess corporate performance. From the above recommendation, considering the improvement on the environment as the original purpose of green innovation. therefore, both financial (financial performance) and non-financial indicators (environmental performance) in assessing firm performance. From the theory of stakeholder, this study project the characteristics of green innovations which are vital contributors to different dimensions of firm performance and examining if substantive green innovation and strategic green innovation have different impacts on corporate financial and environmental performance. Therefore, this study investigates the Impact of Green Innovation on the Competitiveness of Small and Medium Enterprises in Lagos State, Nigeria

2. LITERATURE REVIEW

Green Entrepreneurial Initiatives and SME Competitiveness

Green entrepreneurial initiatives are described as the process of adopting business practices that prioritize environmental sustainability. Research indicates that the type of initiatives has significantly enhance the sustainability and competitiveness of manufacturing SMEs in Nigeria. Adebajo et al. (2023) found that green entrepreneurial inclination, business models, marketing, and innovation positively affect SME sustainability, leading to improved competitiveness. By integrating environmental stewardship into their operations, SMEs can achieve sustainable growth and a competitive edge.

Green Finance as a Catalyst for Green Innovation

Having access to green finance is very important for SMEs in implementing green innovations. Green loans and investments enable SMEs to adopt eco-friendly technologies and practices, thereby enhancing their environmental performance. Sajuyigbe et al. (2024) demonstrated a significant positive relationship between green loans, green technology, and the environmental performance of SMEs in Lagos. The study also made some recommendations that the government bodies and financial institutions should provide financial incentives so as to encourage the SMEs to adopt green technologies, which can help in improving the level of their competitiveness.

Sustainable Entrepreneurship and Value Creation

The focus of Sustainable entrepreneurship is on creating economic value while still addressing environmental and social concerns. Ishola et al. (2021) examined the relationship between sustainable entrepreneurship and value creation among SMEs in Agege Local Government of Lagos. Their studies reveal a positive relationship between sustainable entrepreneurship and value creation, this depicts that when SMEs engages in sustainable practices can help to enhance competitiveness with the help of innovation through innovative product development and quality improvement.

Challenges to Implementing Green Innovation

Even with the enormous benefits, SMEs in Lagos still face serious challenges in the adoption of green innovation. These include having little access to technology, lack of skilled workers, inadequate government support, and insufficient awareness about environmental sustainability practices. A study by Akinbami et al. (2025) explained that when some SMEs are aware of environmental sustainability, but there is clear understanding of circular economy concepts, hindering the widespread adoption of green practices.

3. RESEARCH METHODOLOGY

Sample Selection

The sample selection from this research is the Lagos State A-share-listed companies. In which the sample interval was set from 2010–2021 because of the availability of green patents, carbon emissions, and other related data. The raw data was processed after collecting the data in the sample interval with the financial and insurance companies excluded, Companies with irregular trading (ST and *ST enterprises) also excluded, samples with missing observations of core variables (green patent licensing and carbon emission data) were also excluded, and the continuous variables were shrink-tailed by 1% up and down so as to prevent the extreme values.

Furthermore, the unbalanced panel of 10,940 valid observations over 12 years was obtained, which consist of the firms in Lagos State Nigeria A-share-listed companies who have implemented the use of green innovations, either it been substantive or strategic even the both. All the companies which we listed are Lagos A-share market and they have a certain size, The

sources of data for this paper are mainly green innovation-related data were obtained from the Nigeria Research Data.

Definition of Variables

Dependent Variables

The financial performance (FP) and environmental performance (EP) was used as the dependent variables. The return on assets (ROA) we used in the CSMAR database in measuring the corporate financial performance (FP). The firms' carbon emissions were chosen in measuring the environmental performance. Moreover, carbon dioxide (CO₂) emissions were used to measure corporate environmental performance (EP). This happens to be an inverse indicator, with the lower values representing the emission of the lower carbon for better environmental performance. The ROE and carbon dioxide mission per capita was also used as alternative measures of financial performance (FP1) and environmental performance (EP1) in the tests

Independent Variables

The independent variables were substantive green innovation (LnSubGI) and strategic green innovation (LnStrGI). The commonly used indicators used in measuring research and development activities is called patent and the right to protect the industrial property rights. From the previous studies, the substantive and strategic green innovations was measured through the number of green patents granted by firms. This means that the substantive green innovation (LnSubGI) was measured using the number of green invention patents which was granted by firms, while the number of green utility model patents granted was used to measure strategic green innovation (LnStrGI).

Control Variables

This research also included set of variables which are meant for controlling potential effects on the relationship which lies among green innovations, financial and environmental performance. Some other studies show the size of the firm and government subsidy tin order to significantly moderate the relationship between green innovation and financial performance. Furthermore, the control variables that was used in other studies includes the firm fixed asset ratio, research and development investment, and gearing ratio. So far, the green patents are used already and having their effect already on corporate performance in process,

the current year was chosen as a period for all the variables.

The Hausmantest which is used to determine whether the fixed or random effects model was first conducted before conducting the panel data regression analyses, in which the results suggested a fixed effects model for the measurement. So as to avoid regression results being biased with the omission of important explanatory variables, the two-way fixed-effects model which controls the individual (μ_{ind}) and year (μ_t) in the regression was used.

$$FP = \alpha + \alpha \times \text{LnSubGI} + \alpha \times \text{LnStrGI} + \alpha \times \text{Controls} + \mu_{ind} + \mu_t + \varepsilon_{it} \quad (1)$$

$$EP = \beta + \beta \times \text{LnSubGI} + \beta \times \text{LnStrGI} + \beta \times \text{Controls} + \mu_{ind} + \mu_t + \varepsilon_{it} \quad (2)$$

In this research the FPit is the financial performance of the company in a year, and it is been measured with ROA; EPit is also the environmental performance of a company in a year, this helps in measuring the carbon dioxide (CO₂) emissions per unit of assets; LnSubGIit is also being referred to as the substantive green innovation of a company in a year, this also helps in measuring the green innovation numbers the patents obtained by a firm in a year; LnStrGIit is also the strategic green innovation of a company in a year, which measures the number of green utility model patents obtained by a firm in a year; while the Control sit is control variables this includes the enterprise size, fixed asset ratio, gearing ratio, research and development investment, government subsidies, and ISO14001 certification; μ_{ind} is being referred to as a dummy variable that represents the firm; while μ_t is being referred to as a dummy variable representing a the year used in the analysis.

4. EMPIRICAL FINDINGS AND DISCUSSION

Descriptive Statistics

In table 1, the statistical results of the variables were shown. This shows that the means of financial performance (FP) and environmental performance (EP) of the samples are 3.916 and 20.165, respectively, while the median values are 3.821 and 7.632, respectively, meanwhile the standard deviations are 6.083 and 11.643, respectively, this simply indicate that there is a more even distribution of the dependent variables. This means in green innovation, green innovation distribution among the sample companies is highly skewed. The minimum and maximum values of substantive green patents are 0 and 512, respectively, which have a median value of 0. The minimum and maximum values of strategic green patents are 0 and 732,

respectively, having a median value of 4. This result shows that both green innovations and substantive rate innovations are still new to Nigeria firms this is also in line with the findings of Zhang et al. (2016). This might be suggesting a structural imbalance in green innovation activities in Nigeria, these can also result from the high numbers of quality substantive green innovations having being lower than the number of the quality of the low strategic green innovation, which is in line with the findings of Zhao et al. (2020). The minimum value of SubGI and StrGI is 0, the maximum values are 512 and 732, having the standard deviations are 18.98 and 33.39, respectively, this shows a very big difference between substantive green innovation and strategic green innovation in the samples. Furthermore, the correlation matrix in Table 2 explains how the substantive green innovation indicator LnSubGI is having a positively correlation with FP, and the strategic green innovation indicator LnStrGI negatively correlates with FP. More also, it also indicates that LnSubGI positively correlates with EP, and LnStrGI negatively correlates with EP. This helps to explain the preliminary relationship that exist between the substantive green innovation, strategic green innovation, enterprises' financial and environmental performance.

Table 1

Variable	Mean	Median	Skewness	SD	Min	Max
FP	3.916	3.821	2.121	6.083	49.243	1.82
EP	20.165	7.632	1.743	11.643	1.9211	2.43
TotalGI	13.534	11.723	7.27	1	10	71
SubGI	3.665	0	15.27	18.98	0	512
StrG	19.976	4	11.356	33.39	0	732
LnSubGI	0.612	0	1.665	0.923	0	4.322
LnStrGI	1.576	1.376	0.854	1.023	0	5.121
Size	22.543	22.35	0.632	1.353	19.12	7
Fixed	22.043	18.92	0.921	14.754	0.132	2.41
Lev	44.023	43.93	0.0832	19.221	3.132	92.421
R&D	4.617	3.830	2.403	3.916	0.0200	32.26

Table 2. Correlation matrix of the variables

Variable	FP	EP	LnSubGI	LnStrGI	Size	Fixed	Lev	R&D
FP	1							
EP	0.153 ***	1						
LnSubGI	0.022 **	0.034 ***	1					
LnStrGI	-0.072***	-0.005	0.432***	1				

Size	0.003	0.232***	0.37 ***	0.376 ***	1			
Fixed	−0.08 ***	0.053***	−0.024**	−0.025***	0.236 ***	1		
Lev	−0.376***	0.135***	0.16 ***	0.323***	0.402 ***	0.132 ***	1	
R&D	−0.026***	−0.267***	0.013	−0.071***	−0.276** *	−0.256***	−0.326** *	1

Note: Table contains Pearson's correlation coefficient. * indicates $p < 0.1$, ** indicates $p < 0.05$, *** indicates $p < 0.01$.

Results of Panel Regression

Report from table 3 shows the results of two-way fixed-effects regressions of substantive and strategic green innovations on corporate financial and environmental performance. The table has 4 columns in which the columns 1 and 2 represent the model baseline with the control variables, while Column 3 shows a regression results of substantive and strategic green innovations on financial performance, and column 4 shows the regression results of substantive and strategic green innovations on environmental performance.

Table 3. The impact of substantive and strategic green innovations on corporate financial and environmental performance.

Variables	(1) FP	(2) FP	(3) EP	(4) EP
LnSubG			0.245 *** (0.077)	−0.272*** (0.093)
LnStrGI			−0.246 *** (0.074)	−0.292 *** (0.097)
Size	1.162** (0.152)	0.062 (0.193)	1.247 *** (0.152)	0.183 (0.192)
Fixed	−0.073 *** (0.005)	0.037 *** (0.017)	−0.081 *** (0.007)	0.036 *** (0.018)
Lev	−0.197 *** (0.008)	−0.006 (0.009)	−0.195 *** (0.006)	−0.006 (0.006)
R&D	−0.676 *** (0.028)	−0.665 *** (0.036)	−0.664 *** (0.023)	−0.654 *** (0.032)

It can be seen in columns (1) and (2), Size, Fixed, Lev and R&D are having a significant effect on corporate financial performance, while Fixed and R&D also have a significant effect on corporate environmental performance. substantive green innovation and strategic green innovation coefficient in column (3) are 0.245 and -0.272 , respectively, with a significant value of 1%. This result is showing a significant and positive correlation between substantive green innovation (LnSubGI) and ROA, and a significant negative correlation between strategic green innovation (LnStrGI) and ROA. These results suggest that there is a higher number of firms' substantive green innovations which is more beneficial to the firm's financial performance, meanwhile having a higher number of strategic green innovations is more detrimental to the firm's financial performance. Nevertheless, strategic green innovation does not play a minimal role in reducing costs and boosting sales with the help of the green production but also increases firms' equipment acquisition and innovation costs unilaterally, which leads to the loss in firms' financial performance. In column (4), the regression analysis shows that the coefficients of substantive green innovation (LnSubGI) and strategic green innovation (LnStrGI) are -0.272 and -0.292 respectively. Both coefficients are statistically significant at a 1% level. This shows that both substantive green innovation and strategic green innovation can reduce the emissions per unit of assets and improve the environmental performance of enterprises. The results show the extent to which there is a reduction in CO₂ emissions per unit of assets because of the strategic green innovation is having a higher than that of the substantive green innovation. Hence, the effect of substantive green innovation on environmental performance shows a smaller value than that of strategic green innovation. This gives validation to H2c. explaining the difference and states that the difference may be because of strategic green innovation and can also directly reduce the emissions of three wastes. Therefore, this is having a more effects on environmental performance, but the green innovation can also help in the reduction of the negativity in the impacts of products on the environment.

5. CONCLUSION

According to the study it was found that green innovation has both economic and environmental benefits, which was supported fully by Porter hypothesis. Nevertheless, green innovation alters the Porter hypothesis which means it can help in Improving the performance of the environmental, and hurts the firms' reward economically. Besides, the heterogeneity analyses explains that the financial performance is having effect on green innovation but it is

weak in the state-owned enterprises and in areas where there are high government environmental concerns. Equally, the financial performance effect which is very detrimental on green innovation is also weaker in state-owned enterprises. The results explain the reason why the firm had to invest in why firms invest in such costly strategic green innovations in large numbers, which made their existence is justified. In addition, green innovation requires a highly investment in R&D, and strategic green innovation gives chance to the firms in building up the knowledge of green and capabilities which serve as a means of transition to green innovation. Generally, strategic green innovation exists because of the sake of the legitimacy of the firm, while green innovation can achieve both efficiency and legitimacy outcomes. The findings suggest that it is important to all firms in Lagos State go green, while green innovation development happens to be a very good strategies for the firms in achieving high profits and achieving high environmental performance.

Recommendation

The Green innovation helps in significantly enhancing more competition among SMEs in Lagos State this is done by promoting sustainability, improving environmental performance, and creating value. it is recommended that:

- **Government Support:** government should try and implement several policies that that would give room for financial incentives, example are tax reductions and grants, so that the SMEs can adopt green technologies easily.
- **Capacity Building:** it is also recommended that there should be training of different programs so as to prepare the SME owners and employees for acquiring the necessary skills needed for the implementation of green practices.
- **Access to Green Finance:** there should also be a way in which green loans and investments can be gotten by the SMEs so as to invest in the eco-friendly technologies and processes.

With this process of addressing these challenges and making implementation of this support process, all SMEs in Lagos State can rely on green innovation so as to strengthen their competitiveness and make several contributions to the sustainable economic development.

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