Journal of Strategic Management

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Moses Kiprono Chelang'a, Sr. Dr. Lucy Wanza & Dr. Pamela Eng'airo

ISSN: 2616-8472

Stratford Peer Reviewed Journals and Book Publishing
Journal of Strategic Management
Volume 8||Issue 3 ||Page 34-49||August||2024|
Email: info@stratfordjournals.org ISSN: 2616-8472

Green Innovation Strategies, Environmental Regulations and Competitive Advantage of Tea Processing Firms in Rift Valley Region, Kenya

[*1]Moses Kiprono Chelang'a, [2]Sr. Dr. Lucy Wanza & [3]Dr. Pamela Eng'airo

[1]Student, School of Business, The Catholic University of Eastern Africa

[2]Lecturer, School of Business, The Catholic University of Eastern Africa

[3]Lecturer, School of Business, The Catholic University of Eastern Africa

***Email of the Corresponding Author: chelangamoses@yahoo.com**

How to cite this article: Chelang'a, M., K., Wanza, L. & Eng'airo, P. (2024). Green Innovation Strategies, Environmental Regulations and Competitive Advantage of Tea Processing Firms in Rift Valley Region, Kenya. Journal of Strategic Management, 8(3), 34-49. https://doi.org/10.53819/81018102t3101

Abstract

In the context of growing environmental concerns, examining the effect of green innovations on the competitiveness of tea processing firms not only broadens the frontier of research in the field, but also provides guidance to firms in their pursuit of competitiveness and sustainability. To assess tea processing firms' competitive advantage, this study looked into the moderating role of environmental regulations in the interaction of green innovation practices and competitive advantage in the Rift Valley Region of Kenya. The study was guided by four theories: the Schumpeter theory of innovation, dynamic capabilities theory, institutional theory, and Porters' theory of competitive advantage. An explanatory research design was used. The investigation focused on 59 private tea firms in Rift Valley counties. The sample size was 51 private tea processing firms and 204 informants drawn from the population. A multi-stage sampling technique was used. A questionnaire was used to collect primary data, and a documentary analysis guide for secondary data. Expert opinion determined validity, and Cronbach's alpha was used to assess reliability. The data was analysed using descriptive and inferential statistics. Descriptive statistics included frequencies, percentages, means, and standard deviations, whereas inferential statistics included regression analysis. The research is important to the studied firms because it serves as a decision-making reference and provides insight to regulatory bodies on sustainability issues. It will also serve as a foundation for future research in the areas of environmental guidelines, green innovation, and competitive advantage. The study found that circular economy practices ($\beta1=0.298$, $p<0.05$), resource efficiency ($\beta2=0.225$, $p<0.05$), waste reduction ($\beta3=0.234$, $p<0.05$), green business model innovation ($\beta4=0.246$, $p<0.05$), and environmental regulations ($\beta5=0.177$, $p<0.05$) all had a positive and significant effect on competitiveness. Implementing circular economy practices, improving resource efficiency, reducing waste, innovating green business models, and adhering to environmental regulations all contribute significantly to tea processing firms' competitive advantage in Kenya's Rift Valley Region. The study suggests that tea processing companies standardize refurbishment, invest in advanced recycling and waste reduction technologies, optimize production processes, improve transparency, and streamline certification to strengthen sustainability and competitive advantage.

Keywords: *Green Innovation Strategies, Environmental Regulations, Competitive Advantage, Tea Processing Firms, Rift Valley Region*

https://doi.org/10.53819/81018102t3101

1.1 Background to the Study

Over the last few decades, changes in production and consumption patterns have resulted in over-exploitation of natural resources, climate change, and biodiversity loss, all of which pose significant threats to life on Earth and have an impact on both environmental and organizational performance. Therefore, companies around the world are increasingly implementing green innovation strategies to improve sustainable development and competition (Alcácer & Cruz-Machado, 2019). Green innovations, backed by stricter government regulations, seek to boost consumer satisfaction and promote long-term progress (Bai et al., 2019). This trend is especially evident in the tea processing industry, where companies that follow environmental guidelines are more likely to gain a competitive advantage (Bossle et al., 2021). As businesses become more aware of environmental issues, implementing sustainable practices has become critical for addressing current challenges and avoiding future crises (Chen & Liang, 2023). This study seeks to determine how environmental standards influence the relationship between green innovation practices and the competitive advantage of tea processing firms in Kenya's Rift Valley Region (Chien et al., 2021). A competitive advantage is a company's ability to generate returns on investments that are higher than the market average due to its unique position and effective resource deployment (Sigalas, 2021). In today's global business environment, a company's competitiveness determines its ability to outperform competitors, enter new markets, and keep production costs low (Kaleka & Morgan, 2020). Indicators of competitive advantage, such as market share, product differentiation, brand equity, and low production costs, are critical for assessing a firm's success in comparison to its competitors and contribute to sustainable environmental performance (Adamik, 2019).

Green innovation strategies are increasingly being used by businesses and policymakers to address environmental destruction and climate change, with a focus on innovations in products, processes, and organizations that reduce ecological harm (Becker, 2023). These strategies, which include circular economy practices, resource efficiency, waste reduction, and green business model innovation, seek to achieve sustainable development while balancing economic and environmental objectives (Ren & Yan, 2023). Green innovation can help businesses gain a competitive advantage, reduce environmental impact, and meet regulatory requirements (Eiadat & Eyadat, 2018). Globally, sectors such as the tea industry have seen significant benefits from implementing green innovation strategies, which assist firms in maintaining market competitiveness and ensuring long-term sustainability (Akcigit and Kerr, 2018). Tea processing firms in Kenya have recognized the importance of these strategies, which have been implemented to address environmental challenges and improve sustainability (Kiai & Wambui, 2018).

Environmental regulations are critical for controlling the negative effects of commercial activities on the environment, and they frequently impose significant costs on businesses (Sanchez and McKinley, 2018). These regulations are classified as either flexible, which encourages innovation by allowing firms to choose how to meet regulatory goals, or inflexible, which requires specific compliance measures (Ramanathan & Muyldermans, 2020). In the context of tea processing firms, environmental regulations act as a moderator, influencing the adoption of green innovation strategies and potentially affecting a firm's competitive advantage (Ou & Jiang, 2023). Kenya is a leading global producer and exporter of tea, which contributes significantly to the country's economy in terms of foreign exchange and employment. The industry is well-organized, from the Ministry of Agriculture to small-scale farmers, with regulatory oversight provided by organizations such as the Tea Directorate and the Kenya Tea Development Agency (KTDA) (Muoki & Bore, 2020). Kenyan tea processing companies are

increasingly adopting green innovation strategies to maintain competitiveness, guided by regulations such as organic certification and environmental responsibility, which are critical for long-term operations in the sector (Afande, 2015).

1.2 Statement of the Problem

The tea industry makes a significant contribution to Kenya's economy. Tea is a major foreign exchange earner, accounting for roughly 23% of total foreign exchange income and 2% of agricultural GDP. Kenya produces over 450 million kgs of tea each year, generating over Ksh 120 billion in export revenue and 22.0 billion in local sales (AFA, 2024). However, over the last three years (2021-2023), the sector's production volumes have declined. More than half of the tea handling firms in the Rift Valley Region face stiff competition from similar firms in other regions of Kenya and other tea-growing countries around the world, limiting their ability to break even (Ngeno, 2023). Most households in the Rift Valley Region's livelihoods continue to suffer as a result of fierce competition. It has contributed to a 34% unemployment rate, with tea-processing firms reducing their workforce to recover operational costs, among other challenges (Nyaribo & Kariuki, 2022). Competing beverages present a significant challenge in the research location. This is due to the recent tax reduction on soft drinks; carbonated drinks and mineral water are more appealing than tea (Anyona et al., 2023). Compliance with environmental standards and labor laws are two additional issues that must be addressed (Kamer, 2022). If these issues are not addressed, the sector may collapse, denying the owners their income while the government loses tax revenue and other benefits derived from the sector. Previous research (Wang and Liu, 2022; Onguso, 2022; Kiai & Wambui, 2018; Nguyen et al., 2023; Nzomo et al., 2023) on green innovation strategies and competitive advantage has found a link between these variables. However, these works were not conceptually informative and were presented in a variety of contexts around the world over time. As a result, the goal of this study was to fill in the gaps by determining the moderating role of environmental restrictions in the interaction between green innovation strategies and strategic advantages of tea processing companies in Kenya's Rift Valley region.

1.3 Purpose of the Study

To determine the effect of Green innovation strategies, environmental regulations on competitive advantage of tea processing firms In Rift Valley Region, Kenya.

1.4 Research Hypotheses

Ha_1: There is significant relationship between circular economy practices and competitive advantage of tea processing firms in Rift Valley Region, Kenya.

Ha_2: There is significant relationship between resource efficiency and competitive advantage of tea processing firms in Rift Valley Region, Kenya.

Ha_3: There is significant relationship between waste reductions and competitive advantage of tea processing firms in Rift Valley Region, Kenya.

Ha_4: There is a significant relationship between green business model innovation and competitive advantage of tea processing firms in Rift Valley Region, Kenya.

Ha_5: There is a significant relationship between environmental regulations and competitive advantage of tea processing firms in Rift Valley Region, Kenya.

Ha_6: There is a significant relationship between green innovation strategies and competitive advantage of tea processing firms in Rift Valley Region, Kenya.

Ha_7: Environmental regulation has a significant moderating effect on the relationship between green innovation strategies and competitive advantage of tea processing firms in Rift Valley Region, Kenya.

H_{a07a} Environmental regulations has no significant moderating effect on the relationship between circular economy practices and competitive advantage of tea processing firms in Rift Valley Region, Kenya.

H_{a07b} Environmental regulations has no significant moderating effect on the relationship between Resource efficiency and competitive advantage of tea processing firms in Rift Valley Region, Kenya.

H_{a07c} Environmental regulations has no significant moderating effect on the relationship between waste reduction and competitive advantage of tea processing firms in Rift Valley Region, Kenya.

H_{a07d} Environmental regulations has no significant moderating effect on the relationship between green business model innovation and the competitive advantage of tea processing firms in Rift Valley Region, Kenya.

2.0 Literature Review

The section provides the theoretical review, empirical review and conceptual framework.

2.1 Theoretical Framework

Main theory for this study was Resource-based view (RBV) theory developed by Barney (1991). This theory posits that firms can achieve strategic advantage by appropriating their unique assets and aptitudes. The theory presupposes that all organizational resources should be immobile and heterogeneous. The heterogeneous assumption suggests that the aptitudes and competencies of one business should differ from those of another (Nyaribo & Kariuki, 2022). Its further states that when all organizations have the same quantity and nature of assets, then different strategies were not deployed by each business (German & Liwanag, 2023). Immobile assumption avers that the assets cannot transfer across businesses in the short-term because the businesses are incapable of emulating and implementing similar measures as those of their rivals them in the marketplace (Suhaily & Anasthashia, 2020). The theory explains how a firm can use its internal sources to achieve lasting strategic advantage (Kraaijenbrink *et al*., 2010). The theory states that that a firms' strategic advantage is drawn from a firms' ability to assemble and exploit an appropriate combination of assets (Chen, 2018). According to Zailani *et al*. (2021), the RBV theory, innovation is essential for firms to succeed. Those firms that have the capability to innovate have the highest potential to become a springboard of strategic advantage since innovations are knowledge-based and causally ambiguous among others and therefore more akin to be idiosyncratic to the firm with the capabilities (Barney, 1991). In the tea processing context, green innovation resources and competences could include: access to renewable energy sources, water conservation technologies, pollution control technologies, knowledge of sustainable agricultural practices and expertise in green product design and marketing. Tea processing firms have firm specific resources that can be an uphill task to imitate and therefore becomes an embedded, valuable, and a basis for strategic advantage in the long-term.

2.2 Empirical Review

The literature review covers various aspects of the relationship between green innovation strategies, environmental regulations, and competitive advantage across different sectors and

geographical contexts. Research on circular economy practices (CEPs) has consistently shown that these practices contribute to a firm's strategic advantage by improving sustainability and competitive positioning. For example, studies by Zheng and Sobhani (2022) in China demonstrated that CEPs enhance firms' green competitive edge, although gaps remain, such as the need for more research on product reuse within these practices. Similarly, in Kenya, Nzomo et al. (2023) found that CEPs are a strong antecedent of strategic advantage among ISO 14001 accredited manufacturers, though their study lacked a clear justification for the sampling techniques used, which this research aims to address. Resource efficiency has also been shown to play a crucial role in enhancing competitive advantage, particularly in sectors like manufacturing and tea processing. For instance, Maziriri and Maramura's (2022) research in South Africa highlighted the positive impact of resource efficiency on long-term strategic advantage and business performance. However, their study was geographically limited, prompting the need for similar research in other contexts, such as Kenya's tea industry. Similarly, Xie et al. (2022) in China found that resource efficiency significantly enhances competitive edge, but their study did not consider production cost reduction, a gap that the current research aims to fill.

Waste reduction is another critical area of study, particularly in industries facing high production costs, like the tea sector in Kenya. Kiai and Wambui's (2018) study on KTDA tea handlers in Meru and Kirinyaga counties found that waste reduction measures significantly reduced operating expenses and enhanced competitive advantage. However, their research did not consider energy conservation, an aspect that this study incorporates to provide a more comprehensive understanding of waste reduction strategies. Walker et al.'s (2021) research in Iran also supports the link between waste reduction and competitive advantage, but their use of a descriptive survey design leaves room for more robust methodologies, such as the explanatory design used in the current study. Green business model innovation is increasingly recognized as a driver of competitive advantage, especially in sectors focused on sustainability. Kneipp et al. (2022) found that dynamic capabilities are crucial for sustaining green business model innovation in Brazil's logistics sector, which in turn enhances long-term competitiveness. However, the study did not address process improvement, a gap that the current research fills by exploring its role in the tea industry in Kenya. Similarly, Nguyen et al. (2023) in Vietnam confirmed the positive impact of green business model innovation on competitiveness but highlighted the need for more research in different geographical contexts.

Environmental regulations have been shown to significantly influence competitive advantage by shaping the green innovation strategies that firms adopt. In the UK, Dechezleprêtre and Sato (2017) found that environmental regulations enhanced the competitiveness of manufacturers, but their study did not consider organic certification, a critical factor in industries like tea processing. Stavropoulos et al. (2018) in China also found that environmental regulations promote industrial competitiveness, but their research was geographically limited, highlighting the need for studies in other regions, such as Kenya's Rift Valley. Further, the interplay between green innovation strategies, environmental regulations, and competitive advantage is a key area of interest. Research by Domazlicky and Weber (2018) suggests that environmental regulations not only influence the adoption of green innovation strategies but also enhance a firm's competitive edge. This is supported by findings from Stavropoulos et al. (2018) in China, which showed that compliance with environmental standards boosts competitiveness.

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Journal of Strategic Management
Volume 8||Issue 3 ||Page 34-49||August||2024|
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2.3 Conceptual Framework

A conceptual framework is a diagram that is used to illustrate the anticipated relationship of the investigated variables (Mishra & Alok, 2022). Conceptual framework design comprises of selection of the suitable study questions, definition of process variables, namely dependent, independent, mediating and moderating variables and it also helps to determine the cause-effect interplay of studied variables. The conceptual outline of this investigation is as provided in Figure 1.

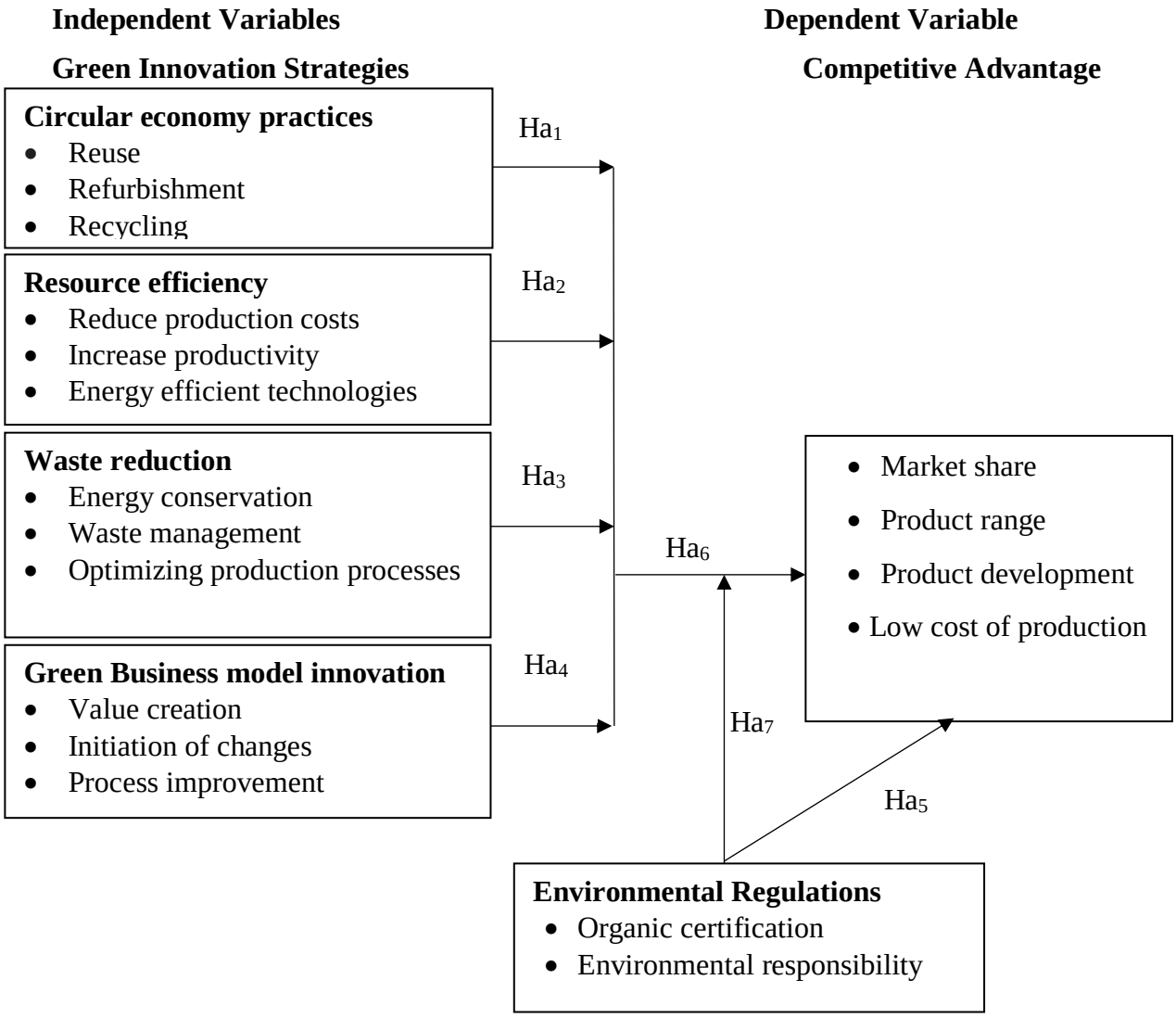

Figure 1: Conceptual framework

Source: Adopted from Austoos and Cerqueti (2018); Onguso (2022); Ford and Verreynne (2021) and modified by Reseacher (2024)

3.0 Research Design and Methodology

The study employed an explanatory research design to explore the relationships between variables, specifically focusing on the interactions between green innovation strategies, environmental regulations, and competitive advantage among tea processing firms in Kenya.

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Volume 8||Issue 3 ||Page 34-49||August||2024|
Email: info@stratfordjournals.org ISSN: 2616-8472

The target population consisted of 59 private tea-processing firms, with a sample size of 51 firms and 204 managers determined using Yamane's formula. A multistage sampling technique was used to ensure representative sampling, followed by the use of a structured questionnaire and document analysis for data collection. The research instrument was validated through expert opinions and literature review, and reliability was confirmed with a Cronbach's alpha of 0.776. Data analysis involved descriptive and inferential statistics, including Pearson correlation and regression models, to test the study's hypotheses. Assumptions of linearity, normality, multicollinearity, autocorrelation, and homoscedasticity were tested and upheld, ensuring the robustness of the results.

4.0 Findings and Discussion

This chapter presents the data analysis, results, and discussions for the study on green innovation strategies, environmental standards, and competitiveness of tea processing firms in Kenya's Rift Valley Region. Out of 204 distributed questionnaires, 139 were returned, resulting in a response rate of 68.2%. The demographic data revealed that 55% of respondents were male and 45% female, showing near-equal gender representation. Regarding education, 29.5% held certificates, 28.1% diplomas, 23.7% undergraduate degrees, and 18.7% had graduate-level education. In terms of work experience, 23% had less than one year, 28.1% had 1-3 years, 26.6% had 4-6 years, 13.7% had 7-9 years, and 8.6% had over 10 years of experience. The management positions held by respondents were primarily field service coordinators (28.8%), followed by field unit managers (25.9%), production managers (25.2%), and factory accountants (20.1%).

4.1 Correlation Analysis

For the purpose of determining the direction and degree of the connection between the variables under investigation, a Pearson correlation analysis was carried out. When the Pearcon Correlation Coefficient is -1.00, it implies that there is a perfect negative correlation, and when it is +1.00, it shows that there is a perfect positive correlation. Given that the number is 0.00, it may be concluded that there is no correlation between the two variables concerned (Orodho, 2003).

Table 1: Correlation Analysis

Variable	Competitive Advantage	Circular Economy Practices	Resource Efficiency	Environmental regulations	Waste Reduction	GBM Innovation
Competitive Advantage	1.000					
Circular Economy Practices	.728**	1.000				
	0.000					
Resource Efficiency	.663**	.712**	1.000			
	0.000					
Environmental regulations	.641**	.555**	.486**	1.000		
	0.000	0.000				
Waste Reduction	.676**	.622**	.510**	.564**	1.000	
	0.000	0.000				
GBM Innovation	.633**	.586**	.508**	.493**	.514**	1.000
	0.000	0.000	0.000			

https://doi.org/10.53819/81018102t3101

H_{01}: There is no significant relationship between Circular economy practices and competitive advantage of Tea Processing Firms in Rift Valley Region, Kenya.

The study sought to test the above Hypothesis $H_{01.}$ The results on Table 1 above show that there was a strong significant positive relationship between Circular economy practices and competitive advantage ($r=0.728^{**}$, $p<0.01$). Therefore, the null hypothesis H_{01} that states that "There is no significant relationship between Circular economy practices and competitive advantage of Tea Processing Firms in Rift Valley Region, Kenya" was rejected. This means that circular economy practices influence a firm's competitive advantage.

H_{02}: There is no significant relationship between Resource efficiency and competitive advantage of Tea Processing Firms in Rift Valley Region, Kenya.

The study further sought to test Hypothesis H_{02} above. The findings of Table 1 above revealed that there was a strong positive relationship between resource efficiency and Competitive advantage ($r=0.\ 663^{**}$, $p<0.01$). Thus, the null hypothesis H_{02} that states that "there is no significant relationship between Resource efficiency and competitive advantage of Tea Processing Firms in Rift Valley Region, Kenya" was rejected. This means that resource efficiency is positively and strongly correlated with competitive advantage. This implies that when a firm improves on its resource efficiency it achieves a competitive advantage.

H_{03}: There is no significant relationship between Waste reduction and competitive advantage of Tea Processing Firms in Rift Valley Region, Kenya.

The study also sought to test hypothesis $H_{03,}$ to find out if there was no significant relationship between waste reduction and competitive advantage. The results in Table 1 above established that there was a strong and positive relationship between waste reduction and competitive advantage $r=0.\ 641^{**}$, $p<0.01$). Therefore, the null hypothesis H_{03} which states that "there is no significant relationship between Waste reduction and competitive advantage of Tea Processing Firms in Rift Valley Region, Keny" was rejected. This means that waste reduction is positively and strongly correlated with competitive advantage. This suggests that when a firm reduces wastage, it gains a strong competitive advantage.

H_{04}: There is no significant relationship between Green business model innovations between competitive advantages of Tea Processing Firms in Rift Valley Region, Kenya.

In addition, the study sought to test hypothesis H_{04} which states that there is no significant relationship between green business innovations and competitive advantage. The study found out that green business model innovations had a strong positive relationship between green business model innovations and competitive advantage ($r=0.\ 676^{**}$, $p<0.01$). Therefore, the null hypothesis H_{04} that states that "there is no significant relationship between Green business model innovations between competitive advantages of Tea Processing Firms in Rift Valley Region, Kenya was rejected". This means that Green business model innovations are strongly correlated with competitive advantage. This suggest that when organizations adopt green business model innovations it will the firm improve its competitive advantage.

H_{05}: There is a significant relationship between environmental regulations and competitive advantage of tea processing firms in Rift Valley Region, Kenya. The results indicate a strong positive relationship between environmental regulations and competitive advantage ($r=0.641^{**}$, $p<0.01$). Therefore, Ha5 is supported. This implies that compliance with environmental regulations is positively and strongly correlated with competitive advantage, suggesting that firms adhering to environmental regulations gain a competitive edge.

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Journal of Strategic Management
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4.2 Regression Analysis Results

H_{01}: There is no significant relationship between Green innovation strategies and competitive advantage of Tea Processing Firms in Rift Valley Region, Kenya.

The study performed multiple regression analysis to test H_{01} which states that there is no significant relationship between Green innovation strategies and competitive advantage of Tea Processing Firms in Rift Valley Region, Kenya. Table 2 below summarizing the findings.

Table 2: Regression Model Summary

R	R Square	Adjusted R	Std. Error of the Estimate
.821[a]	.674	.664	.49310

Table 2 above shows that there is a very strong positive relationship between green innovation strategies and competitive advantage (R=.821). Therefore, the null hypothesis H_{06} that states that there "is no significant relationship between Green innovation strategies and competitive advantage of Tea Processing Firms in Rift Valley Region, Kenya" is rejected. This implies that when a firm engages in combine circular economy practices; resource efficiency; waste reduction; and green business model innovations the competitive advantage improves. The study further confirmed R^2=.674. This means that 67.4% of variation in competitive advantage of a firm is a result of the firm's green innovation strategies the other 32.6% is a result of other factors that were not part of this study. In other words, the R square value implies that circular economy practices, resource efficiency, Waste reduction, green business model innovation, and environmental regulations account for 67.4% of the variation in competitive advantage of tea processing firms in Rift Valley region.

Table 3: Results of Model Fitness

	Sum of	df	Mean Square	F	Sig.
Regression	67.322	4	16.830	69.219	.000b
Residual	32.582	134	.243		
Total	99.903	138			

A fitness test was performed on the model using the data shown in Table 3. The results of the research indicated that the model used in the study was suitable for the investigation (F=69.219; p = 0.000< 0.05). The fact that the multiple regression models are a good fit for the data indicates that the variables that were selected, as well as the circular economy practices, resource efficiency, waste reduction, green business model innovation, and environmental regulations, all play a role in the competitive advantage that tea processing companies in the Rift Valley region have.

https://doi.org/10.53819/81018102t3101

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Table 4: Regression Analysis Coefficient

	Unstandardized		Standardized	t	Sig.
	B	Std.	Beta		
(Constant)	.090	.224	.285		.402
Circular economy practices	.298	.083	.216	.285	3.602
Resource efficiency	.225	.074	.233	.216	3.024
Waste reduction	.234	.064	.257	.233	3.677
Green business model innovation	.246	.064	.285	.257	3.824

Table 3 presents the regression coefficient results. From the above table the results for circular economy practices and competitive advantage were (β_1=.298, p=.000), since p<.05 then it was significant. This means that for any unit change in Circular economy practices the competitive advantage changes by .298. Further, the study findings on resource efficiency and competitive advantage were found to be significant (β_2=.225, p=.003<0.05). This means that for any unit change in resource efficiency the completive advantages increase by .225. Furthermore, the outcomes of the research demonstrated that the correlation between the decrease of waste and the competitive advantage was both positive and statistically significant (β3=.234, p=.000<.05). This indicates that the competitive advantage is increased by.234 for every unit change in the amount of waste that is minimized. In conclusion, the results of the research demonstrated that there is a positive and statistically significant association between green business model innovation and competitive advantage (β4=.246, p=0.000<.05). It can be deduced from this that the competitive advantage grows by a factor of.246 whenever there is a change of any kind in the green business model innovation. As a consequence, the findings of the complete regression reveal that there is a positive and substantial influence of green business model innovation, resource efficiency, waste reduction, and circular economy practices on competitive advantage.

The resultant equation becomes:

$Y=0.\ 090+0.298X_1+0.225X_2+0.234X_3+0.246X_4$……Equation 4.1

Where:

Y represents competitive advantage which is the independent variable,

X_1 Circular economy practices

X_2 Resource efficiency

X_3 Waste reduction

X_4 Green business model innovation

4.3 Hierarchical Moderated Regression Analysis

H_{07}: Environmental regulation has a significant moderating effect on the relationship between green innovation strategies and competitive advantage of Tea Processing Firms in Rift Valley Region, Kenya.

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The objective of the investigation was to determine whether environmental regulations influenced the correlation between competitive advantage and green innovation strategies. The outcomes are shown in Table 5.

Table 5: Multiple Regression Model Summary Results

					Change Statistics				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**R Square Change**	**F Change**	**df1**	**df2**	**Sig. F Change**
1	.821[a]	.674	.664	.49310	.674	69.219	4	134	.000
2	.833[b]	.694	.682	.47946	.020	8.732	1	133	.004
3	.839[c]	.705	.691	.47287	.011	4.734	1	132	.031
4	.850[d]	.723	.708	.45989	.018	8.558	1	131	.004
5	.855[e]	.731	.715	.45455	.008	4.091	1	130	.045
6	.861[f]	.741	.723	.44781	.010	4.943	1	129	.028

Source: Field data (2024)

Table 5 shows the proportion of variation in the dependent variable explained by the model, as measured by R2. The independent variables' explanatory power was 0.674, with a statistically significant R2 value ($p<0.001$). This means that the four independent variables (circular economy practices, resource efficiency, waste reduction, and green business model innovation) explained 67.4% of the variation in competitive advantage. Table 5 also includes the results of the R2 modification. R2 changed significantly from model 1 to model 2 by 0.020 ($p < 0.05$). According to the findings, incorporating environmental regulations into the model could increase the model's predictive potential in predicting competitive advantage by 2.0 percent. Model 3 showed a statistically significant change in R2 of 0.011 ($p<0.05$). As a result, environmental regulations have statistically moderated the competitive advantage of circular economy practices. Model 4 showed a statistically significant R2 change of 0.018 ($p<0.05$) compared to model 3. This suggested that environmental regulations mitigated the impact of circular economy practices and resource efficiency on competitive advantage by 1.8%. The difference in R2 between models 4 and 5 was 0.008 ($p < 0.001$). As a result, environmental regulations mitigate the impact of circular economy practices, resource efficiency, and waste reduction on competitive advantages by 0.8%. The difference in R2 between models 5 and 6 was 0.010 ($p < 0.05$). This showed that environmental regulations reduce the competitive advantage of circular economy practices, resource efficiency, waste reduction, and green business model innovation by 1.0%. As a result, the study rejects the null hypothesis H07, which states that environmental regulations have no significant effect on the relationship between green innovation practices and competitive advantage. This suggests that while implementing green innovation practices can improve an organization's competitive advantage, adhering to environmental regulations can provide an even greater competitive advantage. exiting.

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Table 6: Test Results for Goodness of Fit

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	67.322	4	16.830	69.219	.000[b]
	Residual	32.582	134	.243		
	Total	99.903	138			
2	Regression	69.329	5	13.866	60.317	.000[c]
	Residual	30.574	133	.230		
	Total	99.903	138			
3	Regression	70.387	6	11.731	52.464	.000[d]
	Residual	29.516	132	.224		
	Total	99.903	138			
4	Regression	72.197	7	10.314	48.767	.000[e]
	Residual	27.706	131	.211		
	Total	99.903	138			
5	Regression	73.043	8	9.130	44.189	.000[f]
	Residual	26.861	130	.207		
	Total	99.903	138			
6	Regression	74.034	9	8.226	41.020	.000[g]
	Residual	25.869	129	.201		
	Total	99.903	138			

The significance of the fitted regression model was determined using the F test in Table 6. Model 1 F statistic was 69.219, indicating that independent variables predicted dependent variables ($F=69.219$; $p<0.05$). Based on the data, the research suggests that the model is appropriate for testing multiple hierarchical regression. The regression analysis revealed that implementing circular economy practices, resource efficiency, waste reduction, and green business model innovation increased competitive advantage by aligning with the organization's goals and objectives. The Model 2 F-test resulted in a value of 60.317, indicating that the model maintained a strong fit even with moderation ($F=60.317$; $p<0.05$). Statistically, environmental regulations reduce the impact of circular economy activities on competitive advantage. The F-test for model 3 returned an F-value of 52.464, indicating that, after accounting for environmental constraints, it had a strong ability to forecast competitive advantage. Furthermore, the overall model was statistically significant (P-value < 0.05), and the predictors of competitive advantage were deemed effective.

The Model 4 F-test returned an F-value of 48.767, indicating that when environmental constraints on circular economy practices and resource efficiency were moderated separately, they were found to be strong predictors of competitive advantage. Additionally, the model was statistically significant with a p-value < 0.05. Model 5's F-test resulted in an F-value of 44.189, indicating that environmental regulations moderate circular economy practices, resource efficiency, and waste reduction, which is a strong predictor of competitive advantage. The overall model was statistically significant (P-value < 0.05), and significant predictors of

competitive advantage were identified. The Model 6 F-test resulted in an F-value of 41.020, indicating that the overall model was statistically significant (P-value 0.05) after controlling for circular economy practices, resource efficiency, green business model innovation, and waste reduction. Furthermore, environmental regulations were found to be a significant predictor of competitive advantage.

5.0 Conclusions of the Study

The objective of this study was to identify the factors that give tea processing companies in Kenya's Rift Valley Region an advantage in the market, as well as how these factors relate to the innovative methods they employ. The study concluded that Circular Economy Practices have a strong and positive relationship with competitive advantage for tea companies. Tea products are particularly reusable, resulting in cost savings and a stronger competitive position. Equipment refurbishment and production material recycling were also identified as key contributors to competitiveness. The study also found a positive and significant link between resource efficiency and competitive advantage. Respondents specifically reported that productivity improvements and the use of energy-efficient technologies have increased resource efficiency and reduced production costs, resulting in an industry-leading cost advantage. According to the study, waste reduction has a positive and strong correlation with competitive advantages. In terms of waste reduction, the findings revealed that practices such as energy conservation and optimised production processes significantly reduced waste levels, thereby increasing firms' competitiveness. The majority agreed that effective waste management contributed significantly to this advantage. Furthermore, the study found a strong and positive relationship between green business model innovation and competitive advantage. In terms of Green Business Model Innovation, the study discovered that creating value by exceeding customer expectations, cultivating strong customer relationships, and initiating production process changes boosted firms' competitiveness. These innovations enhanced the company's brand and overall manufacturing process. According to the study, environmental regulations weaken the link between green innovation methods and competitive advantages. Lastly, environmental regulation has a positive and strong correlation with competitive advantage. The study concludes that obtaining and maintaining organic certifications, despite the high costs, ensured environmental responsibility and strengthened the firms' competitive position by meeting customer expectations for sustainable products.

6.0 Recommendations of the Study

To further strengthen circular economy practices, tea processing firms should standardize equipment refurbishment procedures to ensure consistency and reliability across all equipment. While recycling practices are in place, firms should invest in advanced recycling technologies and establish more efficient recycling processes. Additionally, improving transparency about these practices through public documentation and communication can enhance the firm's market appeal and reinforce its commitment to sustainability.

In resource efficiency and cost leadership, there is a need for regular audits of energy-efficient technologies to ensure they meet current standards. Firms should also focus on continuous optimization of production processes by adopting advanced resource management techniques. Expanding training programs on resource efficiency for employees can help maintain high standards and drive further improvements.

Waste reduction and energy conservation efforts are effective, there is room for improvement. Firms should invest in advanced waste reduction technologies and refine production processes to minimize waste generation. Also, they should practice setting ambitious energy-saving

targets and promoting a culture of sustainability through regular waste management reviews and employee engagement can drive further progress.

To enhance green business model innovation, firms should establish structured frameworks to foster continuous innovation and support the development of new green initiatives. Strengthening change management practices and expanding customer relationship management efforts through feedback systems and loyalty programs can further drive value creation and improve competitiveness.

Firms should explore cost-effective certification solutions and streamline the certification process to reduce administrative burdens. Increasing communication about environmental efforts and developing best practices for regulatory compliance can also help reinforce the firm's commitment to sustainability and enhance its competitive advantage.

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