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Circular Economy Practices and Financial Performance of Listed Manufacturing Firms in Nigeria

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Abstract: This paper examined the impacts of circular economy practices on the financial performance of listed manufacturing firms in Nigeria. Specifically, it examined the impact of recycling, dematerialization, refurbishment, and renewable energy on the financial performance from 2013 to 2022. The study employed a longitudinal research design. The data were obtained from the annual reports of forty-six (46) listed manufacturing firms on the Nigeria Exchange Group.The panel data regression analysis was used to test the hypotheses. The results revealed that whereas renewable energy and refurbishment have positive and significant impact on the financial performance, recycling and dematerialization have positive but insignificant impact on the financial performance. Therefore, the paper concludes that the movement towards the circular business model and practices, particularly refurbishment and renewal energy management by listed manufacturing firms has a positive and significant impact on the financial performance. The paper recommends that more attention should be paid to CE practices particularly refurbishment and renewal energy practices and initiatives, by government, manufacturing firms and other stakeholders; and there should be integration and alignment of circular economy practices with the corporate strategies, among others.

Keywords: Circular economy, financial performance, refurbishment, recycling, dematerialization, renewable energy

INTRODUCTION

Although production drives economic growth, it also generates large waste of natural resources which have harmful long-term effect on the ecosystem (Sarfraz *et*

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al.,2023). The limitation of natural resources and the concerns about the survival of the environment have made sustainable operations of assets and the pollution of the environment one of the major global issues in current times (Odia, 2022). According to Atlin and Gibson (2017), the extreme use of non-renewable resources driven by the speed of economic development has influenced the atmosphere negatively and increased several environmental concerns. Odia (2022) opined that there are optimized pressures from society and government bodies for organisations to adopt economic models that will promote sustainability. The manufacturing sector faces the highest pressure from stakeholders due to its tendency to produce more waste of natural economic resources, which creates an imbalance in the environment. The business climate in the current times have experienced several changes, creating more complexities and uncertainties (Taouab & Issor, 2019). Therefore, for a business to be competitive, it must explore plans that identify the organization's long-term ways of using existing resources in achieving its goals (Fatihudin *et al*., 2018).

An economic model that emphasizes taking, making, and discarding is known as the linear economy (Upadhayay & Alqassimi, 2018). The linear economy model under solid waste management results in increased waste deposits into landfills and waterways during resource extraction, manufacturing for consumption, and final disposal procedures. However, despite the usefulness and success of the linear economy in the 20th century, Sariatii (2017) argues that it could not cope with the demands of the new millennium, and if it is uncontrolled, it might lead to environmental collapse. Similarly, Ogunmakinde *et al*. (2022) argue that altering the linear economy model would require a change in our production and consumption practices.

The circular economy (CE) is a regenerative approach to managing natural resources unlike the linear strategy which is unsustainable. Innovative transformational technologies, such as those in the digital and engineering fields, along with innovative CE thinking, are causing profound changes along the whole value chains not limited to industries or types of materials. Thus, CE comprises renewed interests in waste valorisation, cleaner manufacturing, life cycle thinking, and green consumption (Ezeudu & Ezeudu,2019). According to Khan *et al*. (2021), the assessment of a company's operational effectiveness, profitability, and sustainability, with financial performance, serves as a critical evaluation of its overall effectiveness. Within the context of CE and sustainable development, evaluating financial performance takes on a greater level of importance as companies strive

to balance economic growth with environmental responsibility and social impact. The attainment of sustainable financial performance extends beyond the mere generation of profits. It encompasses the creation of lasting value for all stakeholders (Mochalova,2020). Therefore, corporations must adopt a comprehensive approach to financial management that considers environmental and social risks and opportunities in addition to traditional financial metrics. According to Galant and Cadez (2017), adopting the CE approach requires a cognitive transformation whereby the emphasis shifts from prioritizing short-term gains to long-term sustainability. The strategy involves distributing resources towards sustainable energy sources, reducing waste and emissions, and promoting workplace diversity and inclusivity. The establishment of a connection between organizations and their stakeholders can be facilitated through open communication and cooperation. This can foster the development of trust and promote innovative practices (Rehman-Khan *et al*.,2022).

One challenging issue confronting humanity today is how to decouple economic development from resource usage through implementing policies effectively, developing social and physical infrastructure, creating markets, and transforming corporate practices along global value chains. This should also entail; efficient managing natural resources efficiently, reducing garbage and pollution, recycling, and sustainable consumption by 2030 (Dantas *et al*., 2021; Morton *et al*., 2017; Schroeder *et al*., 2018). Nasrollahi *et al*. (2020) noted that as the natural capital base diminishes, every corporate and political institution of the 21st century would face a major problem. It has been shown that the implementation of a CE may have a positive impact on numerous economic sectors. Natural resources that may be used by businesses should not be depleted, but rather preserved. Natural resources are regarded as perpetual phenomena, non-renewable resources are non-renewable, while renewable ones change forms with grave repercussions for man (Ogunsanwo & Ayo-Balogun,2020). Poor environmental practices usually lead to colossal ecological damage and threaten sustainability and organizational performance. The economic and environmental difficulties facing Nigeria require a reorientation of the nation's development strategy and a quick or holistic shift toward a CE to curb environmental harms and harness economic advantage.

Škrinjarić (2020) examined the subject with respect to European countries to include Germany, the Netherlands, Denmark, France, and Italy. Güney (2019) evaluated the literature in terms of 40 developed nations, and Sarfraz *et al*. (2023)

conducted their study in relation to countries within the European member nations. However, only a handful of related literature could be found for African nations, particularly Nigeria. Furthermore, studies such as Güney (2019), Hysa *et al*. (2020), Inglesi-Lotz (2016), and Ogunsanwo and Ayo-Balogun (2020) examined the impact of only two CE practices (recycling or reuse) on financial performance. This creates a gap in the extent CE practices affect a firm's financial performance. Hence, this paper fills the knowledge gaps as it examines four CE practices, such as recycling, dematerialization, refurbishment, and renewable energy, and their impacts on the financial performance of listed manufacturing firms in Nigeria. The paper contributes to existing literature by examining how listed manufacturing companies can improve their financial performance by adopting circular economy practices of refurbishment, renewable energy, recycling, and dematerialization. The rest of the paper is divided into four sections as follows. The immediate section is the literature review on circular economy, CE practices, and the impacts of CE practices on financial performance. Section three is the materials and methods, while section four is the results. Section five is the discussion, while section six is the conclusion and policy implications.

2. LITERATURE REVIEW

2.1. Concept of the Circular Economy

The CE is "a regenerative system in which resource input and waste, emissions, and energy leakage are reduced by gradually closing and narrowing energy and material loops (UNFCC, 2019).The CE slows, closes, and narrows material and energy loops to reduce resource input, wastes, emissions, and energy leakages (Geissdoerfer *et al*.2020). Corvellec *et al.* (2022), defined CE as the "creation and consumption of commodities through closed loop material flows that internalize environmental externalities connected to virgin resource extraction and waste generation (including pollution)". They see the CE main objective is to reduce resource consumption, pollution, and waste throughout the product's life cycle. The CE revolutionizes the function of resources (Massaro *et al*.2021); it ensures economic growth and sustainability (Benz, 2022; Walker *et al*., 2021), and promotes an alternative to the linear business model (Uhrenholt *et al*., 2022). The CE focuses on recycling, restricting and re-using the physical inputs to the economy and utilizing wastes as a resource, and lowering the depletion of the primary resource. Grafström and Aasma (2021) noted that an important aspect of CE entails how to keep and prolong

the life of resources and materials in order to obtain the greatest value from them. According to Valavanidis (2018), the CE centres on turning products into resources for others after their useful lives are over, closes loops in industrial ecosystems, reduces wastes, and uses sustainable business practices. Every product generated in this CE paradigm can become a secondary raw material. A closed loop of material flow changes from the traditional linear relationship of resources, products, waste, and emissions into a circular relationship of "resources, products, and resources" to reduce the over-dependence on primary natural resources.

Accenture (2020) identifies six factors that have expedited movements towards a CE in recent years to include: "(1) the shift in the preferences of end-consumers toward sustainable and eco-friendly products for which they are willing to pay a premium, (2) the engagement of brand owners in voluntary sustainability commitments that are now altering the structure and dynamics of existing markets and demand, (3) the application of strict organizational sustainability targets in investment decisions by participants and stakeholders who are aiming to contribute to this shift, (4) a significant increase in the number of regulations in various countries and the European Union (EU), (5) investment by both established and start-up companies in the development of new recycling technologies; and (6) the establishment of a diverse array of public and private initiatives around the world". The circular business model is affected by industry barriers and institutional challenges, such as a lack of a national policy framework, a lack of data and capability, regulatory and institutional gaps, capability, silo procurement, market barriers, and a traditional business model (OECD 2024).African Union (2024) highlights the challenges of CE in the African continent to include; lack of holistic approach to adopting CE, limited and communication of benefits of CE, market entry barriers for innovation and growth of CE business models, limited coordination of CE strategies and action plans, as well as little monitoring of circular initiatives, and insufficient and misaligned financing mechanisms, and funding options.

The first practical effort towards the CE model in Nigeria was the creation of 26 recycling plants in 26 cities and Abuja (Onogwu,2019). Sadly, several state administrations abandoned recycling operations following official handover from one government to another (Ogunsanwo & Ayo-Balogun, 2020). Although the CE has not received much attention in private and public debates, Nigeria has several sectors that would benefit from CE practices. For instance, Rajput *et al*. (2020) identified the agriculture, plastics/packaging, and waste management sectors as

promising for CE growth in Nigeria. Furthermore, Onogwu (2019) stated that due to Nigeria's expanding population, high unemployment, and young unrest, the CE model might be the nation's solution. This consolidates the position of Orji *et al.* (2022) and Ogunsanwo and Ayo-Balogun (2020) that Nigeria's economic issues include poverty, poor capital creation, inequality in the distribution of resources/ wealth, unemployment, inflation, inefficient mobilization of resources, and the failure to diversify the economy, among other things

2.2. Circular Economic Principles and Practices

According to the Ellen MacArthur Foundation (2015), there are three core principles of the CE which are; "1) Design waste and pollution out of systems; 2) Keep products and materials in use; and 3) Regenerate natural systems". The CE frameworks include reducing, reusing, recycling, recovering, remanufacturing, and refurbishing (Su *et al.*, 2013). Reducing is to decrease the consuming of resources and generating of pollutants by adopting more advanced technologies or facilities (Anderson,2007). Reusing means to utilize resources as many possible times or in diverse ways (Brunori *et al.*,2005); recycling is to turn end-of-life products into renewable energy or resources, with the possibility for a new product life cycle (Hicks *et al.*, 2005). Recycling plays a critical role in the CE practices as it promotes the efficient use of resources and reduces waste. Recycling contributes to reducing the consumption of non-renewable resources, such as oil, coal, and gas, which are essential to produce new materials. Recycling also reduces the environmental impact of waste disposal as it reduces the amount of wastes that go into landfills, as well as the amount of energy require to produce new products (Yildirim, 2022).

Dematerialization refers to the process of reducing or eliminating the physical use of materials in the production, delivery, or consumption of goods and services (Kasulaitis *et al.*,2019). It emphasizes doing more with less by minimizing resource input while maximizing efficiency and value creation. Bag and Rahman (2021) define it as a fall in the bulk of materials utilized in industrial end products. Refurbishment involves the restoration, improvement, or upgrading of existing structures, products, or systems rather than constructing entirely new ones. IT contributes to environmental, social, and economic sustainability by creating benefits such as; resource conservation of materials and energy, waste reduction, and avoidance of disposal into landfills, extended product life span, and economic benefits such as job creation

2.3. Circular Economy Practices and Financial Performance

There is a research gap on relationship between the CE and financial performance (Usón *et al*.,2019). According to Ellen MacArthur Foundation (EMF,2012), circularity promotes strategic opportunities, new profit pools, and long-term revenue streams. Kwarteng *et al*. (2021) found that a CE of reuse, recycle, reduce, regenerate, and recover resources, influences the financial performance in a positive way. Shavkatov *et al*. (2024) found a positive, statistically significant relationship between CE and financial performance. The authors provided a robust evidence to support the business case for a CE transition in sustainable manufacturing. Krystofik *et al*. (2018) found that dematerialization practices enhance operational efficiency, which can be achieved by streamlining processes, eliminating waste, and reducing the use of materials, thereby improving the overall productivity and profitability. Dematerialization encourages innovation because firms are incentivized to develop new products, processes, and technologies that require fewer resources, leading to competitive advantages in the market and potentially higher profits (Ogiemwonyi & Eneizan,2024). However, Ezeudu and Kennedy (2024) argued that the transition to dematerialized processes or products may disrupt existing business models and supply chains because corporate organisations may face resistance from stakeholders accustomed to traditional methods, leading to temporary disruptions in production and sales. Also reduction in material usage could potentially compromise the quality or performance of products (Cordella *et al*.,2020). By refurbishing materials and components, firms can reduce their raw material and production costs, leading to improved financial performance (Pinto,2020). Refurbished products may be perceived as inferior to new ones.

Gonçalve (2022) see business size and initial investment outlay, exposure to risk, complex business structure as some barriers affecting the adoption of CE to promote financial performance. The CE helps to address the issue of climate change (Ellen MacArthur Foundation,2021), and to create higher economic value from their material life cycles (Stahel,2016). Cost reduction through optimization of resources utilization such as waste and water has been found to increase profits, strengthen market position, and lead to competitive advantage in the long-term (Moric *et al*.,2020). Mazzucchelli *et al*. (2022) found that three CE practices (waste treatment, reduction, and recycling) and brand reputation promote firm's performance; while brand reputation wasa good mediator of the relationship. Yu *et al*. (2022) examined the role of Industry 4.0 on CE practices and supply chain capability to

improve firm performance based on the survey of 286.The results shows Industry 4.0 enhances the CE implementation and supply chain capability. Although CE practices have positive relationship with operational and economic performance, supply chain capability has a positive relationship with operational performance, but an insignificant relationship with economic performance. Kwarteng *et al*. (2022) examined the moderating effect of organizational culture on the relationship between CE business model and firms' financial performance in diverse business sectors in Ghana through administration of 617 copies of questionnaires. The study found CE implementation policies of 5Rs- reduce, reuse, recycle, recover, and restore used in manufacturing, distribution, and consumption processes, led to improved financial efficiency. Moreover, the authors found organizational culture to be a positive moderating factor on the relationship. Kuo and Chang (2021) evaluated the factors that determine CE information and its impact on corporate economic sustainability3,768 firms in China using regression analysis for the period of 2011 to 2017. They found firms that disclose more CE disclosures also have higher sustainable growth and return on equity. Also, larger and environmentally sensitive firms disclose more CE information while State-owned enterprises are a leader in CE implementation.

3. MATERIALS AND METHODS

3.1. Population and Sample Size

The study employed a longitudinal research design because the variables of the CE practices covered an extended period. The study comprised all the fifty-nine (59) manufacturing companies listed on the NGX as at December 31st, 2022. The justification for selecting these manufacturing companies is their application of sustainable consumption and production in Nigeria.The sampling filtering technique accommodated manufacturing firms based on certain selection criteria which include; (1) firms must be listed on the NGX during the 10 years (2013 – 2022); Manufacturing firms that joined NGX after year 2013 were excluded from the sample to enable homogeneity of period scope in order to obtain a balanced panel data. (2) Sampled firms with unequal observations were accommodated but consideration was given to firms' whose annual financial reports was available for at least 8 years within the period under consideration, allowing for an unbalanced panel data structure. Notably, the unbalanced panel data analysis approach has been previously employed and ratified in prior studies such as Yaffee (2003), Mahdavi

(2008), and Wooldridge (2019). Therefore, following the selection criteria, the study employed a sample filtering process of thirteen (13) listed manufacturing firms. Four (4) observations were taken away that is Morison Industries Nigerian Plc for 2022, Premier Paints Nigerian Plc for 2022, and Thomas Wyatt Nigerian Plc for 2021 &2022 were excluded due to unavailability of the annual financial reports for those specific period/s. This selection brought down the final sample to forty-six (46) listed manufacturing firms, and four hundred and fifty-six (456) observations for the data analysis. The data was collected from the financial statements of the 46 selected companies from 2013 to 2022.

3.2. Measurement using Content Analysis

We employed a content analysis procedure on various relevant annual reports of the sampled manufacturing firms (Abd *et al.*,2014). The sentence count considered more appropriate (Ganda & Milondzo,2018) was used to measure the CE practices. The scoring was:1 if CE practice was indicated in the firm's annual report, otherwise 0.

3.3. Model Specification

The model of Sarfraz *et al.* (2023) was adapted for the study. Their model specifies the relationship between firms' financial performance and performance measures of circular economy sustainability of G7 countries. The financial performance measures were WACC and ROA while the CE practices include resource use, waste recycled, emission, and management practice (ISO 9000, ISO14000, lean manufacturing, Six Sigma, TQM etc.). The model was stated as

$WACC_{ij}$ &, $ROA_{ij} = \alpha_0 + \alpha_1$Resource $use_{ij} + \alpha_2$Waste $recycled_{ij} + \alpha_3$Management $System_{ij} + \alpha_4$ $Emission_{ij} + \alpha_5$ Resource use. Innovation $_{ij} + \alpha_6$ Governance. Strategy $_{ij} + \alpha_7$ Management . Compensation $_{ij}$ + eijkt (1)

Submitting the CE practices of recycling, materialization, refurbishment and renewable energy, therefore, the functional form of our model is:

Return on Total Asset = f (Recycling, Dematerialization, Refurbishment, Renewable Energy) (2)

Then, the model expressed in its econometric form is given as.

$$ROA_{it} = \gamma_0 + \gamma_1 REC_{it} + \gamma_2 DEM_{it} + \gamma_3 REF_{it} + \gamma_4 REN_{it} + \gamma_4 FSIZE_{it} + \mu_{it}$$

Where: ROA = Return on Assets; REC = recycling**;** DEM = dematerialization**;** REF = refurbishment**;** REN = renewable energy FSIZE = Firm Size

3.4. Operationalization of Variables

Table 1: Measurements of Vaariables

S/No	***Variables***	***Type of Variable***	***Measurement***	**Apriori *Expectation***	***Source***
1	Financial Performance	Dependent	Profit After Tax Divided by Total Assets (ROA)		Sarfraz *et al.* (2023)
2	Recycling Practices	Independent	Dummy (0,1)	Positive	Esposito *et al.* (2023)
3	Dematerialization Practices	Independent	Dummy (0,1)	Positive	Gaustad *et al.* (2012)
4	Refurbishment	Independent	Dummy (0,1)	Positive	Sarfraz, *et al.* (2023)
5	Renewable Energy	Independent	Dummy (0,1)	Positive	Esposito *et al.* (2023)
6	Firm Size	Control	Natural logarithm of total asset	Positive	Kasbar *et al.* (2023).

Sources: Researchers compilation

The panel data regression analysis was employed to test our hypotheses because the data includes properties of time-series and cross-sectional data.Moreover, the Hausman test was conducted to determine whether to use either the random effect or the fixed effect. The results of the Hausman test [p=0.9999] indicates the adoption of the random effect model instead of the fixed effect model. The test result for normality of residua for the random effect model shows a statistically significant idiosyncratic error e: = 11.18 (0.0037) and u: = 7926.21 (0.0000) which suggests the presence of cross-sectional effect. This violates the assumption of homoscedasticity of the error term. Therefore, the robust panel regression analysis technique was employed instead of the random effect in other to control for the random effect error, and consequently employed to test the formulated hypotheses.

4. RESULTS

4.1. Descriptive Statistics Analysis

The descriptive statistics analysis is shown in Table 2. Return on Assets (ROA), a key measure of financial performance, has a mean value of 3.19%, reflecting a modest level of profitability across the sample. However, the wide standard deviation (15.22%) and the extreme minimum (-179.92%) and maximum (108.9%) values underscore considerable disparities in firm performance. These variations suggest that while some firms are thriving, others are struggling with substantial losses, likely due to

economic volatility and operational inefficiencies. Similar findings were observed by Ailemen *et al.* (2015), who attributed such disparities to the capital structure and management quality of Nigerian firms.

Table 2: Descriptive Statistics Analysis Result

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
ROA	456	3.194759	15.21635	-179.92	108.9
REC	456	.0942982	.2925642	0	1
DEM	456	.0635965	.2443008	0	1
REF	456	.0679825	.2519923	0	1
REN	456	.1425439	.349991	0	1
FSIZE	456	7.145746	.8999264	5.24	9.38

Source: Output from

The adoption of CE practices, measured by dummy variables for recycling (REC), dematerialization (DEM), refurbishment (REF), and renewable energy (REN), indicates a generally low level of engagement. The mean values for these practices 9.4%, 6.4%, 6.8%, and 14.3%, respectively highlight a nascent stage of CE integration among Nigerian manufacturing firms. The relatively higher mean value for renewable energy adoption suggests growing awareness of the benefits of transitioning to sustainable energy sources, likely driven by rising energy costs and regulatory encouragement. Also, it may stem from recent policy shifts and international funding for sustainable energy projects, as highlighted by Mutezo and Mulopo (2021). However, the low adoption and practice rates for other CE practices reveal significant barriers, such as limited technical capacity and financial resources, consistent with the study of Debrah *et al.* (2022). Firm size (FSIZE), expressed as the natural logarithm of total assets, shows a mean value of 7.15, with a narrow standard deviation (0.90), suggesting that the sampled firms are predominantly medium to large-sized entities. The range of firm size values (5.24 to 9.38) indicates that smaller firms might face unique challenges, such as limited access to credit and higher operational costs, which constrain their ability to engage in CE activities. The relatively low standard deviations for most variables suggest some degree of uniformity in firm characteristics, with outliers likely driving the observed disparities in financial performance and practice adoption.

4.2. Correlation Analysis

Table 3: Correlation Matrix

	ROA	*REC*	*DEM*	*REF*	*REN*	*FSIZE*
ROA	1.0000					
REC	-0.0572	1.0000				
DEM	-0.0309	0.5309	1.0000			
REF	-0.0774	0.4196	0.3937	1.0000		
REN	-0.0794	0.6197	0.5621	0.4880	1.0000	
FSIZE	0.3346	-0.0160	-0.0308	-0.0256	-0.1305	1.0000

Table 3 shows the results from the spearman rank correlation of the independent variables with ROA, to include recycling CE practice reporting (-0.0572/6%), dematerialization CE practice reporting (-0.0309/3%), refurbishment CE practice reporting (-0.0774/8%) and renewable CE practice reporting (-0.0794/8%) are negatively correlated with the dependent variable: return on total asset. However, FSIZE is positively correlated with ROA.

4.3. Regression Analysis

Table 4: Regression Analysis

	ROA Model (Pooled OLS)	*ROA Model (Fixed Effect)*	*ROA Model (Random Effect)*	*ROA Model (Robust Panel Regression)*
REC	-1.053 (0.739)	0.127 (0.901)	0.030 (0.969)	0.036 (0.382)
DEM	-1.479 (0.680)	-0.132 (0.898)	0.070 (0.936)	0.0001 (0.989)
REF	-1.562 (0.627)	-0.009 (0.992)	-0.347 (0.662)	0.079** (0.038)
REN	-0.114 (0.968)	-0.588 (0.473)	-0.199 (0.772)	0.088 ** (0.007)
FSIZE	4.480 *** (0.000)	0.658 (0.597)	0.230 (0.226)	-0.097 ** (0.052)
Cons	-28.503 (0.000)	4.204 (0.629)	-1.244 (0.387)	0.869** (0.006)
F-stat/Wald Stat	7.29*** (0.0000)	0.84 (0.6268)	13.15 (0.5150)	10.52*** (0.0000)
R- Squared	0.0749	0.0288	0.0276	
VIF Test	1.57			

	ROA Model (Pooled OLS)	*ROA Model (Fixed Effect)*	*ROA Model (Random Effect)*	*ROA Model (Robust Panel Regression)*
Hausman Test Prob>chi2	2.07 (0.9999)	Breusch and Pagan Lagrangian multiplier test for random effects	0.11 (0.3696)	Joint Test for Normality **e:** = 11.18 (0.0037) **u:** = 7926.21 (0.0000)

Note: **, ***, significance at 5% and 1% respectively

REC= recycling, DEM= dematerialization; REN=renewal energy, REF=refurbishment, FSIZE=firm size

Table 4 shows the R-squared regression results for Pooled OLS, fixed effect and random effect were 7%, 3% and 3% respectively. Moreover, the F-statistic value was significant at 1% for Pooled OLS (7.29, P=0.000) and robust regression (10.52, p=0.000). The VIF values are within the benchmark value of 10, indicating the absence of multi-collinearity. The robust regression analysis result reveals that refurbishment and renewal energy have a positive and significant impact on financial performance, whereas recycling and dematerialization have a positive but insignificant impact on financial performance.

5. DISCUSSIONS

There is a significant positive impact of refurbishment on the financial performance of manufacturing firms. This may be attributed to the combination of factors such as strategic sustainability practices, market responsiveness, alignment with stakeholder expectations, and regulatory requirements. This outcome underscores the potential financial benefits of embracing CE principles in the context of Nigeria's business landscape. As global and local regulations increasingly focus on sustainable business practices, manufacturing firms in Nigeria must proactively report on refurbishment to align with these expectations, resulting in a positive impact on financial performance. Sony *et al.* (2015) and Kumar and Ghodeswar (2015) found that consumers are becoming more environmentally conscious, and there is a growing preference for products from sustainable and socially responsible companies. Therefore, manufacturing firms reporting on refurbishment which emphasizes resource efficiency and waste reduction may appeal to a consumer base that values sustainability, thereby leading to increased demand for their products, may also signal a commitment to sustainable and responsible business practices,

which can contribute to increased positive corporate image, goodwill, corporate responsibility, resilience and climate change mitigation, and a subsequent higher financial performance (Omar ,2020; Kwarteng *et al.*,2022).

The significant positive effect of CE underscores the potential financial benefits of embracing renewable energy practices such as solar and wind power in the Nigerian business environment due to the huge cost savings in the long run. Manufacturing firms which report on their adoption of renewable energy experiences reduced energy costs and increased operational efficiency. This result has implications for Nigeria and developing countries having challenges relating to energy security and the reliability of the power supply in that manufacturing firms' investment in renewable energy sources not only enhances their energy resilience, reducing dependency on inconsistent grid power leading to increased reliability, positively influencing production efficiency but also results in positive return on total assets. Moreover, the finding reflects the opinion of Raybould *et al.* (2020) that government policies and regulations supporting renewable energy adoption can incentivize manufacturing firms to invest in sustainable practices. The result is also consistent with Odu (2019) who documents that investors are including ESG criteria in their investment decisions. Therefore, firms which report on renewable energy initiatives will attract investors who prioritize sustainable and responsible business practices, positively influence firms' valuation and financial performance, mitigate climate-related risks, and increase resilience to supply chains disruptions. This finding supports prior studies such as Kuo and Chang (2021), Majeed and Luni (2020), and Mazzucchelli *et al.* (2022).

The result indicates that recycling has insignificant impact on financial performance. This is consistent with the findings of Yu *et al.* (2022). Lastly, the result shows dematerialization as a CE practice has no significant effect on financial performance is consistent with Oliveira *et al.* (2023).

6. CONCLUSION AND POLICY IMPLICATIONS

The chapter concludes that CE practices such as refurbishment and renewable energy have significantly positive on corporate financial performance, indicating that circularity of the business model influences the financial performance of manufacturing firms in Nigeria. Firstly, given the significant positive impact of CE practices (particularly in relation to refurbishment), on the financial performance, policymakers may consider the following recommendations: 1).There should be

collaboration with industry stakeholders to establish clear reporting standards for CE practices especially for refurbishment and renewable energy, and create guidelines that define the key indicators, measurement methodologies, and disclosure requirements. 2.There could be organization for training programmes, and provision of resources to manufacturing firms that would enhance their capacity to implement CE practices. This can include workshops, seminars, and access to information that educates firms on the benefits and best practices associated with refurbishment and other circular initiatives. 3 Financial incentives such as tax credits, grants should be given to the manufacturing firms to actively invest in sustainable CE practices, and report transparently on CE practices especially refurbishment and renewable energy practices. 4 The government should incorporate CE considerations, including refurbishment reporting, into corporate governance codes. Refurbishment can be encouraged by instituting recognition programmes that celebrate manufacturing firms demonstrating exemplary and international best practices in CE practices, including successful refurbishment initiatives, and 5. There should be public acknowledgement and reward for firms through awards, certifications, or other forms of recognition to incentivize a positive competitive environment.

Secondly, since renewable energy practices have positive effect on the return on total assets, policymakers can consider some key recommendation including fostering a regulatory environment supporting and integrating sustainable energy through the following; (1) The introduction of incentive such as tax credits and subsidies to motivate manufacturing firms to invest in renewable energy infrastructure. These incentives can help to offset the initial capital outlays associated with adopting solar, wind, and other sustainable energy sources, (2) Instituting feed-in tariffs that secure a fixed payment for renewable energy generated by manufacturing firms. This mechanism provides a predictable revenue stream for firms investing in renewable energy, making the business case more attractive and financially viable, (3) Simplifying and expediting the permit processes to install renewable energy systems. The reduction of the bureaucratic bottlenecks, and streamlining of the approval processes can encourage more manufacturing firms to invest in sustainable energy infrastructure, (4) Setting clear and achievable renewable energy standards for manufacturing firms. These standards can mandate a certain percentage of a firm's energy consumption to come from renewable sources and compliance with these standards linked to regulatory approvals or other benefits, (5) Encouraging partnerships between public and private entities to develop and implement renewable

energy projects. Collaborations can include joint investments, research initiatives, and knowledge-sharing platforms, fostering a collective approach toward sustainable energy adoption, (6) Collaborating with financial institutions to create specialized financing programs for renewable energy projects in the manufacturing sector. These programs could offer favorable interest rates, longer repayment periods, and other financial incentives to facilitate the adoption of sustainable energy solutions, (7) Integrating renewable energy criteria into public and private procurement policies. Give preference to manufacturing firms that actively source a significant portion of their energy from renewable sources when awarding contracts. This can create market pull for sustainable practices, and (8) Offering technical assistance and capacity-building programs to manufacturing firms interested in transitioning to renewable energy. This can include training programs, workshops, and access to expertise that helps firms navigate the complexities of implementing sustainable energy solutions.

Lastly government should re-invigorate policies on recycling and dematerialization to rejuvenate these CE by manufacturing firms.

7. SUGGESTION FOR FURTHER STUDY

The limitations include the restriction of scope to only the manufacturing sector of the Nigerian Exchange Group. Future studies may consider (1) conducting a longitudinal study to explore causality and temporal relationships between circular economy practices and financial performance in the manufacturing and other sectors such as financial, oil and gas etc., (2) examine the impacts of other CE practices on ESG performances, (3) examine the moderating and mediating roles of macroeconomic factors such as interest rates, inflation, on the relationship between CE practices and financial performance.

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