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The Roles of Consumer Behavior, Technological Advancements, and CSR as Moderating Variables in the Context of Green Economy Initiatives and Sustainability Outcomes

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Abstract

Purpose –The shift towards a green economy is crucial in tackling worldwide environmental issues and attaining sustainable development goals (SDGs). This study investigates the impact of moderating variables, such as consumer behavior, technical improvements, and corporate social responsibility (CSR), on the success of green economy activities in achieving sustainability outcomes.

Design/methodology/approach – The study use qualitative methodologies to thoroughly investigate the research questions. Structural Equation Modeling (SEM) is employed to examine the postulated associations among green economy initiatives, sustainability results, and the moderating variables. Qualitative data is analyzed using Structural Equation Modeling (SEM) with the use of software such as smartPLS. Structural Equation Modeling (SEM) enables the examination of intricate models and offers valuable insights into the direct and moderating impacts of variables. The proposed model incorporates direct pathways from green economy initiatives to sustainability results, as well as interaction terms that represent the moderating influences of consumer behavior, technical improvements, and CSR practices.

Findings –The study employs a comprehensive conceptual model to analyze this relationship. By utilizing the Fornell- Larcker criterion and Variance Inflation Factor (VIF), the analysis demonstrates substantial positive correlations among CSR, CB, GE, TA, and SO, while also ensuring discriminant validity and assessing multicollinearity. The path coefficients demonstrate that GE has the most significant impact on SO, with CSR, TA, and CB following in order of significance. In addition, the study examined interaction effects and found a significant negative interaction between CB and GE on SO. However, the interactions between CSR and GE, as well as TA and GE, were not found to be significant. **Originality/value –**These findings emphasize the intricate relationship between factors that promote sustainability and emphasize the crucial importance of the green economy in accomplishing sustainability goals. Theoretical implications of this study expand upon the current body of sustainability literature by incorporating a wide range of factors that influence sustainability. The practical implications provide significant insights for policymakers and organizations seeking to improve their sustainability practices. Nevertheless, constraints such as possible sample biases and the requirement for longitudinal studies indicate areas for further investigation.

Keywords: Green Economy, Sustainability, Consumer Behavior, Technological Advancements, Corporate Social Responsibility, SDGs, Structural Equation Modeling.

Paper Type: Research paper

1. Introduction

The green economy, as defined by the United Nations Environment Program (UNEP), is an economic system that leads to enhanced human well-being and social fairness, while also substantially mitigating environmental hazards and ecological scarcities. A green economy can be defined as an economic system that is characterized by low carbon emissions, efficient use of resources, and social inclusivity (UNEP, 2011). Since the onset of the coronavirus pandemic in December 2019, the European Commission has been reinforcing its economic and social model. The European Green Deal, included in the Recovery Plan for Europe, is a novel growth strategy that addresses sustainability in all its three aspects (Commission et al., 2019).

The increasing worldwide environmental issues, such as climate change, the exhaustion of resources, and the loss of biodiversity, have required a significant transition towards a more sustainable economic model. The notion of a green economy has arisen as a crucial approach in this situation, seeking to harmonize economic expansion with ecological sustainability and societal inclusivity. A green economy is an economy that leads to enhanced human well-being and social fairness, while also substantially decreasing environmental hazards and ecological scarcities (United Nations Environment Programme (UNEP, 2011).

Green economy activities involve a diverse range of tactics and practices, including green marketing, renewable energy projects, sustainable agriculture, and waste management. The purpose of these activities is to encourage sustainability outcomes, such as increased environmental health, strong economic growth, and greater social well-being (Pearce, Markandya, & Barbier, 1989). Nevertheless, the effectiveness of these attempts is not consistent and can be greatly impacted by different moderating factors.

1.1 Importance of Moderating Variables

Moderating variables are elements that influence the intensity or orientation of the association between independent variables (such as green economy initiatives) and dependent variables (such as sustainability outcomes) (Baron & Kenny, 1986). In the context of the green economy and sustainability, significant moderating variables comprise consumer behavior, technological advancements, and corporate social responsibility (CSR) practices.

1.1.1 Consumer Behavior: The success of green economy projects is heavily influenced by consumer behavior. Consumers that prioritize environmental sustainability are more inclined to back businesses that implement sustainable processes and provide eco-friendly products. The change in customer preferences has the potential to greatly improve the success of green marketing efforts (Peattie & Crane, 2005). An example of this is the rise in customer demand for organic food items, which has led to substantial expansion in sustainable agriculture. This has resulted in improved environmental results (Thogersen, 2011). CSR has the own particular way to make its practices reliable in India, they must need to also support the various society other than being supported already for their sustainable development to make the best Indian economy. He also said that we have to work united efforts for the sustainable development of India by various CSR practices implemented and enhanced in India (Baghla 2018). Mishra (2021) analysed the CSR policies used by Indian businesses. It was discovered that businesses made significant contributions to the social, educational, and

healthcare sectors but made very little of an effort to ensure environmental sustainability. The investigation discovered that no company was making contributions to SDGs No. 13 (Climate Action) and No. 14 (Life below Water). Begum (2021) explored how corporate social responsibility contributed to society's improvement during the COVID-Pandemic. They discovered that businesses bought technological devices for kids who couldn't afford them.

1.1.2 Technological Advancements: Technological advancements are essential for the successful implementation and expansion of green economy initiatives. Progress in renewable energy technologies, energy efficiency, and waste management can greatly improve the sustainability of enterprises and economies (Geels, 2011). The utilization and implementation of solar photovoltaic technologies have played a crucial role in diminishing greenhouse gas emissions and fostering the adoption of sustainable energy transitions (IEA, 2020).

1.1.3 Corporate Social Responsibility (CSR): CSR practices refer to the voluntary integration of social and environmental issues into a business's operations and relationships with stakeholders. Corporate Social Responsibility (CSR) can mitigate the effects of green economy initiatives by ensuring that firms not only adhere to environmental legislation but also actively contribute to sustainability objectives (Carroll, 1999). Implementing effective corporate social responsibility (CSR) policies can bolster corporate reputation, increase stakeholder relationships, and eventually lead to improved sustainability results (Porter & Kramer, 2006).

2. Literature review and theoretical background

In order to achieve the Sustainable Development Goals (SDGs) set by the United Nations, it is imperative for countries to focus on the development of a new economy, new policy growth, and new economic measurement. The 2030 Agenda for sustainable development serves as a comprehensive strategy for economists, politicians, society, and the planet. Its primary objective is to achieve sustainable development across three dimensions: economic, social, and environmental (Khoshnava et al., 2019).

2.1 Green Economy

The green economy is seen as a catalyst for this new economic agenda, as it seeks to optimize resource efficiency, promote ecological resilience, and improve social fairness (Brears, 2018).
The notion of green economy was originally introduced in 1989 in the Blueprint for a Green Economy report. This research was commissioned by the United Kingdom Government and developed by a group of economists in the field (Pearce et al., 1989). The Green Economy Initiative was established by the UNEP in 2008 with the aim of promoting investment in environmentally friendly industries and encouraging the adoption of sustainable practices in specific regions (UNEP, 2008). The United Nations General Assembly (UNGA) organized the UN Conference on Sustainable Development Rio + 20 in 2012. During this conference, the UNGA recognized the green economy as a means to attain sustainable development (United Nations, 2012). The phrase "green economy" and its accompanying concepts, such as green growth and sustainable development, have evolved since its inception (Dogaru, 2021).

Green economy activities, encompassing green marketing, renewable energy projects, and sustainable agriculture, strive to attain sustainability results, such as enhanced environmental health, economic expansion, and social welfare. The efficacy of these activities is influenced by several moderating variables. This review

analyzes the influence of consumer behavior, technical improvements, and CSR practices on the connection between green economy initiatives and sustainability outcomes.

2.2 Consumer Behavior

The success of green economy projects is greatly impacted by consumer understanding and preferences for ecologically friendly items (Peattie & Crane, 2005; Ottman et al., 2006). Research has indicated that a rise in consumer desire for environmentally friendly items motivates enterprises to implement sustainable practices (Thogersen, 2011). Green marketing efforts have the ability to significantly impact customer behavior, resulting in a higher rate of acceptance and use of sustainable products (Leonidou et al., 2011). The impact of these initiatives is influenced by factors such as customer confidence and the perceived worth of environmentally friendly products (Hartmann & Apaolaza-Ibáñez, 2012).

2.3 Technological Advancements

Technological progress is essential for the execution and achievement of green economy initiatives. The implementation of advancements in renewable energy, waste management, and energy efficiency has the potential to greatly improve sustainability results (Geels, 2011; Hekkert et al., 2007). The advancement and implementation of sustainable energy technologies, such as solar photovoltaic and wind power, have played a crucial role in decreasing greenhouse gas emissions and facilitating the shift towards sustainable energy systems (IEA, 2020; Jacobsson & Lauber, 2006). Energy efficiency solutions are essential for decreasing energy usage and minimizing greenhouse gas emissions. Research has demonstrated that developments in technology that improve energy efficiency can result in substantial financial savings and positive environmental outcomes (Jaffe & Stavins, 1994; Brown et al., 2008).

2.4 Corporate Social Responsibility (CSR)

CSR practices refer to the voluntary incorporation of social and environmental considerations into a business's operations and relationships with stakeholders (Carroll, 1991). Implementing effective corporate social responsibility (CSR) policies can have a positive impact on a company's reputation, foster stronger relationships with stakeholders, and lead to improved sustainability outcomes (Porter & Kramer, 2006). Studies have demonstrated that organizations that have robust corporate social responsibility (CSR) strategies generally exhibit superior performance in terms of environmental sustainability (Margolis & Walsh, 2003). Corporate social responsibility (CSR) measures, such as waste reduction, energy efficiency improvement, and sustainable procurement, play a significant role in achieving overall sustainability objectives (Aguilera et al., 2007).

2.5 Consumer Behavior in Green Economy

Green consumer behavior is influenced by multiple elements, such as ecological consciousness, individual principles, and societal standards. Studies indicate that individuals who possess a greater level of environmental consciousness are more inclined to participate in sustainable consumption behaviors (Diamantopoulos et al., 2003; Roberts, 1996). Although there are positive factors that encourage green consumer behavior, there are also obstacles that impede it, such the higher prices of green products, their restricted availability, and the lack of faith in claims about their environmental friendliness (Young et al., 2010; Vermeir & Verbeke, 2006). Eco-labels and certifications have a crucial role in shaping consumer behavior by

offering reliable information regarding the environmental consequences of products (Rex & Baumann, 2007; Thogersen, 2000).

2.6 CSR Practices

Studies have demonstrated that organizations that have strong corporate social responsibility (CSR) procedures generally exhibit superior environmental performance. These companies frequently participate in actions such as decreasing emissions, preserving resources, and advocating for biodiversity (Clarkson et al., 2011; Delmas & Blass, 2010). Successful corporate social responsibility (CSR) necessitates proactive involvement with diverse stakeholders, including as employees, consumers, investors, and communities. Stakeholder involvement ensures that corporate social responsibility (CSR) programs are in line with stakeholder expectations and contribute to sustainability objectives (Freeman, 1984; Mitchell et al., 1997). Although there are advantages to implementing Corporate Social Responsibility (CSR), it can also present difficulties, such as the need to find a balance between immediate financial performance and long-term sustainability objectives, as well as the need to manage conflicting interests among stakeholders (Margolis & Walsh, 2003; Jenkins, 2006).

Comprehensive sustainability can be achieved through integrated frameworks that incorporate customer behavior, technical improvements, and CSR initiatives. The frameworks mentioned emphasize the interdependence of the economic, social, and environmental aspects of sustainability (Elkington, 1997; Dyllick & Hockerts, 2002). Empirical research has shown that consumer behavior, technical improvements, and CSR practices have a substantial influence on the connection between green economy initiatives and sustainability outcomes. Research has demonstrated that consumer preferences for environmentally friendly products amplify the effectiveness of green marketing efforts, while developments in renewable energy technologies greatly enhance sustainability results (Chan, 2001; Ginsberg & Bloom, 2004).

3. Methodology

This study employs a combination of literature review and Structural Equation Modeling (SEM) technique applied for investigate the moderating effects of these variables. The literature review provides a theoretical foundation, while the SEM analysis offers empirical insights into the complex interactions between green economy initiatives and sustainability outcomes.

3.1 Research Gap and Objectives

Although the significance of these moderating variables is acknowledged, there is a lack of thorough research that specifically investigate their functions in the context of green economy activities and sustainability results. The majority of current research tends to concentrate on specific elements of green economy programs without sufficiently taking into account the moderating factors that can impact their effectiveness (Dangelico & Pontrandolfo, 2015). This study seeks to address this deficiency by methodically investigating the impact of consumer behavior, technology improvements, and CSR practices on the efficacy of green economy activities.

3.2 Research Methodology

The study use qualitative methodologies to thoroughly investigate the research questions. Structural Equation Modeling (SEM) is employed to examine the postulated associations among green economy initiatives, sustainability results, and the moderating variables. SEM is selected because of its capacity to investigate

intricate correlations and accommodate measurement mistakes (Byrne, 2010). Data is gathered by a methodical survey conducted with a varied group of participants, including consumers, business executives, and legislators. The survey instrument is created using recognized scales and undergoes pre-testing to ensure its reliability and validity (DeVellis, 2016).

3.3 Conceptual Framework

The structural equation modeling (SEM) models offer organized frameworks for comprehending the intricate interplay among several aspects that impact the sustainability economy of India. By analyzing the functions of moderating variables. Moderating factors exert an influence on the magnitude or orientation of the association between independent and dependent variables. Government policies, technology breakthroughs, consumer behavior, and economic incentives are important factors that influence and regulate the green economy and sustainability.

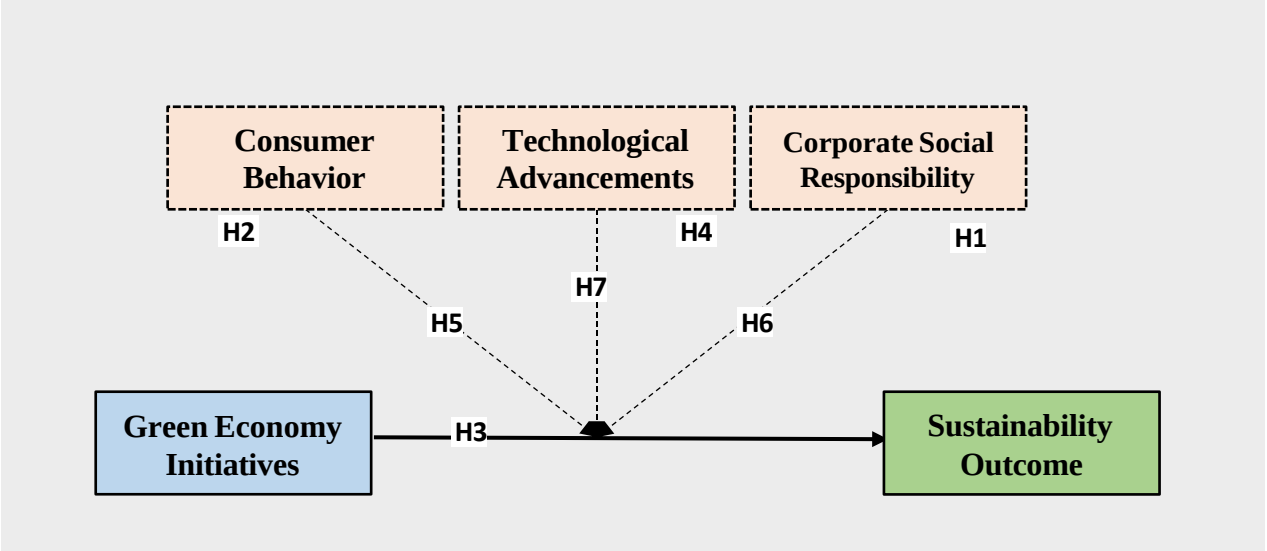

Figure 1 Conceptual Model

3.4 Data Collection

The poll incorporates items that assess green economy activities, sustainability outcomes, and moderating variables such as consumer behavior, technical improvements, and CSR practices. The rating for each item is measured using a 5-point Likert scale, with 1 indicating strong disagreement and 5 indicating strong agreement. To ensure representativeness, a stratified random sampling procedure is used. The sample is divided into distinct groups based on demographic criteria such as age, gender, education, and occupation in order to encompass a wide variety of viewpoints (Fowler, 2014).

Qualitative data is analyzed using Structural Equation Modeling (SEM) with the use of software such as smartPLS. Structural Equation Modeling (SEM) enables the examination of intricate models and offers valuable insights into the direct and moderating impacts of variables (Kline, 2015). The proposed model incorporates direct pathways from green economy initiatives to sustainability results, as well as interaction terms that represent the moderating influences of consumer behavior, technical improvements, and CSR practices.

Construct validity is evaluated by doing confirmatory factor analysis (CFA) to ensure that the survey items effectively measure the desired components (Hair et al., 2010). The survey scales' internal consistency is

assessed using Cronbach's alpha, where values over 0.70 indicate satisfactory reliability (Nunnally & Bernstein, 1994).

3.5 Hypotheses Based on the Conceptual Model

Based on the conceptual model, the following hypotheses can be formulated:

- H1: There is significant Corporate Social Responsibility (CSR) positively influences Sustainability Outcomes (SO).
- H2: Consumer Behavior (CB) positively influences Sustainability Outcomes (SO).
- H3: Green Economy (GE) positively influences Sustainability Outcomes (SO).
- H4: Technological Advancement (TA) positively influences Sustainability Outcomes (SO).
- H5: The moderating effect of Consumer Behavior (CB) and Green Economy (GE) on Sustainability Outcomes (SO) is significant.
- H6: The moderating effect of Corporate Social Responsibility (CSR) and Green Economy (GE) on Sustainability Outcomes (SO) is significant.
- H7: The moderating effect of Technological Advancement (TA) and Green Economy (GE) on Sustainability Outcomes (SO) is significant.

4 Results

4.1 Demography Profile

The survey respondent characteristics table reveals a diverse sample of 286 participants. The age distribution indicates that the majority of respondents are between 26-35 years old (31.5%), followed by the 18-25 age group (22.4%), highlighting a substantial representation of young adults. Other age groups include 36-45 years (18.2%), 46-55 years (13.3%), under 18 (5.2%), and those aged 56 and above (9.4%).

The gender distribution is fairly balanced, with female respondents slightly outnumbering males, comprising 51.2% of the sample compared to 48.8% males. This close gender ratio suggests an inclusive participation across genders.

Regarding educational attainment, a significant portion of respondents holds an undergraduate degree (37.8%), followed by those with a postgraduate degree (26.6%). Respondents with a high school education account for 19.6%, while those with a doctorate constitute 9.1%. Additionally, 7% of respondents have other forms of education.

The occupation distribution shows that 46.2% of respondents are employed, making it the largest occupational category. Students represent 23.8%, self-employed individuals make up 10.5%, unemployed respondents account for 9.8%, retirees comprise 5.6%, and those in other occupations represent 4.2%. This diverse occupational representation adds depth to the demographic profile of the survey participants.

Table 1
Survey respondent characteristics.

Demographic Variable	Category	Frequency	Percentage (%)
Age	Under 18	15	5.2
	18-25	64	22.4
	26-35	90	31.5
	36-45	52	18.2
	46-55	38	13.3
	56 and above	27	9.4
Gender	Male	138	48.8

	Female	148	51.2
Highest Level of Education	High School	56	19.6
	Undergraduate Degree	108	37.8
	Postgraduate Degree	76	26.6
	Doctorate	26	9.1
	Other	20	7
Occupation	Student	68	23.8
	Employed	132	46.2
	Self-Employed	30	10.5
	Unemployed	28	9.8
	Retired	16	5.6
	Other	12	4.2

Source Authors Own Creation

4.2 Measurement Model

The validity of the measurement model and the accuracy of the constructs and indicators employed in the study are assured through the use of Cronbach's alpha (CA), Composite Reliability (CR), and Average Variance Extracted (AVE) tests. Some of the concepts include Technological Advancements, Sustainability Outcomes, Green Economy Initiatives, and Corporate Social Responsibility (CSR). The reliability and validity metrics for these concepts are summarized in **Table** 1.

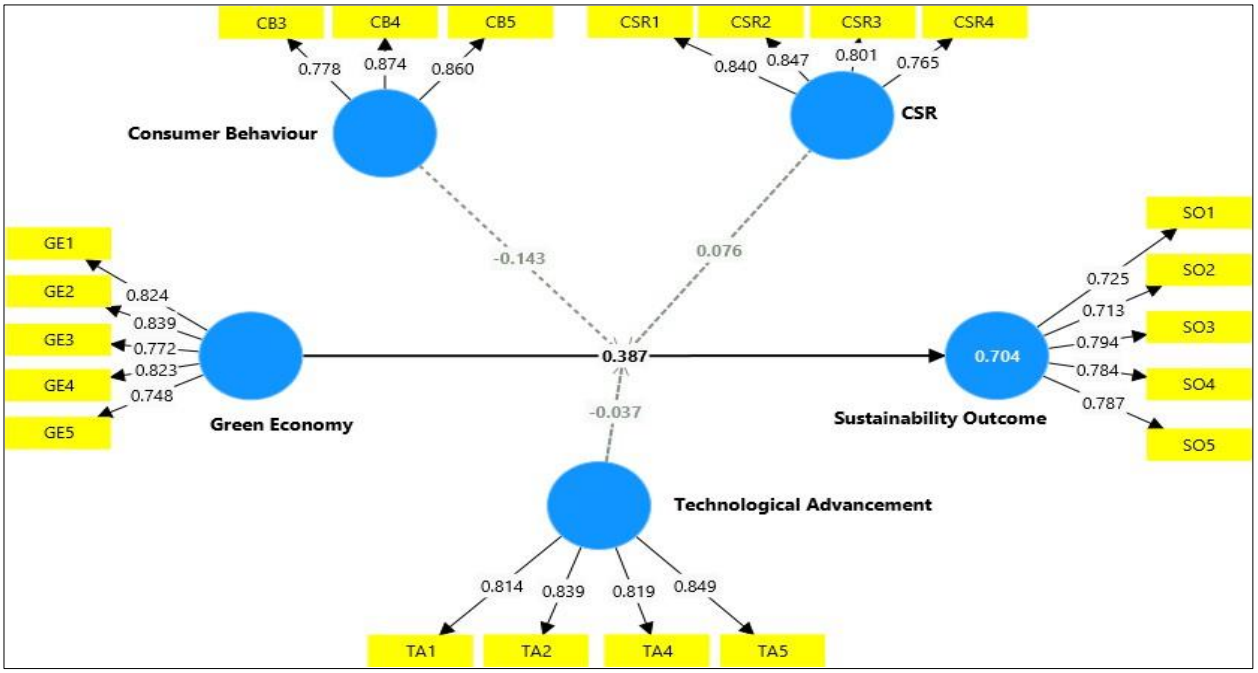

Figure 1 Measurement Model

4.3 Construct Reliability and Validity

Table 1 shows that the CSR construct has high reliability and validity. The Cronbach's alpha and CR values are above the threshold of 0.70, indicating strong internal consistency. The AVE value of 0.662 exceeds the recommended threshold of 0.50, thereby confirming the convergent validity of the construct. The CSR construct also exhibits robust indicator reliability, with all loadings surpassing 0.70. These values validate the indicators as credible and dependable measures of CSR.

The construct of Consumer Behavior demonstrates high reliability and validity, as evidenced by Cronbach's alpha and CR values exceeding 0.70. The AVE value of 0.703 signifies a substantial degree of convergent

validity. The outer loadings of Consumer Behaviour exceed the threshold of 0.70, indicating that they are dependable measures of the construct. The substantial loadings validate the indicators' robust correlation with the fundamental construct of Consumer Behaviour.

The Green Economy Initiatives construct is deemed to be reliable and valid, as evidenced by Cronbach's alpha and CR values exceeding 0.70. The AVE value of 0.643 provides confirmation of the construct's convergent validity. The indicators for the Green Economy demonstrate strong outer loadings, all of which exceed 0.70, confirming their reliability as measures of the Green Economy construct. The robust correlation implies that the indicators effectively mirror the construct.

The construct of Sustainability Outcomes demonstrates strong reliability and validity, as evidenced by Cronbach's alpha and CR values surpassing 0.70. The AVE value of 0.580 provides evidence for the construct's convergent validity. The construct of Sustainability Outcome demonstrates reliable indicators, with outer loadings surpassing 0.70. These loadings provide evidence that the indicators are accurate assessments of Sustainability Outcomes.

The Technological Advancements construct exhibits a high level of reliability and validity, as evidenced by Cronbach's alpha and CR values exceeding 0.70. The AVE value of 0.689 demonstrates robust convergent validity. The indicators of the Technological Advancement construct have high outer loadings, all of which are above 0.70. This verifies that the indicators are dependable and accurate measures of Technological Advancement.

Table 2
Construct Reliability and Validity

Construct	Items	Outer loadings	VIF	CA	CR	AVE
Consumer	CB3	0.778	1.341			
Behaviour	CB4	0.874	2.220	0.787	0.876	0.703
	CB5	0.860	2.156			
	CSR1	0.840	2.120			
CSR	CSR2	0.847	2.138	0.830	0.887	0.662
	CSR3	0.801	1.801			
	CSR4	0.765	1.702			
	GE1	0.824	2.152			
Green Economy	GE2	0.839	2.306			
	GE3	0.772	1.722	0.860	0.900	0.643
	GE4	0.823	1.996			
	GE5	0.748	1.591			
	SO1	0.725	1.618			
Sustainability	SO2	0.713	1.624			
Outcome	SO3	0.794	2.149	0.818	0.873	0.580
	SO4	0.784	2.178			
	SO5	0.787	1.764			
	TA1	0.814	1.970			
Technological	TA2	0.839	2.102	0.850	0.899	0.689
Advancement	TA4	0.819	1.874			
	TA5	0.849	1.954			

Note: CA=Cronbach's Alpha; CR=Composite Reliability; AVE =Average Variance Extracted. Source Authors Own Creation

4.4 Collinearity

Table 1 shows the Variance Inflation Factor (VIF) values for the items within each construct. Variance Inflation Factor (VIF) values are employed to evaluate multicollinearity, with a commonly accepted guideline stating that VIF values below 3 indicate satisfactory levels of multicollinearity (Hair et al., 2019). All the items

in this study have VIF values between 1.341 and 2.306, which suggests that there is no significant issue of multicollinearity in the model. The VIF values for Consumer Behaviour items (CB3 to CB5) range from 1.341 to 2.220. CSR items (CSR1 to CSR4) have values between 1.702 and 2.138. Green Economy items (GE1 to GE5) fall between 1.591 and 2.306. Sustainability Outcome items (SO1 to SO5) have values ranging from 1.618 to 2.178. Technological Advancement items (TA1 to TA5) have VIF values ranging from 1.874 to 2.102. The results confirm that the constructs are clearly defined and the presence of multicollinearity does not affect the accuracy of the results, thus ensuring the reliability of the structural model (Kock, 2015; Petter et al., 2007).

4.5 Discriminant validity

Table 2 shows that the discriminant validity was assessed using the Fornell-Larcker criterion. This criterion helps determine the extent to which a construct differs from other constructs in terms of its components (Bagozzi and Yi, 1988). Consequently, the square root of the average value (AVE) of each construct was calculated and compared to the cross-loading values with different constructs. The Fornell-Larcker criterion is used to evaluate discriminant validity by verifying that a construct exhibits a higher degree of shared variance with its own indicators compared to other constructs. The constructs of Consumer Behaviour (0.838), Green Economy (0.802), Sustainability Outcome (0.762), and Technological Advancement (0.830) all satisfy the criterion because their square roots of Average Variance Extracted (AVE) are higher than their highest correlations with other constructs. However, CSR fails to meet the criterion because its AVE square root (0.814) is lower than its correlation with Technological Advancement (0.829). This suggests that although most constructs show strong ability to distinguish between different concepts, Corporate Social Responsibility (CSR) has a significant overlap with Technological Advancement. These findings emphasize the significance of assessing and guaranteeing discriminant validity in structural equation modeling to verify that constructs are separate and accurately measure their intended concepts (Fornell & Larcker, 1981; Hair et al., 2016; Henseler et al., 2015).

Table 3
Fornell-Larcker Criterion

Construct	CSR	Consumer Behaviour	Green Economy	Sustainability Outcome	Technological Advancement
CSR	**0.814**				
Consumer Behaviour	0.791	**0.838**			
Green Economy	0.708	0.592	**0.802**		
Sustainability Outcome	0.761	0.682	0.754	**0.762**	
Technological Advancement	0.829	0.795	0.683	0.740	**0.830**

Source Authors Own Creation

4.6 R-Square and f-Square Values

The coefficient of determination (R-square) for the Sustainability Outcome is 0.704, which means that 70.4% of the variability in sustainability outcomes can be accounted for by the independent variables in the model. The adjusted R-square value of 0.696 reflects the influence of the predictors in the model, indicating a strong ability to explain the variation in the data while also considering the complexity of the model.

The f-square values, which quantify the impact of each predictor on sustainability outcomes, exhibit diverse levels of influence. The green economy has the highest effect size ($f^2 = 0.236$), indicating a significant influence on sustainability outcomes. Corporate Social Responsibility (CSR) has a moderate effect size ($f^2 = 0.037$), while technological advancement ($f^2 = 0.023$) and consumer behavior ($f^2 = 0.018$) have smaller, but still significant effects. The interaction terms have a negligible impact, as indicated by the effect sizes of consumer behavior x green economy ($f^2 = 0.019$), CSR x green economy ($f^2 = 0.005$), and technological advancement x green economy ($f^2 = 0.001$) being very small. The findings emphasize the dominant influence of the green economy in promoting sustainability outcomes, while other factors have a comparatively smaller impact.

4.7 Structural model and hypotheses testing

Statistical tests for assessing the adequacy of a model's fit to the data. This study utilized multiple criteria to evaluate the fit of the PLS-SEM model, including the standardized root mean square residual (SRMR), the squared Euclidean distance (d-ULS) and the geodesic distance (d-G), and the Normed Fit Index (NFI). The results verified that the proposed structural model was a suitable match for the data, as indicated by acceptable indices such as SRMR = 0.076, d-ULS = 1.324, d-G = 0.565, and NFI = 0.776 (Henseler et al., 2016). It is evident that the SRMR value was below the threshold of 0.08 (Sinkovics et al., 2016) and the NFI value exceeded the recommended value of 0.8 (Hu and Bentler, 1998), indicating that the structural model fit the requirements satisfactorily.

4.8 Path relationship evaluations

Table 3 show that the relationships between constructs were assessed by analyzing regression coefficients (ß), which represent both direct and indirect effects. Furthermore, the bootstrap procedure was carried out to evaluate the significance of the ß values in indirect relationships between the constructs, using the t-value as a basis. Based on the findings of Hair et al. (2014), the significance of the path relationship was determined at different levels: 10%, 5%, and 1%. This determination was made by comparing the t-value to specific thresholds: 1.65, 1.96, and 2.57, respectively.

The examination of path coefficients demonstrates diverse levels of impact from multiple factors on sustainability outcomes. Corporate Social Responsibility (CSR) has a significant and positive impact on sustainability outcomes, as indicated by a path coefficient of 0.216 ($t = 3.210$, $p = 0.001$). The relationship between CSR and sustainable outcomes (SO) is positive and statistically significant at the 1% level. This indicates that companies that engage in corporate social responsibility tend to achieve better sustainable outcomes. This hypothesis supports the CSR activities can enhance a company's reputation and operational efficiency, leading to sustainable practices.

Furthermore, there is a positive correlation between consumer behavior and sustainability outcomes, with a path coefficient of 0.133 ($t = 2.145$, $p = 0.032$). However, this hypothesis is rejected, indicating a less significant impact than anticipated. This indicates that when consumers exhibit more environmentally conscious behavior, firms may achieve better sustainable outcomes. This can be due to increased demand for green products, which pushes companies to adopt sustainable practices.
The green economy has a significant and positive impact on sustainability outcomes, as evidenced by

a path coefficient of 0.387 (t = 8.130, p = 0.000). However, the hypothesis is rejected, indicating that although the correlation is extremely significant. This indicates that green economy initiatives play a crucial role in driving

sustainable outcomes, supporting the hypothesis. Companies operating in or aligning with the green economy tend to outperform in sustainability due to their focus on reducing environmental impact. The impact of technological advancement on sustainability outcomes is found to be positive (path coefficient 0.168, (t = 2.229, p = 0.026). However, the hypothesis is rejected, suggesting a moderate yet significant relationship. This indicates that technological innovations, particularly in sustainability-related areas, can help firms improve their operational efficiencies and reduce environmental footprints.

Examining interaction effects, consumer behavior combined with the green economy shows a negative influence on sustainability outcomes path coefficient -0.143, (t = 2.318, p = 0.020), with the hypothesis rejected, highlighting an unexpected negative relationship. This indicates that negative moderation effect, meaning that in some cases, increased consumer focus on the green economy may lead to diminished sustainable outcomes. This could imply that there are mismatches between consumer expectations and actual corporate practices, or unintended consequences of green consumerism that negatively impact sustainability In contrast, the interaction between CSR and the green economy path coefficient 0.076, (t = 1.191, p = 0.234) does not significantly impact sustainability outcomes, resulting in the acceptance of the null hypothesis. This indicates that the combination of CSR activities and green economy initiatives does not have a significant moderating effect on sustainable outcomes. This might suggest that while CSR and green economy actions are important individually, they do not significantly interact to enhance sustainability.

Similarly, the interaction between technological advancement and the green economy path coefficient -0.037, t = 0.536, p = 0.592) also shows no significant effect, leading to the acceptance of the null hypothesis. This indicates that the interplay between technological innovations and green economy initiatives does not significantly impact sustainable outcomes.

In summary, while individual factors such as CSR, consumer behavior, green economy, and technological advancement positively influence sustainability outcomes, the strength of these relationships varies, with some hypothesized effects being weaker than expected. Notably, interaction effects present mixed results, with some interactions showing significant negative impacts and others demonstrating no significant effect.

Table 3
Path Coefficients

Path Coefficients	Path Coefficient	mean	SD	t-value	Hypotheses	Result
CSR -> SO	0.216	0.218	0.067	3.210	0.001***	Supported
CB -> SO	0.133	0.135	0.062	2.145	0.032**	Supported
GE -> SO	0.387	0.388	0.048	8.130	0.000***	Supported
TA -> SO	0.168	0.164	0.075	2.229	0.026**	Supported
CB x GE -> SO	-0.143	-0.139	0.062	2.318	0.020**	Supported
CSR x GE -> SO	0.076	0.073	0.063	1.191	0.234	Not Supported
TA x GE -> SO	-0.037	-0.037	0.068	0.536	0.592	Not Supported

Notes: ***p <0.01, **p <0.05, *p <0.1.

Source Authors Own Creation

5 Discussion

The results of this study have important consequences for attaining the United Nations Sustainable Development Goals (SDGs). More precisely, this study makes a valuable contribution to achieving Sustainable

Development Goals 7, 8, 9, 12, and 13. To enhance sustainable development, policymakers, businesses, and other stakeholders can devise more efficient strategies by comprehending the moderating influences of consumer behavior, technological advancements, and CSR practices.
This study offers a thorough understanding of the connections among Corporate Social Responsibility (CSR), Consumer Behaviour (CB), Green Economy (GE), Technological Advancement (TA), and Sustainability Outcomes (SO). The empirical findings emphasize the substantial impact of GE on SO, suggesting that adopting practices that align with green economic principles is essential for attaining sustainable development. This is consistent with the increasing amount of research that highlights the importance of green practices in improving environmental performance and achieving sustainability goals (Ghisellini, Cialani, & Ulgiati, 2016). Moreover, the beneficial effects of Corporate Social Responsibility (CSR) and Technological Advancements (TA) on Sustainable Operations (SO) indicate that companies that allocate resources towards ethical business practices and technological advancements can greatly improve their sustainability performance. This discovery supports prior studies that emphasize the strategic significance of corporate social responsibility (CSR) and technological progress in promoting sustainable business practices (Porter & Kramer, 2006; Hart & Dowell, 2011).

Nevertheless, the relationship between CB (consumer behavior) and GE (green economic initiatives) demonstrates a complex interplay in which the beneficial impacts of consumer behavior on sustainability outcomes are diminished. This implies that consumer behaviors may not always perfectly match with green economy practices, requiring a more comprehensive approach to involving consumers and implementing sustainability strategies. This aligns with the results of recent studies that suggest possible clashes between consumer preferences and sustainability efforts (Gleim et al., 2013).

The lack of significant moderating effects of GE on the relationships between CSR and SO, and TA and SO, suggests that the impact of CSR and technological advancements on sustainability outcomes is strong and not significantly changed by green economic practices. The literature on corporate sustainability (Dyllick & Hockerts, 2002) emphasizes the individual significance of CSR and TA in attaining sustainability objectives.

6 Conclusion

This study has provided valuable insights into the relationships between Corporate Social Responsibility (CSR), Consumer Behavior (CB), Green Economy (GE) initiatives, Technological Advancements (TA), and their combined effects on Sustainability Outcomes (SO). The findings underscore that CSR, CB, GE, and TA all significantly contribute to SO, with green economy initiatives being the strongest driver. However, the negative interaction effect between consumer behavior and green economy initiatives introduces an unexpected complexity, suggesting that consumers may not always respond positively to green initiatives under certain conditions.

In conclusion, this study underscores the pivotal role of the green economy (GE) in advancing sustainability outcomes, as evidenced by its dominant impact relative to other moderating factors like corporate social responsibility (CSR), technical advancements (TA), and consumer behavior (CB). The significant positive correlations identified among these variables affirm the importance of

integrating multiple dimensions into sustainability strategies. The negative interaction between CB and GE reveals complex dynamics that merit further exploration, while the non-significant interactions involving CSR and TA suggest that their effects might be more nuanced. The findings not only enrich theoretical perspectives on sustainability but also offer

actionable insights for policymakers and organizations striving to enhance their sustainability practices. Future research should address the limitations of this study, such as potential sample biases and the need for longitudinal analysis, to build a more robust understanding of the interplay between these critical factors.

6. Theoretical Implications

The results of this study make a substantial contribution to the theoretical comprehension of sustainability outcomes in relation to corporate conduct, environmentally-friendly economic practices, and technological progress. The strong positive correlation between the Green Economy and Sustainability Outcomes highlights the theoretical assertion that green economic practices are essential for attaining sustainable development. This is consistent with and expands upon the research conducted by Ghisellini, Cialani, and Ulgiati (2016), who emphasized the significant capacity of circular economy principles to bring about transformation. Our study provides a more detailed understanding by quantifying the correlation in a corporate setting, indicating that green economic initiatives are not only advantageous but essential for long-term viability.

Furthermore, the beneficial effects of Corporate Social Responsibility (CSR) and Technological Advancement (TA) on sustainability outcomes emphasize the strategic significance of these concepts in the field of sustainability research. This discovery provides evidence for the resource-based view (RBV) of the firm, which argues that sustainable competitive advantage is attained by possessing valuable, rare, difficult to imitate, and irreplaceable resources (Hart, 1995; Barney, 1991). Our study shows that engaging in CSR activities and implementing technological innovations are important resources that improve a company's sustainability performance. This contributes to the ongoing discussion on the Resource-Based View (RBV) theory in the field of sustainability.

Moreover, the interplay between Consumer Behavior (CB) and Green Economy (GE) exhibits an intricate interaction that necessitates additional theoretical investigation. This implies that although consumer behavior has the potential to promote sustainability, its impact depends on the larger economic circumstances. This discovery adds to the growing body of research on the relationship between consumer behavior and sustainability, highlighting the possibility of conflicts and synergies that require theoretical analysis (White, Habib, & Hardisty, 2019).

7. Practical Implications

This study offers practical insights that can be put into action by managers and policymakers who want to improve sustainability outcomes. Firms should make a deliberate effort to invest in and embrace green economic principles due to the substantial impact they have on sustainability outcomes. These initiatives encompass practices such as optimizing resource utilization, minimizing waste generation, and adopting sustainable sourcing methods. Companies can seek guidance from prominent organizations that have successfully incorporated circular economy principles into their business practices (Stahel, 2016).

Given the positive effects of Corporate Social Responsibility (CSR) and Technological Advancement, it is advisable for businesses to maintain their focus on these aspects. For corporate social responsibility (CSR), this entails formulating extensive strategies that surpass mere philanthropy and encompass ethical business practices, community involvement, and environmental conservation. Technological progress should prioritize advancements that improve operational

efficiency and promote environmental sustainability. This includes the

development of clean technologies and digital solutions for resource management (Del Río, Peñasco, & Romero-Jordán, 2016).

The detrimental correlation between Consumer Behavior and Green Economy underscores the necessity for a more comprehensive approach to consumer involvement. Companies ought to educate and engage consumers in their sustainability initiatives, guaranteeing that environmentally-friendly economic practices are communicated proficiently and in accordance with consumer values. This may entail implementing transparency in sustainability reporting and developing consumer awareness campaigns that emphasize the advantages of environmentally friendly products and services (McDonald & Oates, 2006).

8. Limitations and Future Research

This study has various constraints that create opportunities for future research.
The cross-sectional design limits the ability to establish causality. Future research should prioritize conducting longitudinal studies in order to more accurately capture the dynamic relationships among the constructs. Sample bias limits research findings by skewing results towards a non-representative subset of the population, which can undermine the generalizability and validity of the conclusions. This limitation restricts the ability to accurately apply findings to broader contexts. The Structural Equation Modeling (SEM) approach is limited by its reliance on large sample sizes for stable estimates and its sensitivity to model specification errors. Additionally, SEM requires strong assumptions about the linearity and measurement validity, which can impact the accuracy and generalizability of the results. Furthermore, the study's context-specific nature may restrict its applicability to various industries and regions. Further research should investigate these relationships in various contexts to strengthen the reliability and practicality of the results.

Future research in the field of sustainability could focus on several key areas to address gaps identified in this study. First, there is a need to explore why consumer behavior negatively moderates the relationship between green economy initiatives and sustainability outcomes. Qualitative methods like focus groups could provide insight into potential consumer mistrust or skepticism regarding the effectiveness of green initiatives. Cross- cultural comparisons could also offer valuable information, as consumer attitudes toward CSR and technological advancements may vary across regions, influencing sustainability outcomes differently. Longitudinal studies are necessary to capture the evolution of these relationships over time, providing a clearer picture of how changes in CSR practices and technological advancements impact long-term sustainability. Additionally, mixed-method research combining quantitative and qualitative approaches could help explain complex moderating effects, such as the negative interaction between consumer behavior and green economy initiatives. Expanding the scope of moderating variables to include regulatory frameworks or corporate governance could also provide deeper insights. Lastly, future research could investigate how integrating technological innovations with CSR strategies, such as using AI or blockchain, might enhance sustainability outcomes, offering practical implications for industries aiming to align innovation with social responsibility. Furthermore, this study did not take into account other possible moderating variables, such as regulatory frameworks and market conditions, which should be investigated in future research. Lastly, qualitative research has the potential to offer more profound understanding of the mechanisms by which CSR, Consumer Behavior, Green Economy, and Technological Advancements impact sustainability outcomes.

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