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Innovation as a Driver of Growth in the Context of Circular Economy and Green Management

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Abstract

The circular economy represents a transformative shift away from the linear production and consumption patterns that have prevailed since the Industrial Revolution. This concept emerged in response to the realization that natural resources are finite and that waste generation carries significant environmental and economic costs—assumptions often overlooked by the linear economic model. Instead, the circular economy advocates for reducing dependency on natural resources while fostering a self-sustaining economic system through a closed-loop approach. The circular economy is rooted in the principles of sustainable development, focusing on redesigning the procurement processes for goods and services within the economy. In contrast, green management emphasizes integrating environmental considerations throughout the entire business lifecycle, from sourcing raw materials to post-sale activities, ensuring sustainability at every stage. Businesses of all sizes must adopt an environmentally conscious approach to create meaningful ecological impacts. This study examines how circular economy and green management practices influence a firm's growth performance through the lens of innovation. The analysis reveals that innovation significantly enhances a firm's growth performance, whereas the impact of green management is comparatively limited. Interestingly, the circular economy was found to have neither a positive nor a negative effect on the firm's growth performance.

Keywords: Circular Economy, Green Management, Innovation

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1. INTRODUCTION

The concept of a circular economy has gained significant prominence in recent years as the world faces the alarming reality of an impending inability to meet the basic needs of future generations (Wijkman & Skanberg, 2015; Qasim & Su, 2022; Iqbal & Noor, 2023). While the circular economy is often viewed as a macro-level initiative, its success depends on a collective effort—from international agreements to the contributions of individuals as the smallest participants (Geissler et al., 2018; Iqbal, 2018; Kilyachkov & Chaldaeva, 2021). Although widely adopted and promoted by multinational corporations and developed nations (Su et al., 2013; Khan, 2018; Khan & Rehman, 2021), the circular economy remains less prevalent in developing and underdeveloped countries (Ciraig, 2015; Ali & Afzal, 2019). Notably, China took a pioneering step toward implementing a circular economy in 2008, setting an example for European nations (Pesce et al., 2020). However, challenges such as transformation costs and resistance to change have hindered broader adoption. Green management, on the other hand, originates from the principles of sustainable development (Haden et al., 2009; Ismail & Saeed, 2019; Labeeque & Sanaullah, 2019). It emphasizes that businesses of all sizes—whether small, medium, or large—should incorporate environmental protection and sustainability into every stage of their operations, from initial production planning to post-sale services (Babiak & Trendafilova, 2011; Konnov, 2020; Fatima & Zaman, 2020). Although concepts like zero waste, green production, and green marketing are gaining traction, along with increasing demand for recyclable packaging and products made from waste, their impact on economic growth continues to be overlooked (Preston & Lehne, 2017; Khan & Ullah, 2020). The anticipated costs and the daunting challenges of change often hinder the adoption of practices such as the circular economy and green management. Nevertheless, the economic potential of such practices is evident; for instance, the United States exported recyclable plastic worth $495 million to China in a single year (Geng et al., 2013). Developing economies, with their significant recyclable waste potential (Diaz, 2017; Saijo, 2022; Russo, 2022) and their inclination toward innovation despite resistance to change (Aubert, 2005; Das, 2022; Qasim, 2022), highlight the missed opportunities. The failure to implement circular economy practices represents a financial loss not only for the global economy but also for national economies and individual enterprises.

This study seeks to assess the direction and magnitude of the impact that circular economy and green management practices have on the growth performance of enterprises. Although theoretical models for material cycles have existed for many years (Desrochers, 2002), their significance has grown as they are increasingly linked to concepts such as sustainable growth and sustainable development. These models have gained further traction through their alignment with emerging ideas like sustainable production, sustainable consumption, and the sharing economy (Murray et al., 2017; Lakatos et al., 2018; Fidelis et al., 2019; Audi, 2024; Wang & Li, 2024). Extensive research has been conducted on the

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applicability and enhancement of circular economy practices, particularly through the German, Japanese, and Chinese models (Nelles, 2016; Ogunmakinde, 2017; Schiller, 2017). Additionally, studies have explored the new business opportunities it creates (Horbach, 2015), the potential for developing new sectors and entrepreneurship initiatives, and its contributions to economic growth (Heshmati, 2015; Zamfir, 2017; Radas, 2023; Nur & Kumar, 2023; Rossi, 2023; El-Sahli, 2023; Modibbo & Saidu, 2023). Recent research has also examined growth opportunities in the use of plastics and other raw materials, particularly in the construction industry (Hahladakis et al., 2020; Baars et al., 2020; Martinez et al., 2020; Ibrahim & Simian, 2023; Chaudhary & Ahmad, 2023). Our study focuses specifically on the manufacturing sector, investigating how these practices influence growth performance within this industry.

Industry 4.0 (I4.0), a rapidly emerging concept, has been recognized as a critical enabler of the circular economy, prompting research into its integration with circular practices (Souza Jabbour et al., 2018; Nascimento et al., 2018; Rosa et al., 2020). The foundation of I4.0 lies in communication and information technologies (Stock & Seliger, 2016), with its digital infrastructure facilitating key circular economy processes, such as transforming waste into raw materials and optimizing production flows (Rajput & Singh, 2019). In this context, I4.0 is viewed not as an optional tool but as a necessity for transitioning production systems to align with circular economy principles (Jabbour et al., 2020). Tseng et al. (2018) referred to the synergy between I4.0 and the circular economy as "industrial symbiosis." Studies on their application in the Chinese model and their impact on sustainable development goals reveal a direct and positive effect (Dastas et al., 2020; Piscitelli et al., 2020; Zhou et al., 2020; Ibrahim & Simian, 2023; Chaudhary & Ahmad, 2023). Smart technologies, central to I4.0, play a pivotal role in measuring circular efficiency, collecting and monitoring data, and ensuring that resources and waste remain within the production cycle (Blunck & Werthmann, 2017; Rossi et al., 2020). Additionally, the Internet of Things (IoT) has emerged as a key component within the circular economy framework. In I4.0 systems, IoT is often applied individually, yet its potential to support the circular economy spans from large organizations to individuals, underscoring the interdependence of these concepts (Nobre & Tavares, 2017; Garcia-Munia et al., 2018). Research on IoT's role in facilitating the circular economy transition has provided valuable insights (Pagoropoulos et al., 2017; Ramadoss et al., 2018; Shahid & Ali, 2015). These advancements have introduced new terminologies into circular economy literature, such as the "smart circular economy" and "smart waste," reflecting the evolving integration of digital technologies with circular practices (Alcayaga et al., 2019; Zhang et al., 2019; Kristoffersen et al., 2020).

2. GREEN MANAGEMENT

The environmental damage caused by industrialization began to significantly impact ecosystems and living organisms by the 1980s. In response, several governments, including those of the United States, Sweden, and England, identified addressing environmental issues as a critical national priority and initiated various measures to mitigate these problems (Eren, 2013; Iqbal, 2018; Ahmad, 2018; Ali & Zulfiqar, 2018). This period also saw the emergence of numerous new concepts and a growing interest in green management, both in academic research and among business leaders (Yusoff et al., 2018; Willy, 2018; Kumar, 2018; Gorus & Groeneveld, 2018; Achy & Lakhnati, 2019; Audi & Ali, 2019). Green management is rooted in the principles of sustainable development, where the concept of sustainability becomes meaningful when aligned with environmental considerations, often referred to as "filling the gold with green." While development and environmental protection may appear contradictory at times, their integration is essential for achieving balanced progress (Erkan et al., 2013). Furthermore, sustainability initiatives that fail to simultaneously address social, economic, and ecological goals fall short of meeting genuine needs and delivering comprehensive solutions (Farrell & Hart, 1998).

Green management refers to integrating environmental responsibility into every aspect of organizational activities. It involves adopting and implementing new environmental management measures within the enterprise, fostering a culture where employees at all levels are encouraged to be environmentally conscious and collaborative (Haddadi, 2020; Ma et al., 2018; Khan & Hassan, 2019; Imran et al., 2019; Mahmood, 2019; Emodi, 2019; Adejumobi, 2019; Skhirtladze & Nurboja, 2019; Bakht, 2020; Ahmad & Ali, 2022; Ang, 2022; Pacillo, 2022). Effective green management requires a long-term, integrated approach that balances environmental protection and economic growth. Unlike traditional social responsibility initiatives, green management represents a strategic commitment to environmental sustainability. Henry Ford's statement, "Conditions between the industry and society change. We are now asked to serve humanitarian values in a wider scope and to accept that we have an obligation to the members of the public with whom we are not engaged in commercial activities," encapsulates this ethos (Shrivastava, 1995; Alfred & Adam, 2009; Akatay, 2008; Iqbal & Khan, 2020; Khan & Rehman, 2021; Chen, 2022; Audi et al., 2022).

The interplay between environmental conservation and development was first formally addressed at the United Nations Environment Conference in Stockholm in 1972. This landmark event remains one of the most significant global initiatives for discussing environmental challenges, formulating both short- and long-term strategies, and promoting action against environmental degradation. The conference declaration highlighted environmental damage as a shared concern for humanity and introduced the iconic slogan, "We have only one world." To sustain the momentum of international environmental cooperation, the United Nations established the United Nations Environment Programme (UNEP). UNEP's objectives include (1) fostering international environmental cooperation, (2) guiding global environmental policies, and (3) monitoring the implementation of environmental measures (Perrez, 2020; Sezer, 2007; Akatay & Aslan, 2008; Struthers, 2020; Arezki, 2022; Hussain & Khan, 2022; Mustapha, 2022; Ali, 2022). Following the Stockholm Conference, the World Conservation Strategy (WCS) was introduced in 1980. Developed by the International Union for Conservation of Nature and Natural Resources (IUCN), the World Wildlife Fund (WWF), and the United Nations Environment

Programme (UNEP), the WCS emphasized the need to integrate conservation and development efforts to achieve sustainability goals. This pivotal report brought the concept of "sustainable utilization" into the global political discourse, marking a significant milestone in environmental policymaking (Orr, 2002; Bozlağan, 2010).

In 1983, responding to the request of the UN Secretary-General, the Our Common Future report, commonly known as the Brundtland Report, was commissioned under the leadership of Norway's Prime Minister, Gro Harlem Brundtland. Prepared by the World Commission on Environment and Development (WCED), which included representatives from twenty countries, the report was presented to the United Nations General Assembly in 1987. It proposed a framework reconciling developmental goals with environmental sustainability. The report highlighted the critical importance of achieving harmony between environmental protection and economic development to address growing environmental challenges. It further emphasized that maintaining this balance was essential for ensuring the future well-being of humanity (Barkemeyer et al., 2014; Çankır et al., 2012; Niskala & Pretes, 1995). The United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992 and commonly referred to as the "Earth Summit," provided a more comprehensive definition of sustainable development. Attended by representatives from 178 states, the conference emphasized the need to reassess economic development and proposed measures for governments to address natural resource depletion and environmental pollution (Grubb et al., 2019; Wirth, 1994). Topics such as toxic waste, reliance on fossil fuels, emissions, water scarcity, air pollution, and their associated health impacts were highlighted (Emelie, 2020; Ali, 2022).

At the Rio+20 Conference in 2012, green management was identified as a vital instrument for achieving sustainable development and alleviating poverty. It was noted that green management contributes to stability in economic growth, social welfare, and employment while playing a key role in maintaining ecosystems without significant harm (Andonova & Hoffman, 2012; Benites et al., 2020; Ali, 2022). Studies on green management have revealed various reasons for its implementation, including its environmental benefits and the competitive advantage it offers enterprises. For successful implementation, businesses must assess and control their environmental impacts across all functions. They need to establish a robust environmental management system encompassing environmental policies, programs, and objectives. Furthermore, senior management must define clear environmental policies aimed at protecting and continuously improving the environment. Lastly, enterprises should recognize their social responsibility regarding environmental issues and ensure employees are environmentally aware through appropriate training (Ceyhan & Ada, 2015; Karabulut, 2003). According to Piper (2002), several principles guide enterprises in understanding and implementing green management effectively. These include having a clear vision and goals, adopting a holistic perspective, identifying core elements, ensuring an appropriate scope of activities, focusing on critical areas, maintaining transparency, fostering effective communication, encouraging high levels of participation, conducting continuous evaluations, and achieving institutionalization. Starik and Rands (1995) categorized the principles of green management into five key levels: ecological, individual, organizational, political-economic, and socio-cultural. Hart (2007) emphasized that green management and sustainability should be assessed differently at varying economic levels. For instance, the issues of environmental pollution, resource consumption, and poverty manifest uniquely in developed, developing, and underdeveloped nations, necessitating tailored strategies for each context.

Green human resource practices aim to cultivate "green employees" within organizations. This begins with incorporating environmental considerations into job descriptions during recruitment. Training and development activities are enhanced by integrating green management principles into performance appraisals, compensation, and reward systems. Employees are assigned green goals and responsibilities, and their contributions to environmental initiatives are recognized and rewarded. Additionally, they are encouraged to propose ideas for environmental improvements (Renwick et al., 2013; Hosain & Rahman, 2016; Saha et al., 2020; Abigail, 2023; Sossounov & Kolenikov, 2023; Muhammad, 2023; Ali & Mohsin, 2023). The rise in environmental concerns has also necessitated the adoption of green management throughout the supply chain. Increased ecological awareness has transformed supply demands, compelling enterprises to adopt new strategies to remain competitive. To achieve meaningful outcomes, environmental sensitivity must begin at the procurement stage. Among green management activities, supply chain management demands particular attention and control, as it involves external processes. Effective implementation requires a strong flow of information among all supply chain members to ensure alignment with environmental objectives (Hsu & Hu, 2008; Renwick et al., 2008; Wu et al., 2009; Liu et al., 2019; Jayabalan et al., 2020; Ackah, 2023; Sadashiv, 2023).

The green supply chain encompasses every stage of the production process, from the procurement of inputs to the packaging and sale of the final product. It emphasizes the minimal use of resources and the selection of raw materials that can either decompose rapidly in nature or re-enter the production cycle. Additionally, activities such as improvement, disassembly, testing, reuse, repair, re-manufacturing, and recycling—commonly referred to as reverse supply chain practices—should prioritize environmental benefits. Green initiatives like green purchasing, sustainable supply management, inter-enterprise environmental collaborations, and green supply chain integration are essential for enhancing supply chain cooperation (Bag et al., 2020; Yang et al., 2020; Yu & Huo, 2018; Ali et al., 2023). Green marketing is often perceived as a tool to promote environmentally friendly products. However, its scope is much broader, encompassing consumer goods, industrial products, and services (Polonsky, 1994). Despite being one of the most recognized aspects of green management, green marketing's tangible effects in the market are difficult to measure. This challenge arises from the multitude of factors influencing consumer decisions, making it hard to predict or observe outcomes (Ginsberg & Bloom, 2004; Shabbir et al., 2020; Ali et al., 2023). To successfully implement green marketing, two primary strategies are necessary. The first is ensuring that consumers' expectations for quality, performance, affordability, and convenience are met without compromising environmental sustainability. The second is fostering consumer demand for businesses

committed to environmental protection (Ottman, 2011; Umoh & Effiong, 2024; Iqbal & Nader, 2024). To achieve this, enterprises must operate transparently, clearly communicating their environmental goals and the benefits of their strategies (Singh et al., 2016). It is equally important for businesses to educate customers about their green initiatives and design marketing tools tailored to green practices (Nekmahmud & Farkas, 2020; Feng & Qi, 2024). Based on these principles, the traditional four P's of marketing—product, price, place, and promotion—have evolved into green-focused concepts. These include green design, green positioning, green pricing, green logistics, marketing waste reduction, green promotion, and green deals (Polonsky & Rosenberger, 2001; Xiong, 2024).

3. RESULTS

Correlation is a statistical concept that measures the direction and strength of the linear relationship between two random variables. It is one of the most commonly used methods for analyzing associations between variables and determining the direction of those associations. However, it is important to note that correlation primarily identifies linear relationships and may not effectively capture nonlinear correlations. Different types of correlation coefficients have been developed to suit various scenarios. It is also critical to understand that correlation does not imply causation. As a result, it is often used to explore relationships between multiple dependent and independent variables or between a single dependent and independent variable. The correlation coefficient quantifies both the strength and direction of the relationship, taking values between -1 and +1. A positive coefficient indicates a direct linear relationship, while a negative coefficient suggests an inverse linear relationship. A coefficient of zero signifies no linear relationship between the variables under study (Nakip, 2013). In the context of the study, the correlation analysis revealed a moderate positive relationship (0.485) between the perception of the circular economy factor and growth performance. This suggests that, excluding other factors, the perception of circular economy practices has a positive effect on enterprise growth performance. Employees believe that implementing circular economy practices contributes positively to the growth of their enterprises. Additionally, a low positive correlation (0.357) was observed between the limits of the circular economy and growth performance. This indicates that while the limits of the circular economy do have an effect on enterprise growth performance, the influence is relatively weak. The analysis revealed significant relationships between various aspects of green management and enterprise growth performance. The management activities within the green management approach, identified as a key factor in the study, showed a strong positive correlation with growth performance (0.648). This indicates that when managers actively adopt and implement green management practices, the growth performance of the enterprise improves significantly, particularly when other factors are excluded.

Similarly, the financial activities associated with green management demonstrated a strong correlation with growth performance (0.644). Enterprises that allocate budgets for green management practices and integrate these principles into their financial operations tend to experience increased growth performance.

The production activities within the green management framework exhibited a moderate positive correlation with growth performance. This finding suggests that environmentally conscious production practices—such as the careful selection of raw materials and other resources, and the management of waste to minimize environmental damage—contribute positively to enterprise growth. A lower correlation (0.434) was found between efficiency in green management practices and growth performance. Post-production activities, such as waste management and environmentally friendly packaging, were positively associated with growth performance, albeit to a smaller degree. The financial dimension of green management displayed a very weak correlation with growth performance (0.146). This was attributed to the inverse significance of the questions in this factor, as green management responsibilities are often seen as cost-intensive and not directly linked to immediate growth outcomes. Lastly, a strong correlation (0.603) was observed between the global environmental issues factor and growth performance. Enterprises that adopt proactive approaches to global challenges—such as population growth, global warming, climate change, biodiversity loss, resource depletion, and environmental pollution—experience notable improvements in their growth performance. This underscores the importance of aligning enterprise activities with global environmental priorities.

The analysis revealed a strong and mutual correlation (0.721) between the innovation orientation factor and enterprise growth performance. This indicates that adopting an innovative approach and leveraging innovation more effectively than competitors significantly enhances growth performance. Enterprises that prioritize innovation as a core strategy are better positioned to achieve sustained growth. In contrast, a low correlation (0.297) was observed between the factor of being content with existing innovations and growth performance. This result, which reflects a lack of drive for innovation and trailing competitors in adopting new advancements, was anticipated. Enterprises that do not actively pursue or implement innovations tend to experience limited growth, underscoring the importance of maintaining a proactive stance on innovation to remain competitive and drive performance.

The correlation matrix reveals several key relationships among the variables. There is a strong positive correlation between MAGM and FAGMA, indicating that these variables are closely linked and may share underlying factors or processes. Similarly, MAGM also shows a significant positive association with IO, suggesting that these two variables tend to increase together. Another noteworthy relationship is between GEI and FAGMA, which also exhibit a strong positive correlation, highlighting their interconnected nature. Moderate correlations are observed between PCE and LCE, as well as between PCE and PAGMA. This implies that while these variables are related, the strength of their association is not as pronounced as some of the stronger correlations. GEI and IO also show a substantial positive relationship, further emphasizing their interaction within the framework. In contrast, weaker relationships are evident for variables like BCEI and FDGM. Their correlations with other variables, while statistically significant in some cases, are relatively low, suggesting that they may play a less central role in the overall structure. For example, BCEI has weak associations with

PCE, LCE, and others, which could imply limited direct influence.

The variable GP exhibits moderate to strong positive correlations with IO, MAGM, and GEI, indicating its close connection with these factors. This suggests that growth potential may be influenced significantly by these variables, particularly IO, which shows one of the strongest associations. Overall, the matrix highlights both central variables with strong interconnections, such as MAGM, IO, and GEI, as well as peripheral variables like BCEI and FDGM, which appear less integral to the system. These insights provide a clearer understanding of the relationships within the dataset.

Table 1: Correlation Matrix

	PCE	LCE	MAGM	FAGMA	PAGMA	EGM	FEGM	GEI	IO	BCEI	GP
PCE	1										
LCE	.645**	1									
MAGM	0.675	.595**	1								
FAGMA	.583**	.526**	.847**	1							
PAGMA	.823**	.606**	.760**	.659**	1						
EGM	.437**	.346**	.515**	.518**	.512**	1					
FDGM	.242**	.459**	.317**	.335**	.270**	.176**	1				
GEI	.584**	.429**	.756**	.804**	.646**	.428**	.241**	1			
IO	.592**	.476**	.786**	.795**	.614**	.463**	.296**	.769**	1		
BCEI	.223**	.214**	.316**	.285**	.227**	.156**	.219	.264**	.272**	1	
GP	.485**	.357**	.648**	.644**	.510**	.434**	.146**	.603**	.721**	.297**	1

Regression analysis is a statistical method employed to evaluate the relationship between two or more variables. When the analysis involves a single independent variable, it is referred to as univariate regression analysis. In contrast, when multiple independent variables are analyzed simultaneously, it is termed multivariate regression analysis. This technique is valuable for identifying whether a relationship exists between variables and, if so, for quantifying the strength of that relationship. In the context of this study, regression analysis was applied to examine the relationships between variables of interest. The results of the analysis, highlighting the strength and direction of these correlations, are summarized in Table 2.

Table 2: Regression Model 1

Variables	Coefficients	T	P
PCE	.040	.634	.526
LCE	-.031	-.634	.527
MAGM	.121	1.559	.120
FAGMA	.100	1.329	.185
PAGMA	-.014	-.196	.844
EGM	.086	2.123	.034
FDGM	-.106	-2.759	.006
GEI	-.001	-.018	.986
IO	.511	8.179	.000
BCEI	.103	2.887	.004
R^2 = .553	F value= 50.757		

The regression model offers a detailed understanding of the relationships between the predictors and the dependent variable. With an R2R^2R2 value of 0.553, it indicates that approximately 55.3% of the variation in the dependent variable is explained by the predictors included in the model. The FFF-value of 50.757 further underscores the overall significance of the model, demonstrating that the predictors, collectively, have a meaningful impact on the dependent variable. Among the predictors, IO stands out as the most influential factor, with a standardized beta coefficient (β=0.511\beta = 0.511β=0.511) that is both substantial and highly significant (p<0.001p < 0.001p<0.001). This indicates a strong positive relationship, suggesting that increases in IO are consistently associated with increases in the dependent variable. BCEI also has a significant positive effect (β=0.103\beta = 0.103β=0.103, p=0.004p = 0.004p=0.004), indicating that while its influence is not as pronounced as IO, it still contributes meaningfully to the dependent variable. These results suggest that IO and BCEI are critical drivers within the model and may represent key areas of focus for influencing outcomes.

Conversely, FDGM exhibits a negative and significant relationship with the dependent variable (β=−0.106\beta = -0.106β=−0.106, p=0.006p = 0.006p=0.006). This suggests that as FDGM increases, the dependent variable tends to decrease, highlighting its potential as a negative predictor. EGM also demonstrates a statistically significant positive relationship (β=0.086\beta = 0.086β=0.086, p=0.034p = 0.034p=0.034), though its impact is more moderate compared to IO and BCEI. These findings collectively suggest that while IO and BCEI drive positive outcomes, FDGM may counteract these effects, and EGM contributes positively but to a lesser extent. In contrast, several variables do not show statistically significant contributions to the model. These include PCE (p=0.526p = 0.526p=0.526), LCE (p=0.527p = 0.527p=0.527),

MAGM (p=0.120p = 0.120p=0.120), FAGMA (p=0.185p = 0.185p=0.185), PAGMA (p=0.844p = 0.844p=0.844), and GEI (p=0.986p = 0.986p=0.986). Their high ppp-values indicate that these factors do not exert a meaningful influence on the dependent variable within the context of this analysis. While these variables may have theoretical or contextual relevance, their lack of statistical significance suggests they may not play a prominent role in this particular model or dataset.

The findings underline the importance of IO as the dominant predictor, supported by the notable influence of BCEI and EGM in a positive direction. At the same time, the negative impact of FDGM warrants attention, as it could offset some of the positive contributions of other variables. The insignificant predictors may reflect redundancy, measurement issues, or limited relevance in this specific analysis, suggesting that further investigation into their roles or alternative model specifications might be necessary. The model demonstrates strong explanatory power, driven by key predictors like IO and BCEI, while highlighting the need for cautious interpretation of less significant factors. These insights are crucial for prioritizing interventions or strategies focused on the most impactful predictors and understanding the dynamics of factors with weaker or negligible contributions. A multiple regression model was developed to analyze the effects of various factors—circular economy, green management, global environmental issues, and innovation—on the growth performance of enterprises. In this model, growth performance was the dependent variable, while all other factors served as independent variables. The circular economy was further divided into two sub-factors: the perception of the circular economy and the limits of the circular economy. Similarly, green management was segmented into five sub-factors: management activities, financial activities, production activities, efficiency in green management, and the financial dimension of green management. Innovation was categorized into two sub-factors: innovation orientation and being content with existing innovations. The global environmental issues factor was treated as a single main factor.

The regression analysis results, summarized in Table 26, identified four factors with a significant effect on growth performance, indicated by p-values less than 0.050. These factors were efficiency in green management, the financial dimension of green management, innovation orientation, and being content with existing innovations. Among these, innovation orientation emerged as particularly influential, with a p-value of 0.000, high t-value, and a substantial beta (β) coefficient. The beta threshold, typically 0.150 or above, was adjusted to a higher level due to the large number of factors analyzed, further highlighting the strong impact of innovation orientation. The model's coefficient of determination (R^2) was calculated at 0.553, indicating that 55.3% of the variance in enterprise growth performance was explained by the included factors. This is considered a robust level of explanatory power in the context of social sciences. To explore the mediating role of innovation orientation and its sub-dimensions, the mediating variable analysis framework of Baron and Kenny (1986) was applied. The analysis assessed how innovation orientation influenced growth performance as a mediating factor between the independent variables and the dependent variable. Regression analysis results excluding the intermediate variables—innovation orientation and being content with existing innovations—are provided in Table 3, offering a comparative perspective on the model's structure and outcomes.

Table 3: Regression Model 2

Variables	Coefficients	t	P
PCE	.122	1.774	.077
LCE	-.048	-.893	.373
MAGM	.313	3.851	.000
FAGMA	.236	2.953	.003
PAGMA	-.090	- 1.204	.229
EGM	.105	2.388	.017
FDGM	-.072	-1.728	.085
GEI	.157	2.417	.016
R^2 = .470	F Value=45.492		

The second regression model provides additional insights into the relationships between predictors and the dependent variable. The model explains 47.0% of the variance in the dependent variable, as indicated by an R2R^2R2 value of 0.470. This indicates a moderately strong explanatory power. The FFF-value of 45.492 suggests the model is statistically significant, meaning the predictors collectively have a meaningful impact on the dependent variable. Among the predictors, MAGM emerges as the most significant and influential factor, with a standardized beta coefficient (β=0.313\beta = 0.313β=0.313) and a highly significant p-value (p<0.001p < 0.001p<0.001). This suggests that MAGM is a key driver of the dependent variable, with its positive relationship indicating that increases in MAGM are strongly associated with increases in the dependent variable. Similarly, FAGMA also has a notable positive influence (β=0.236\beta = 0.236β=0.236, p=0.003p = 0.003p=0.003), underscoring its importance in contributing to the model. GEI demonstrates a statistically significant positive relationship (β=0.157\beta = 0.157β=0.157, p=0.016p = 0.016p=0.016), further adding to the predictive power of the model. Additionally, EGM shows a moderate positive effect (β=0.105\beta = 0.105β=0.105, p=0.017p = 0.017p=0.017), indicating its role as a meaningful contributor. These variables collectively point to their importance in explaining the dependent variable within the given framework.

On the other hand, PCE shows a marginally significant positive effect (β=0.122\beta = 0.122β=0.122, p=0.077p = 0.077p=0.077), suggesting a potential relationship that may become more pronounced with further analysis or larger sample sizes. FDGM exhibits a negative but marginally insignificant relationship (β=−0.072\beta = -0.072β=−0.072, p=0.085p = 0.085p=0.085), indicating it may have some negative influence, though not strong enough to achieve

statistical significance in this model. Other variables, such as LCE (p=0.373p = 0.373p=0.373) and PAGMA (p=0.229p = 0.229p=0.229), do not exhibit statistically significant effects, as their ppp-values exceed the conventional threshold of 0.05. This implies that these factors may not have a meaningful impact on the dependent variable within this model. The results highlight MAGM, FAGMA, GEI, and EGM as the most significant predictors, with MAGM standing out as the strongest positive driver. While PCE and FDGM show some potential for influence, their effects are less robust and would require further validation. The remaining variables, such as LCE and PAGMA, appear to have limited or negligible contributions. This model underscores the importance of focusing on the significant predictors for understanding the dependent variable while recognizing the limitations of factors with weaker or non-significant effects. A multiple regression model was developed to investigate the effects of the circular economy, green management, and global environmental issues on the growth performance of enterprises. The regression analysis revealed that four factors had direct and positive effects on growth performance. The first factor, efficiency in green management, demonstrated its influence in Regression Analysis 1. Additionally, three other factors—management activities within the green management approach, financial activities in the green management approach, and global environmental issues—were found to have direct effects when the intermediate variable, innovation, was excluded from the analysis. These factors did not show significance in the initial analysis but became influential when innovation was omitted. The results highlight that, in the absence of innovation as an intermediate variable, the implementation of green management practices and the sensitivity of enterprises to global environmental issues positively contribute to the growth performance of the firm. The coefficient of determination (R^2) for the model excluding the innovation factor was 0.470, indicating that 47% of the variability in enterprise growth performance was explained by the factors of management activities, financial activities, the financial dimension of green management, and global environmental issues. Lastly, the study examined the validity of the structural model, confirming the robustness of the relationships between the variables and the overall model framework. These findings underscore the significant role of green management and environmental responsiveness in driving enterprise growth.

4. DISCUSSIONS AND CONCLUSIONS

The study aims to evaluate the impact of the circular economy, green management practices, and global environmental issues on firm growth performance, mediated by innovation, and to assess the strength of this relationship. The circular economy and green management have emerged as critical concepts driven by the need to minimize humanity's ecological footprint on natural ecosystems. These approaches emphasize the necessity for a fundamental transformation in production systems and require collaboration across firms, industries, and nations. A key principle of the circular economy is the ability to repurpose waste. Specifically, when a product or group of products deemed waste by one enterprise serves as a resource for another, it not only reduces the consumption of natural resources but also prevents waste generation. This interconnected system highlights the potential of the circular economy to address environmental challenges while fostering sustainable growth. The study evaluated the perception of the circular economy, the applicability of green management practices, and sensitivity to global environmental issues in Turkey, with a focus on their impact on firm performance. In Turkey, research on the circular economy remains limited, despite its growing adoption worldwide. While enterprises face challenges in balancing competitive pressures with the need to address social responsibilities and adapt their working principles accordingly, these efforts can significantly enhance their appeal to consumers.

This consumer preference underscores the strategic importance of integrating sustainability practices into business operations, even amid competitive difficulties. It is important to highlight that both significant and non-significant correlations, as well as hypotheses without observed relationships, provide valuable insights to the scientific community. In this study, no positive or negative effect of the circular economy on firm growth performance was identified. Employees appeared unable to link circular economy practices with the firm's growth, and several potential reasons for this disconnect were identified. One key reason is the limited recognition of the circular economy in Turkey. The concept itself may not resonate with individuals due to a lack of understanding of its content and objectives. Insufficient knowledge about the circular economy and its implications likely contributed to the absence of an established relationship. The scarcity of academic research and practical applications further exacerbates this issue. Given its relatively recent emergence on the global stage, the circular economy remains underexplored, and its principles are not yet widely understood. Another issue is the inadequate communication and promotion of the circular economy’s goals and potential outcomes. While the circular economy holds promise as a solution for addressing environmental challenges and securing the future of natural life, its introduction and dissemination in Turkey have been insufficient. Enterprises, too, may fail to articulate the purpose of their circular economy activities, leaving employees unaware of how these initiatives align with organizational objectives. The lack of correlation between the limits of the circular economy and firm growth performance further reinforces concerns about the recognition and understanding of the concept. To address these gaps, enterprises must not only implement circular economy practices but also clearly communicate their objectives and the broader value of these initiatives to stakeholders. Another possible reason the circular economy could not be positively or negatively associated with the firm's growth performance is that the concept has predominantly been framed in terms of its environmental benefits. While the circular economy undoubtedly supports environmental sustainability and benefits future generations, it also offers significant economic advantages. These include contributions to both business and national economies, despite concerns about the initial implementation costs. The circular economy addresses a critical issue that impacts nearly all sectors—the depletion of natural resources.

A production system that relies on unsustainable raw material supplies cannot continue uninterrupted, underscoring the necessity of adopting circular practices. However, the economic potential of the circular economy, such as cost savings

from resource efficiency and new revenue opportunities, may not have been sufficiently communicated. This lack of emphasis on the economic benefits likely contributed to the inability to link the circular economy with growth performance. To foster a stronger association, businesses and policymakers must highlight not only the environmental value of the circular economy but also its role in ensuring long-term economic viability and resilience. Similarly, the absence of a positive or negative association between production activities within the green management approach and the firm's growth performance can be attributed to limited awareness of its broader contributions. For instance, its potential impact on the national economy and its ability to create new employment opportunities may not be widely understood. This lack of knowledge hampers the recognition of its full value. To address this, efforts should be made to enhance the understanding and visibility of the circular economy and green management practices. In addition to academic studies, accessible platforms such as social media and mainstream media should be utilized to disseminate information to a broader audience. These efforts should emphasize not only the environmental benefits, such as halting damage to ecosystems and conserving resources for future generations, but also the economic and social benefits, including contributions to development, job creation, and social welfare. Focusing exclusively on the environmental aspects of the circular economy provides an incomplete picture.

To maximize its impact and foster greater adoption, a comprehensive narrative highlighting its multifaceted benefits must be shared, ensuring that its significance is understood from environmental, economic, and social perspectives. The analysis revealed that both management activities and financial activities within the green management approach had a positive, albeit limited, impact on the growth performance of enterprises. However, the dominant influence of innovation on growth performance overshadowed the contributions of green management, making its effects appear negligible. This indicates that while green management practices contribute positively, they do not hold the same level of significance or impact as innovation. A key observation is that green management, as a concept, remains relatively unfamiliar or underutilized. Its potential benefits are often underestimated, particularly when compared to the well-recognized and impactful role of innovation in driving growth. This underappreciation of green management suggests the need for greater awareness and implementation of its principles. Enhanced understanding and adoption of green management could lead to more substantial contributions to growth performance, complementing the effects of innovation. The impact of enterprises' sensitivity to global environmental issues, such as global warming, environmental pollution, climate change, and rising energy consumption, on firm growth was similarly overshadowed by the dominant influence of innovation. While these sensitivities positively contributed to growth, their effects were limited. This could be attributed to the difficulty in perceiving the direct impact of such environmental sensitivities on growth performance, especially when compared to more tangible and immediately visible factors like innovation.

Additionally, the indirect nature of these environmental sensitivities on growth performance likely contributed to their diminished prominence in the analysis. While addressing global environmental issues is essential for long-term sustainability and resilience, the benefits may not manifest as immediately measurable outcomes, making their influence appear less significant in the context of short-term growth. This highlights the importance of viewing these efforts as part of a broader strategy for sustainable development, complementing more direct growth drivers like innovation. In this study, the functions of green management were found to have either no effect or a limited effect on growth performance, with the financial dimension of green management identified as having a direct and negative impact. This result reflects the financial responsibilities associated with transitioning to a green management approach, particularly in the initial phases. While green management offers limited positive effects, the financial burden it imposes is more immediately apparent. However, rather than directly attributing this burden to a reduction in growth performance, it would be more accurate to state that the financial strain of implementing green management indirectly impacts growth by constraining resources. It is also important to contextualize this finding within a broader framework. Innovation, which demonstrated the highest impact on growth performance in the study, also carries significant financial obligations. Yet, unlike green management, its effect on growth was overwhelmingly positive, suggesting that the perceived value and return on investment for innovation outweigh the financial costs. This contrast underscores the importance of how financial burdens are managed and perceived within the framework of organizational strategies.

Innovation, treated as an intermediate variable in this research, emerged as the most influential factor in driving growth performance, surpassing all other factors. It exerts a highly positive impact not only on enterprises but also on employees and society at large. In the increasingly competitive and challenging economic landscape, merely keeping pace with innovations is insufficient. Enterprises must actively embrace innovation as a core strategy to sustain their presence and competitiveness in the market. The findings of this study reaffirm the widely accepted belief that innovation is integral to strong and sustainable growth. Innovation provides the infrastructure necessary for robust growth performance, ensuring that businesses remain competitive and adaptable. Enterprises that merely follow trends or resist innovation will struggle to achieve meaningful growth, highlighting the indispensable role of innovation in contemporary business success. The emphasis that enterprises place on innovation is a critical factor in enhancing their growth performance. Enterprises must prioritize the change and adaptation required to fully harness the potential of innovation. Each step in the innovation process should be purposeful, with the primary goal often being to increase profitability.

To ensure this, the outcomes of implemented innovations must be closely monitored. Ideally, each new product or innovation should generate greater revenue than its predecessor. For innovation to truly contribute to growth performance, it must go beyond novelty and deliver tangible benefits. Innovations pursued merely for the sake of being different, without meaningful returns, fail to support growth. Instead, successful innovations should differentiate enterprises in the market and enhance their competitive standing. Based on the findings of this study, a practical recommendation can be made to managers: growth is not solely dependent on innovation but also on an organization’s readiness for change and

its ability to adapt to new conditions. Cultivating a culture of adaptability and openness to innovation provides enterprises with a strong foundation not only for implementing innovative practices but also for adopting circular economy principles and advancing green management initiatives. This adaptability lays the groundwork for integrating sustainable practices into organizational culture. For academicians, the study suggests valuable avenues for further research. One such area is examining the impact of the circular economy on employee performance and organizational culture. Given that the circular economy remains a relatively new concept, it offers rich potential for exploration and the development of new academic resources. Studies focusing on this concept could significantly contribute to its understanding and implementation, addressing existing gaps in knowledge and offering practical insights for businesses and policymakers.

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