Transformational Leadership and Employee Green Behavior in SMEs: The Mediating Roles of Green Business Strategy and Organizational Support and the Moderating Effect of Implementation Barriers

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ABSTRACT

Purpose: This study examines the role of transformational leadership in promoting employee green behavior (EGB) in small and medium-sized enterprises (SMEs), with particular emphasis on the underlying organizational mechanisms and contextual conditions. Specifically, it investigates the mediating roles of green business strategy (GBS) and organizational support (OS), as well as the moderating effect of barriers to green implementation (BF).

Design/methodology/approach: A quantitative research design was employed using survey data collected from 280 employees working in manufacturing SMEs in Hanoi and surrounding provinces in Vietnam. The proposed research model was tested using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4, following a two-stage approach involving measurement and structural model assessment. Bootstrapping with 5,000 resamples was used to evaluate the significance of the hypothesized relationships.

Findings: The results reveal that transformational leadership influences EGB primarily through indirect mechanisms. Among its dimensions, idealized influence and inspirational motivation significantly enhance GBS, whereas intellectual stimulation and individualized consideration do not show significant effects. GBS and OS both exert positive and significant effects on EGB, with GBS emerging as the strongest predictor. Mediation analysis confirms that GBS and OS serve as complementary pathways linking leadership to behavior. However, the moderating effect of BF is not supported, suggesting that perceived barriers do not significantly weaken the impact of GBS on EGB.

Practical implications: The findings highlight the importance of visionary leadership, strategic alignment, and organizational support systems in driving green transformation in SMEs. Managers are encouraged to develop clear sustainability strategies and invest in supportive infrastructures to translate leadership intent into employee action.

Originality/value: This study contributes to the literature by providing a multi-level and mechanism-based perspective on green transformation. It extends transformational leadership theory by identifying dimension-specific effects, introduces a dual mediation framework, and challenges the assumed role of barriers in shaping sustainability outcomes, particularly in emerging economy contexts.

Keywords: Transformational leadership; Green business strategy; Organizational support; Employee green behavior; SMEs; Sustainability; PLS-SEM

INTRODUCTION

In recent years, sustainability and environmental responsibility have become central concerns for organizations worldwide, particularly in the context of increasing regulatory pressure, stakeholder expectations, and climate

change challenges. Small and medium-sized enterprises (SMEs), which constitute the backbone of most economies, are increasingly required to adopt **green business practices** to remain competitive and compliant (OECD, 2021). However, despite their importance, SMEs often face significant challenges in implementing green strategies due to limited resources, capabilities, and institutional support.

In this context, **leadership** has been widely recognized as a critical driver of organizational change and transformation. Among various leadership styles, **transformational leadership (TL)** characterized by vision, inspiration, intellectual stimulation, and individualized consideration has been identified as particularly effective in fostering innovation and strategic change (Bass, 1985; Bass & Avolio, 1994; Avolio et al., 2009). Recent studies have extended this perspective to sustainability and digital transformation contexts, suggesting that transformational leaders play a pivotal role in aligning organizational goals with environmental and social objectives (Vial, 2019; Wu et al., 2026).

Despite these advances, existing research exhibits several important limitations. First, much of the literature assumes that all dimensions of transformational leadership contribute equally to organizational outcomes, without examining their **differential effects**. Second, prior studies often focus on direct relationships between leadership and performance outcomes, overlooking the **organizational mechanisms** through which leadership influences employee behavior. Third, although barriers to green implementation such as cost constraints, lack of expertise, and operational pressures are frequently highlighted in the literature, their **moderating role** remains underexplored and empirically inconsistent.

To address these gaps, this study adopts a multi-level perspective and proposes that the impact of transformational leadership on employee green behavior is **indirect and mechanism-driven**. Specifically, the study introduces **green business strategy (GBS)** as a strategic-level mediator and **organizational support (OS)** as an operational-level mediator. In addition, it examines the moderating role of **barriers to green implementation (BF)** in shaping the relationship between strategy and behavior.

Drawing on **Transformational Leadership Theory** (Bass, 1985), **Dynamic Capabilities Theory** (Teece, 2007), and insights from sustainability and organizational behavior literature, this study develops and empirically tests a comprehensive research model using data collected from manufacturing SMEs in Vietnam. The context of Vietnam is particularly relevant, as SMEs in emerging economies face dual pressures of economic growth and environmental sustainability, making them an ideal setting to examine green transformation processes.

The study aims to answer the following research questions:

RQ1: How do different dimensions of transformational leadership influence green business strategy in SMEs?

RQ2: Through which mechanisms (GBS and OS) does transformational leadership affect employee green behavior?

RQ3: Does the presence of barriers to green implementation moderate the relationship between green business strategy and employee green behavior?

By addressing these questions, this study makes several important contributions. First, it advances transformational leadership theory by identifying **dimension-specific effects** in the context of sustainability. Second, it contributes to the literature on green transformation by uncovering **dual mediation mechanisms** that link leadership to employee behavior. Third, it provides new insights into the role of **barriers**, challenging the assumption that constraints necessarily weaken transformation outcomes.

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature and develops the research hypotheses. Section 3 describes the research methodology and data collection process. Section 4 presents the empirical results, followed by a detailed discussion in Section 5. Finally, Section 6 concludes the study and outlines theoretical and managerial implications.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Theoretical foundations

This study is grounded in three complementary theoretical perspectives, including **Transformational Leadership Theory**, **Dynamic Capabilities Theory**, and **Sociotechnical Systems Theory**, to explain how leadership influences green transformation in organizations.

First, **Transformational Leadership Theory** (Bass, 1985; Bass & Avolio, 1994) posits that leaders can inspire followers to transcend self-interest and achieve higher levels of performance through four key dimensions: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. This leadership style is particularly relevant in contexts requiring organizational change, innovation, and strategic transformation (Avolio et al., 2009).

Second, **Dynamic Capabilities Theory** (Teece, 2007) provides a strategic lens to understand how organizations adapt to environmental changes. It emphasizes the firm's ability to **sense opportunities, seize them through strategic decisions, and reconfigure resources accordingly**. In the context of green transformation, leadership plays a critical role in enabling these capabilities, particularly through the development of strategic orientations such as green business strategy.

Third, **Sociotechnical Systems Theory** highlights the importance of aligning social elements (e.g., leadership, culture) with technical elements (e.g., systems, processes, resources) to achieve effective organizational outcomes (Trist, 1981). This perspective supports the inclusion of **organizational support (OS)** as a key mechanism through which leadership translates into employee behavior.

By integrating these theories, this study adopts a **multi-level framework**, in which leadership operates at the strategic and organizational levels to influence individual-level outcomes.

Transformational leadership and green business strategy

Transformational leadership has been widely recognized as a critical driver of organizational innovation and strategic change. In sustainability contexts, leaders are expected to shape environmental values, promote long-term thinking, and align organizational goals with ecological priorities (Vial, 2019).

Among the four dimensions of TL, **idealized influence (IF)** reflects leaders' ethical standards and role-modeling behavior, which can foster trust and commitment to sustainability goals. **Inspirational motivation (IM)** enables leaders to articulate a compelling vision for green transformation, motivating employees to align their efforts with organizational objectives.

In contrast, **intellectual stimulation (IS)** encourages creativity and problem-solving, while **individualized consideration (IC)** focuses on personal development and support. Although these dimensions are generally associated with innovation, their role in shaping formal strategic orientations such as GBS remains less clear, particularly in SMEs.

Empirical studies suggest that leadership influences sustainability outcomes primarily through **strategic alignment mechanisms**, rather than direct behavioral control (Westerman et al., 2014; Kane et al., 2015). However, the differential effects of TL dimensions on green strategy formation have not been sufficiently examined, representing an important research gap.

Green business strategy and employee green behavior

Green business strategy (GBS) refers to the integration of environmental objectives into organizational strategy, including goal setting, resource allocation, and operational decision-making (Porter & van der Linde, 1995). It serves as a bridge between high-level leadership vision and day-to-day organizational practices.

From a theoretical perspective, GBS can be understood as a manifestation of dynamic capabilities, enabling organizations to respond to environmental challenges while maintaining competitiveness. By embedding sustainability into strategic processes, GBS creates a structured framework that guides employee behavior.

Employee green behavior (EGB), on the other hand, represents the actual implementation of environmental practices at the individual level, such as resource conservation, waste reduction, and proactive environmental initiatives (Ones & Dilchert, 2012).

Prior research suggests that strategy plays a critical role in shaping behavior by providing **clear expectations, incentives, and accountability mechanisms**. Without strategic alignment, individual efforts may remain fragmented and ineffective.

Organizational support as an enabling mechanism

While strategy provides direction, **organizational support (OS)** ensures execution. OS includes the availability of resources, training, policies, and reward systems that facilitate the implementation of green initiatives.

According to Sociotechnical Systems Theory, effective organizational performance requires the alignment of social and technical subsystems. Leadership alone is insufficient if employees lack the necessary tools and support to act.

Empirical studies have shown that organizational support enhances employee engagement, innovation, and pro-environmental behavior (Scott & Bruce, 1994; Schneider et al., 2013). In the context of green transformation, OS serves as a **critical operational mechanism**, translating strategic intent into actionable practices.

Barriers to green implementation

Despite the growing emphasis on sustainability, organizations - particularly SMEs - face numerous **barriers to green implementation (BF)**, including high initial costs, lack of expertise, and operational constraints (OECD, 2021).

Traditional perspectives suggest that such barriers may weaken the effectiveness of sustainability initiatives by limiting resource availability and reducing organizational commitment. However, recent studies indicate that strong leadership and strategic alignment may **mitigate or even neutralize the impact of these barriers**.

Nevertheless, the empirical evidence on the moderating role of barriers remains inconsistent. Some studies report significant negative effects, while others find limited or no influence. This inconsistency highlights the need for further investigation, particularly in emerging economy contexts.

Research framework

Based on the above theoretical foundations and literature review, this study proposes a conceptual model in which:

- Transformational leadership influences green transformation through its four dimensions (IF, IM, IS, IC)
- Green business strategy (GBS) and organizational support (OS) serve as **dual mediating mechanisms**
- Barriers to green implementation (BF) act as a **moderating variable** in the relationship between GBS and EGB

This framework reflects a **multi-level and mechanism-based approach**, integrating leadership, strategy, organizational systems, and employee behavior into a unified model.

The next section develops the research hypotheses based on this framework.

Research Model and Hypothesis Development

Research model

Building on the theoretical foundations and literature review presented in Section 2, this study proposes a **multi-level research model** to explain how transformational leadership (TL) influences employee green behavior (EGB) in SMEs.

Specifically, TL is conceptualized as a higher-order construct consisting of four dimensions: **idealized influence (IF), inspirational motivation (IM), intellectual stimulation (IS), and individualized consideration (IC)**. These dimensions are hypothesized to influence **green business strategy (GBS)**, which in turn affects EGB.

In addition, **organizational support (OS)** is introduced as a parallel mediating mechanism, reflecting the operational conditions that enable employees to engage in green behavior. Finally, **barriers to green implementation (BF)** are modeled as a moderator in the relationship between GBS and EGB.

Figure 1. Model reseach

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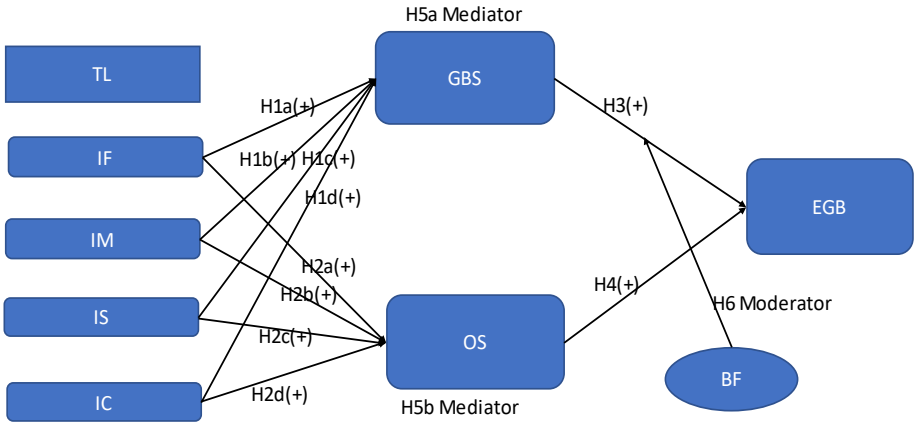


Source: Compiled by author

This model reflects a **mechanism-based perspective**, in which leadership does not directly drive behavior but operates through strategic and organizational pathways.

Transformational leadership and green business strategy

Transformational leadership plays a crucial role in shaping organizational direction and strategic priorities. According to Transformational Leadership Theory (Bass, 1985), leaders influence followers by articulating a compelling vision, fostering trust, and encouraging commitment to organizational goals.

In the context of sustainability, **idealized influence (IF)** reflects leaders' ethical commitment and role-modeling behavior, which can enhance organizational alignment with environmental values. Leaders who demonstrate consistency between words and actions are more likely to foster trust and legitimacy, thereby facilitating the adoption of green strategies.

Similarly, **inspirational motivation (IM)** enables leaders to communicate a clear and compelling sustainability vision, motivating employees to embrace long-term environmental goals. This aligns with the argument that vision-driven leadership is critical for strategic transformation (Avolio et al., 2009).

In contrast, **intellectual stimulation (IS)** encourages employees to challenge existing practices and explore innovative solutions. While this may foster creativity, its direct impact on formal strategy development may be limited in SMEs, where decision-making is often centralized.

Finally, **individualized consideration (IC)** focuses on personal development and support. Although important for employee engagement, its influence on strategic-level outcomes such as GBS may be indirect.Based on these arguments, the following hypotheses are proposed:

H1a: Idealized influence (IF) has a positive effect on green business strategy (GBS).

H1b: Inspirational motivation (IM) has a positive effect on green business strategy (GBS).

H1c: Intellectual stimulation (IS) has a positive effect on green business strategy (GBS).

H1d: Individualized consideration (IC) has a positive effect on green business strategy (GBS).

Green business strategy and employee green behavior

Green business strategy (GBS) represents the integration of environmental objectives into organizational decision-making processes, including planning, investment, and performance evaluation (Porter & van der Linde, 1995).

From a Dynamic Capabilities perspective (Teece, 2007), GBS enables firms to respond proactively to environmental challenges by aligning resources and capabilities with sustainability goals. This strategic alignment provides a clear framework that guides employee actions and behaviors.

Employee green behavior (EGB) reflects the extent to which employees engage in environmentally responsible practices in the workplace, such as conserving resources, reducing waste, and promoting sustainability initiatives (Ones & Dilchert, 2012).

When organizations adopt a strong GBS, employees are more likely to perceive environmental goals as legitimate and important, leading to higher levels of engagement in green behavior.

Therefore, the following hypothesis is proposed:

H2: Green business strategy (GBS) has a positive effect on employee green behavior (EGB).

Organizational support and employee green behavior

While strategy provides direction, its successful implementation depends on the availability of organizational resources and support mechanisms. **Organizational support (OS)** includes training, financial resources, policies, and reward systems that facilitate the execution of green initiatives.

According to Sociotechnical Systems Theory, organizational outcomes are determined by the alignment between social and technical systems. Without adequate support, employees may lack the capacity to translate strategic intentions into actual behavior.

Empirical studies have consistently shown that organizational support enhances employee engagement and pro-environmental behavior (Schneider et al., 2013; Scott & Bruce, 1994).

Thus, the following hypothesis is proposed:

H3: Organizational support (OS) has a positive effect on employee green behavior (EGB).

Barriers to green implementation and employee green behavior

Despite increasing awareness of sustainability, organizations often face significant **barriers to green implementation (BF)**, including financial constraints, lack of expertise, and operational pressures (OECD, 2021).

These barriers may limit the ability of organizations to implement green initiatives and reduce employee motivation to engage in environmentally responsible behavior. From a resource-based perspective, constraints can weaken the effectiveness of organizational strategies.

Therefore, the following hypothesis is proposed:

H4: Barriers to green implementation (BF) have a negative effect on employee green behavior (EGB).

Mediating role of green business strategy

Transformational leadership is unlikely to influence employee behavior directly; instead, its effects are often transmitted through organizational mechanisms (Avolio et al., 2009).

GBS serves as a key mediating mechanism by translating leadership vision into formal strategies and policies. Leaders who effectively articulate sustainability goals are more likely to influence employee behavior through strategic alignment.

Thus, the following hypotheses are proposed:

H5a: Green business strategy (GBS) mediates the relationship between transformational leadership dimensions (IF, IM, IS, IC) and employee green behavior (EGB).

Mediating role of organizational support

In addition to strategy, leadership also influences behavior by shaping organizational conditions. OS reflects the extent to which employees are provided with the necessary resources and support to engage in green practices.

By fostering a supportive environment, leaders can enhance employees' ability and motivation to implement sustainability initiatives.

Therefore, the following hypothesis is proposed:

H5b: Organizational support (OS) mediates the relationship between transformational leadership dimensions (IF, IM, IS, IC) and employee green behavior (EGB).

Moderating role of barriers to green implementation

Finally, this study examines whether **barriers to green implementation (BF)** moderate the relationship between GBS and EGB.

From a contingency perspective, the effectiveness of organizational strategies may depend on contextual factors. High levels of barriers may weaken the impact of GBS by limiting resource availability and increasing implementation difficulties.

Conversely, when barriers are low, the relationship between GBS and EGB is expected to be stronger.

Thus, the following hypothesis is proposed:

H6: Barriers to green implementation (BF) negatively moderate the relationship between green business strategy (GBS) and employee green behavior (EGB), such that the relationship is weaker when barriers are high.

Summary of hypotheses

Table 1. Summary of hypotheses

Hypothesis	Relationship
H1a–H1d	TL dimensions → GBS
H2	GBS → EGB
H3	OS → EGB
H4	BF → EGB
H5a	TL → GBS → EGB
H5b	TL → OS → EGB
H6	BF moderates GBS → EGB

RESEARCH METHODOLOGY

Research design

This study adopts a **quantitative research design** to empirically test the proposed research model and hypotheses. Given the complex relationships among multiple latent constructs and the presence of mediation and moderation effects, the study employs **Partial Least Squares Structural Equation Modeling (PLS-SEM)** as the primary analytical approach.

PLS-SEM is particularly suitable for this research for several reasons. First, it is appropriate for **prediction-oriented and theory development research**. Second, it can effectively handle **complex models with multiple constructs and indicators**, including higher-order constructs. Third, PLS-SEM is robust to violations of normality and suitable for moderate sample sizes (Hair et al., 2022).

The analysis was conducted using **SmartPLS 4**, following a two-stage approach:

(1) assessment of the measurement model and

(2) evaluation of the structural model.

Measurement model

Construct operationalization

All constructs in this study were measured using **multi-item reflective scales**, adapted from established literature and adjusted to fit the context of green transformation in SMEs.

- **Transformational Leadership (TL)** was conceptualized as a higher-order construct comprising four dimensions: Idealized Influence (IF), Inspirational Motivation (IM), Intellectual Stimulation (IS), Individualized Consideration (IC) The measurement items were adapted from the **Multifactor Leadership Questionnaire (MLQ)** (Bass & Avolio, 1994; Avolio et al., 2009).

- **Green Business Strategy (GBS)** was measured using eight items capturing the integration of environmental goals into strategic planning, investment decisions, and performance monitoring, adapted from prior sustainability and strategic management studies (Porter & van der Linde, 1995; Vial, 2019).

- **Organizational Support (OS)** was measured with four items reflecting resource allocation, training, policies, and incentive systems supporting green initiatives (Scott & Bruce, 1994; Schneider et al., 2013).

- **Employee Green Behavior (EGB)** was operationalized using four items measuring environmentally responsible behaviors in the workplace (Ones & Dilchert, 2012).

- **Barriers to Green Implementation (BF)** were measured using four items capturing perceived constraints such as cost, lack of expertise, and operational pressures (OECD, 2021).

All measurement items were assessed using a **five-point Likert scale** ranging from 1 ("strongly disagree") to 5 ("strongly agree").

Measurement assessment criteria

The measurement model was evaluated based on established PLS-SEM criteria (Hair et al., 2022): **Indicator reliability:** outer loadings > 0.70; **Internal consistency reliability:** Cronbach's Alpha and Composite Reliability (CR) > 0.70; **Convergent validity:** Average Variance Extracted (AVE) > 0.50; **Discriminant validity:** HTMT < 0.85. These criteria ensure that the constructs are measured accurately and reliably before testing the structural relationships.

Data collection and sampling

Target population

The target population of this study consists of **employees working in manufacturing SMEs** located in Hanoi and surrounding provinces (e.g., Bac Ninh, Hung Yen, Phu Tho, and Ninh Binh).

SMEs were selected as the research context due to their significant contribution to the economy and their increasing exposure to sustainability pressures.

Sampling method

A **non-probability convenience sampling method** was employed due to practical constraints in accessing respondents. Although this approach may limit generalizability, it is widely used in organizational research in emerging economies and is considered acceptable for exploratory and theory-testing studies.

To improve data quality, the study applied strict screening criteria: Respondents must be currently employed in SMEs; Minimum tenure of three months; Active involvement in organizational activities

Data collection procedure

Data were collected using a structured questionnaire distributed both online and offline. A total of **312 responses** were initially collected.

After data screening, including: Removal of incomplete responses; Elimination of cases failing screening questions; Checking for straight-lining and outliers. A final sample of **280 valid responses** was retained for analysis.

Sample size adequacy

The sample size satisfies the **"10-times rule"** and exceeds the minimum requirements for PLS-SEM (Hair et al., 2022). Additionally, the sample size is sufficient to ensure adequate statistical power for detecting medium effect sizes.

Data analysis procedure

The data analysis followed a **two-step PLS-SEM procedure**:

Step 1: Measurement model evaluation: Assessment of reliability (Cronbach's Alpha, CR); Evaluation of convergent validity (AVE, outer loadings); Assessment of discriminant validity (HTMT criterion)

Step 2: Structural model evaluation: Collinearity assessment (VIF); Estimation of path coefficients (β); Hypothesis testing using bootstrapping (5,000 resamples); Evaluation of explanatory power (R^2); Effect size analysis (f^2); Mediation analysis (indirect effects); Moderation analysis (interaction term: BF × GBS)

Bootstrapping was used to assess the significance of path coefficients, with **t-values and p-values** used to determine hypothesis support.

Common method bias (CMB)

Given that data were collected using a single survey instrument, potential **common method bias (CMB)** was assessed.

Following recommendations in the literature, the study applied:

- Procedural remedies (e.g., anonymity, item randomization)
- Statistical assessment using full collinearity VIF**,** with values below 3.3 indicating no serious CMB concerns (Kock, 2015)

The results confirmed that CMB does not pose a significant threat to the validity of the findings.

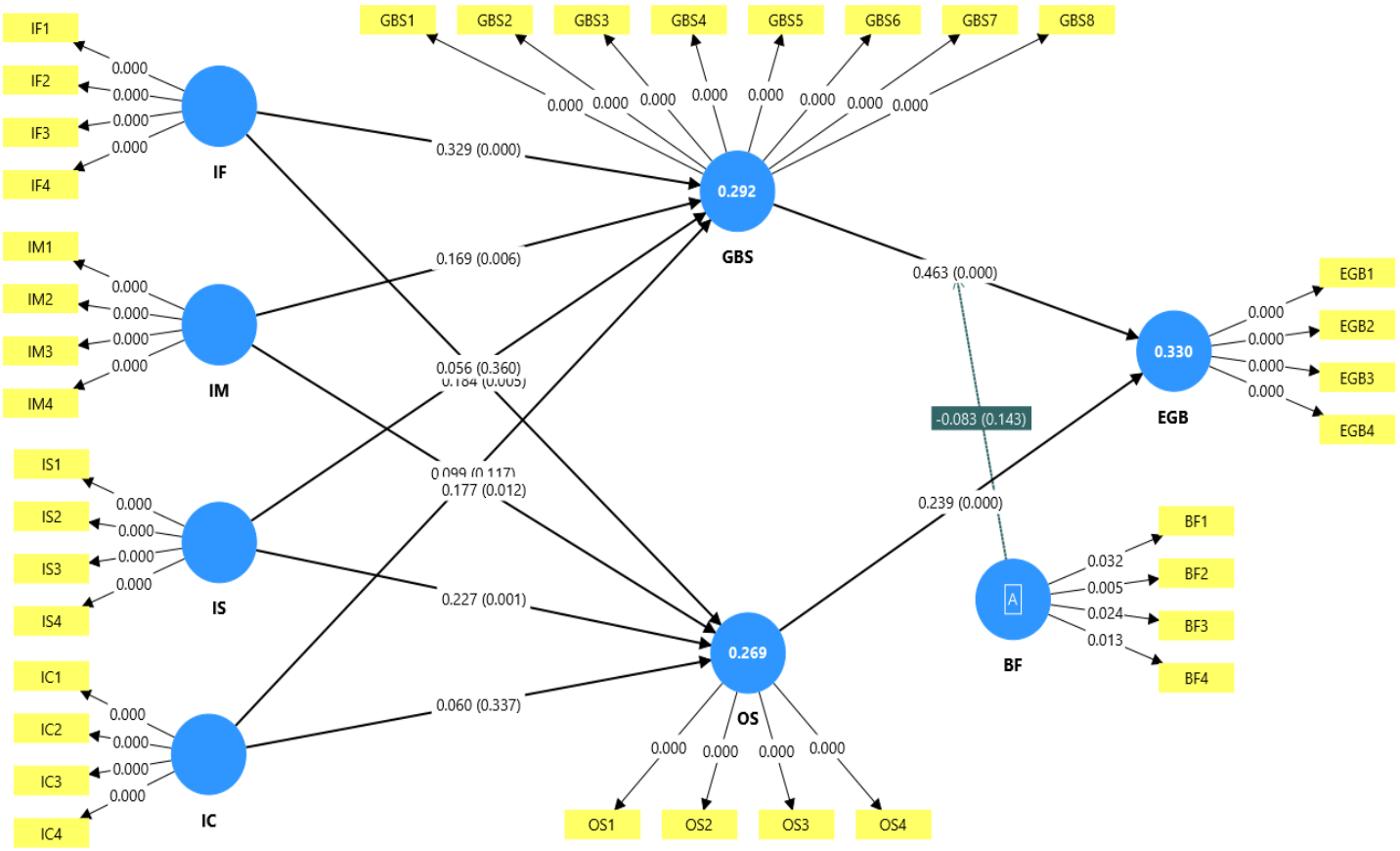
Ethical considerations

The study adhered to standard ethical guidelines in academic research. Participation was voluntary, and respondents were informed about the purpose of the study. All responses were collected anonymously and used solely for research purposes.

RESULTS

To examine the proposed research model, the structural model was assessed using PLS-SEM with bootstrapping (5,000 resamples). The results of the structural model are presented in Figure 2.

Figure 2. Structural model results: SEM-PLS BOOTSTRAPPING 5000 RESAMPLES



Source: Compiled by author

Table 1. Descriptive statistics of study structures (N = 280)

Structure code	Structure	Number of observed variables	N	Mean	SD average	Smallest mean of the observed variable	The largest mean of the observed variable
IF	Ideal influence	4	280	3.580	1.184	3.461	3.707
IM	Inspire	4	280	3.529	1.215	3.400	3.668
IS	Stimulate the intellect	4	280	3.533	1.232	3.496	3.554
IC	Personal interest	4	280	3.593	1.190	3.518	3.682
GBS	Green business strategy	8	280	3.348	1.261	3.271	3.457
OS	Organizational support	4	280	3.228	1.240	3.121	3.364
EGB	Green behavior in the workplace	4	280	3.321	1.258	3.236	3.418
BF	Barriers to green deployment	4	280	2.954	1.288	2.893	2.989

Source: Compiled by author

Table 1 shows that the research variables have average values mostly above the median of 3.0, reflecting respondents' tendency to positively evaluate transformational leadership, green strategies, organizational support, and green behavior. Specifically,**IC (Mean = 3.593)** and **IF (Mean = 3.580)**These are the two highest-rated components, indicating that employees quite clearly recognize the leadership's role in providing guidance and personal support. Conversely,**BF (Mean = 2.954)**At a lower level, it implies that green barriers exist but are not yet perceived as too seriously.

Table 2. Reliability and convergent validity of the scale

Structure	Cronbach's Alpha	rho_A	Composite Reliability (CR)	AVE
BF	0.775	1.273	0.816	0.534
EGB	0.802	0.802	0.871	0.627
GBS	0.889	0.892	0.912	0.563
IC	0.797	0.818	0.866	0.619
IF	0.814	0.815	0.878	0.642
IM	0.808	0.810	0.874	0.635
IS	0.777	0.780	0.856	0.599
OS	0.768	0.778	0.851	0.588

Source: Compiled by author

Comment: All scales achieve good internal reliability when **Cronbach's Alpha > 0.70** and **CR > 0.70** At the same time, the entire structure has **AVE > 0.50**, confirming that the convergence value meets the requirements. Overall, the measurement model is of good quality and can be used for structural model validation. Case**BF's rho_A > 1** Technical considerations are necessary, but since Alpha, CR, and AVE all meet the thresholds, the BF scale may still be acceptable in the context of PLS-SEM.

Table 3. Multicollinearity test and model fit.

3a. Collinearity statistics (Inner VIF)

Relationship	VIF
BF → EGB	1.033
BF × GBS → EGB	1.005
GBS → EGB	1.105
IC → GBS	1.494
IC → OS	1.494
IF → GBS	1.734
IF → OS	1.734
IM → GBS	1.691
IM → OS	1.691
IS → GBS	1.526
IS → OS	1.526
OS → EGB	1.080

Source: Compiled by author

Comment: Total value VIF values are all less than 3. This shows that the model does not suffer from serious multicollinearity issues. Therefore, the path estimates in the structural model can be reliably interpreted.

3b. Model fit

Index	Saturated model	Estimated model
SRMR	0.053	0.056
d_ULS	1.875	2.085
d_G	0.603	0.610
Chi-square	985.308	994.463
NFI	0.775	0.773

Source: Compiled by author

Comment: Index **SRMR = 0.056 < 0.08** This indicates a good fit for the model. The NFI of approximately 0.77 is not particularly high by CB-SEM standards, but in PLS-SEM, SRMR is generally preferred for assessing overall fit. Overall, the model achieves an acceptable fit for further interpretation of structural results.

Table 4. Coefficient of determination and size of influence

4a. R^2 and R^2 correction

Dependent variable	R^2	R^2 correction
EGB	0.330	0.321
GBS	0.292	0.282
OS	0.269	0.258

Source: Compiled by author

Comment: The model can be explained. **33.0% variation of EGB, 29.2% of GBS** and **26.9% of OS** This is a low to medium level of explanation, but it remains relevant in organizational behavior and green governance studies, where individual behavior is often influenced by many factors outside the model.

4b. f^2 of principal relations

Relationship	**f^2**	**Level of impact**
BF → EGB	0.001	Very small
GBS → EGB	0.289	Medium to large
OS → EGB	0.079	Small
BF × GBS → EGB	0.010	Very small
IC → GBS	0.009	Very small
IF → GBS	0.088	Small
IM → GBS	0.024	Small
IS → GBS	0.003	Very small

Source: Compiled by author

Comment: The results show **GBS → EGB** This relationship has the strongest influence in the model. Meanwhile, BF and the interaction variable BF × GBS have very small influence sizes, consistent with the bootstrap results which are not statistically significant.

Table 5. Testing the direct hypotheses H1a–H4

Hypothesis	**Relationship**	**β**	**STDEV**	**t-value**	**p-value**	**Conclude**
H1a	IF → GBS	0.329	0.060	5.483	0.000	Accept
H1b	IM → GBS	0.169	0.062	2.729	0.006	Accept
H1c	IS → GBS	0.056	0.061	0.915	0.360	Reject
H1d	IC → GBS	0.099	0.063	1.566	0.117	Reject
H2	GBS → EGB	0.463	0.046	10.051	0.000	Accept
H3	OS → EGB	0.239	0.054	4.458	0.000	Accept
H4	BF → EGB	0.024	0.080	0.296	0.767	Reject

Source: Compiled by author

Comment: Within the direct hypothesis group, IF and IM have a positive and significant impact on GBS, while IS and IC do not show a statistically significant effect. At the same time, GBS has the strongest impact on EGB ($\beta = 0.463$), confirming the central role of green business strategy in transforming organizational orientation into green employee behavior. OS also has a positive impact on EGB, while BF has no direct or significant effect, so H4 is rejected.

Table 6. Testing the mediating hypothesis H5a: The mediating role of GBS

Hypothesis	**Indirect effects**	**indirect β**	**STDEV**	**t-value**	**p-value**	**Conclude**
H5a1	IF → GBS → EGB	0.152	0.032	4.728	0.000	Accept
H5a2	IM → GBS → EGB	0.078	0.031	2.512	0.012	Accept
H5a3	IS → GBS → EGB	0.026	0.029	0.902	0.367	Reject
H5a4	IC → GBS → EGB	0.046	0.029	1.574	0.115	Reject

Source: Compiled by author

Comment: GBS plays a significant mediating role in the word relationship **IF** and **IM** arrive **EGB**, but no intermediary is meaningful for **IS** and **IC** This shows that, in the context of SME manufacturing businesses, green strategies are formed more strongly from the exemplary and inspiring role of leaders rather than from intellectual stimulation or personal concern.

Table 7. Testing the mediating hypothesis H5b: The mediating role of OS

Hypothesis	Indirect effects	indirect β	STDEV	t-value	p-value	Conclude
H5b1	IF → OS → EGB	0.044	0.020	2.231	0.026	Accept
H5b2	IM → OS → EGB	0.042	0.020	2.134	0.033	Accept
H5b3	IS → OS → EGB	0.054	0.021	2.641	0.008	Accept
H5b4	IC → OS → EGB	0.014	0.015	0.937	0.349	Reject

Source: Compiled by author

Comment: OS is a more effective intermediary mechanism than GBS in some aspects of transition leadership. Specifically, **IF, IM, and IS** They all have a positive indirect impact on EGB through the OS, while **IC** This is meaningless. This result implies that to promote green behavior, leaders need not only to develop strategies but also to translate them into specific organizational resources, processes, and support.

Table 8. H6 Regulation Test: The Regulatory Role of BF in the GBS → EGB Relationship

Hypothesis	Regulatory relationship	β	STDEV	t-value	p-value	Conclude
H6	BF × GBS → EGB	-0.083	0.056	1.465	0.143	Reject

Source: Compiled by author

Comment: Interaction variable **BF × GBS → EGB** The coefficient is negative but not statistically significant. Therefore, there is no evidence to suggest that green implementation barriers significantly alter the magnitude of the impact of green business strategies on green behavior in the workplace. In other words, H6 is not supported.

Table 9. Simple slope analysis for H6

BF level	GBS coefficient → EGB coefficient
BF at +1 SD	0.380
BF at Mean	0.463
BF at -1 SD	0.545

Source: Compiled by author

Comment: Although the moderating effect is not statistically significant, the simple slope analysis reveals a practically plausible trend: when **low green barrier**, the impact of GBS on EGB is stronger; when **high green barrier.** However, this effect weakens. Nevertheless, since the interaction curve is not statistically significant, this trend should only be considered suggestive and not sufficient for drawing definitive conclusions.

This section summarizes the results

The PLS-SEM results show that the measurement model is of good quality, with reliability and convergence values meeting acceptable thresholds. All structures have Cronbach's Alpha greater than 0.70, Composite Reliability greater than 0.80, and AVE greater than 0.50. The HTMT values between pairs of structures are all less than 0.85, confirming that the discriminant validity meets the requirements. The structural model also does not have multicollinearity issues, as all VIFs are less than 3, while the SRMR = 0.056 indicates that the model fit is acceptable.

Regarding hypothesis testing, the results show that ideal influence (IF) and inspiration (IM) have a positive and significant impact on green business strategy (GBS), while intellectual stimulation (IS) and personal interest (IC) are not statistically significant. At the same time, GBS and organizational support (OS) both positively impact green workplace behavior (EGB), with GBS being the strongest influencing factor. Barriers to green implementation (BF) do not have a significant direct impact on EGB.

Mediating analysis revealed that the mediating GBS was significant for the influence of IF and IM on EGB, while the mediating OS was significant for IF, IM, and IS. Finally, the unmediated BF was significant for the relationship between GBS and EGB. Overall, the results confirm the prominent role of transformation leadership, particularly through green strategies and organizational support, in promoting green behavior among employees in manufacturing SMEs.

DISCUSSION

Overview of key findings

This study set out to examine how transformational leadership (TL) influences employee green behavior (EGB) through organizational mechanisms, specifically green business strategy (GBS) and organizational support (OS), while accounting for the moderating role of barriers to green implementation (BF).

The results provide three major insights. First, among the four dimensions of TL, **idealized influence (IF) and inspirational motivation (IM)** emerge as the most influential drivers of GBS, whereas **intellectual stimulation (IS) and individualized consideration (IC)** do not show significant direct effects. Second, **GBS and OS play complementary mediating roles**, translating leadership into employee-level green behaviors. Third, **BF does not significantly moderate the GBS–EGB relationship**, suggesting that strategic alignment may override perceived constraints in SMEs.

These findings contribute to both leadership and sustainability research by unpacking the mechanisms through which leadership influences green transformation in emerging economy contexts.

Theoretical implications

Extending transformational leadership theory in the context of green transformation

The findings reinforce and refine **transformational leadership theory** (Bass, 1985; Bass & Avolio, 1994) by demonstrating that not all leadership dimensions contribute equally to sustainability-oriented outcomes. Specifically, **IF and IM exhibit strong and significant effects on GBS**, while IS and IC do not.

This pattern suggests that in the context of green transformation, **symbolic and visionary aspects of leadership** such as role modeling ethical commitment (IF) and articulating a compelling sustainability vision (IM) are more critical than cognitive stimulation or individualized support. This aligns with prior research indicating that transformational leadership operates primarily through **value alignment and vision internalization** (Avolio et al., 2009; Judge & Piccolo, 2004).

Importantly, the non-significant effects of IS and IC challenge the assumption that all four "4I" dimensions are equally relevant across contexts. In SMEs, where resources and structures are limited, employees may respond more strongly to **clear direction and moral leadership** than to abstract encouragement of creativity or personalized development. This nuance contributes to the ongoing refinement of TL theory in sustainability and emerging market settings.

Green business strategy as a dynamic capability mechanism

A central contribution of this study lies in positioning **GBS as a key mediating mechanism** linking leadership to employee behavior. This finding can be interpreted through the lens of **Dynamic Capabilities Theory** (Teece, 2007), which emphasizes the firm's ability to sense, seize, and reconfigure resources in response to environmental changes.

Transformational leaders, particularly through IF and IM, enable organizations to **sense environmental challenges**, articulate sustainability priorities, and embed them into formal strategies. GBS, in turn, represents the **"seizing" function**, translating vision into structured goals, investments, and decision-making frameworks.

The strong effect of **GBS → EGB (β = 0.463)** suggests that strategy plays a crucial role in bridging the gap between leadership intent and employee action. This finding supports the argument by Vial (2019) that transformation outcomes depend on how strategic initiatives are operationalized within organizations.

Thus, the study advances the literature by demonstrating that **leadership does not directly drive behavior**, but rather operates through **organizational-level strategic mechanisms**, reinforcing a multi-level perspective on transformation.

Organizational support as a complementary socio-technical pathway

In addition to strategy, **organizational support (OS)** emerges as a second critical mediating mechanism. Unlike GBS, which reflects formal strategic orientation, OS captures the **operational and socio-technical infrastructure** that enables employees to act.

The significant indirect effects of IF, IM, and IS through OS indicate that leadership also influences behavior by **allocating resources, establishing processes, and creating enabling conditions**. This aligns with **Sociotechnical Systems Theory**, which emphasizes the joint optimization of social (leadership, culture) and technical (resources, systems) elements.

Interestingly, IS which was not significant in the direct path to GBS becomes significant through OS. This suggests that **intellectual stimulation may not directly shape strategy but contributes to building supportive environments** that encourage experimentation and green initiatives.

Therefore, the study contributes by highlighting that **green transformation is not only strategic but also infrastructural**, requiring both formal planning and operational support systems.

Rethinking the role of barriers in green transformation

Contrary to expectations, **BF does not significantly influence EGB nor moderate the GBS–EGB relationship**. This finding diverges from much of the sustainability literature, which emphasizes barriers such as cost, lack of expertise, and operational pressures (e.g., OECD, 2021).

One possible explanation is that **strategic clarity and leadership commitment may neutralize perceived barriers**. When organizations have a well-defined GBS and strong leadership alignment, employees may be less sensitive to constraints, focusing instead on executing strategic priorities.

Another explanation lies in the SME context. Employees in SMEs often operate under constraints as a norm, and therefore **perceived barriers may not significantly alter behavior unless they are extreme**.

This finding contributes to the literature by suggesting that **barriers may be less influential than previously assumed when strong leadership and strategy are present**, challenging deterministic views of constraint-driven behavior.

Integration with prior literature

The findings are broadly consistent with prior studies emphasizing the indirect role of leadership in transformation processes (Avolio et al., 2009; Vial, 2019). Specifically:

- The strong role of **GBS** aligns with research on strategic alignment in digital and green transformation (Westerman et al., 2014; Kane et al., 2015).
- The mediating role of **OS** supports studies on organizational climate and support systems (Scott & Bruce, 1994; Schneider et al., 2013).
- The dominance of **IF and IM** is consistent with meta-analytic findings on transformational leadership effectiveness (Judge & Piccolo, 2004).

However, the study also extends prior literature by:

- Demonstrating **differential effects of TL dimensions**
- Identifying **dual mediation mechanisms (strategy + support)**
- Challenging the assumed importance of **barriers as moderators**

Practical implications

From a managerial perspective, the findings provide clear guidance for SMEs pursuing green transformation.

First, leaders should prioritize **visionary and ethical leadership behaviors**, particularly those associated with IF and IM. Communicating a clear sustainability vision and acting as a role model are critical for aligning organizational efforts.

Second, firms should invest in **developing a coherent green business strategy**, including measurable goals, resource allocation, and integration into core business decisions. Strategy serves as the primary mechanism translating leadership into employee action.

Third, organizations must strengthen **organizational support systems**, such as training, incentives, and operational processes. Without these enabling conditions, strategic intentions may not translate into behavior.

Finally, managers should recognize that while barriers exist, **they should not be overemphasized**. Instead, focusing on leadership and strategy may be more effective in driving transformation outcomes.

Limitations and future research directions

Despite its contributions, the study has several limitations.

First, the use of cross-sectional survey data limits causal inference. Future research could adopt **longitudinal designs** to capture dynamic transformation processes.

Second, the study focuses on SMEs in a specific regional context. Future studies should examine **cross-country comparisons** or **industry variations** to enhance generalizability.

Third, while this study considers GBS and OS as mediators, future research could incorporate additional mechanisms such as **digital culture, innovation climate, or ESG governance**.

Finally, the non-significant role of BF warrants further investigation. Future research could explore **non-linear or threshold effects**, or apply **fsQCA** to identify configurational patterns.

CONCLUSION AND IMPLICATIONS

Conclusion

This study investigates the role of transformational leadership (TL) in promoting employee green behavior (EGB) in manufacturing SMEs, with a particular focus on the mediating roles of green business strategy (GBS) and organizational support (OS), and the moderating role of barriers to green implementation (BF).

The findings reveal that transformational leadership exerts a **significant indirect influence on EGB**, primarily through GBS and OS. Among the four dimensions of TL, **idealized influence (IF) and inspirational motivation (IM)** are identified as the most influential drivers of green strategy formation. In contrast, **intellectual stimulation (IS) and individualized consideration (IC)** do not exhibit significant direct effects on GBS.

Furthermore, the results confirm that **GBS plays a central role in translating leadership intent into employee behavior**, while **OS provides the necessary infrastructural support for implementation**. Interestingly, the moderating effect of BF is not supported, suggesting that **strong leadership and strategic alignment may mitigate the impact of perceived barriers**.

Overall, the study demonstrates that **green transformation in SMEs is a multi-level process**, in which leadership shapes organizational mechanisms that, in turn, drive individual behavior.

Theoretical contributions

This study makes several important contributions to the literature.

First, it extends **transformational leadership theory** (Bass, 1985; Bass & Avolio, 1994) by demonstrating that the effects of leadership on sustainability outcomes are **dimension-specific rather than uniform**. The dominant role of IF and IM highlights the importance of **vision, values, and symbolic leadership** in driving green transformation, particularly in resource-constrained SME contexts.

Second, the study contributes to **Dynamic Capabilities Theory** (Teece, 2007) by conceptualizing GBS as a **strategic capability mechanism** that translates leadership into organizational action. The strong mediating role of GBS confirms that transformation outcomes depend not only on leadership intent but also on the organization's ability to embed that intent into formal strategic processes.

Third, the research advances the literature by identifying a **dual mediation mechanism (GBS and OS)**. While prior studies often focus on either strategic or organizational factors, this study demonstrates that **both strategic alignment and operational support are necessary** to drive behavioral outcomes.

Fourth, the non-significant moderating role of BF challenges conventional assumptions in sustainability research, suggesting that **constraints may be less decisive than leadership and strategy** in shaping employee behavior. This finding opens new avenues for rethinking the role of barriers in transformation processes.

Managerial implications

The findings offer several actionable implications for managers and practitioners in SMEs.

First, leaders should emphasize **visionary and ethical leadership behaviors**, particularly those associated with IF and IM. Clearly communicating a sustainability vision and acting as a role model are critical for aligning employees with organizational green objectives.

Second, organizations should prioritize the development of a **comprehensive green business strategy**, including clearly defined goals, performance indicators, and integration into core business decisions. Strategy serves as the primary mechanism through which leadership influences behavior.

Third, firms should invest in strengthening **organizational support systems**, such as training programs, resource allocation, and incentive structures. These elements are essential for translating strategic intentions into day-to-day employee practices.

Fourth, managers should adopt a **proactive rather than reactive approach to barriers**. Instead of focusing solely on overcoming constraints, organizations should leverage leadership and strategy to create momentum for transformation.

Limitations

Despite its contributions, this study has several limitations.

First, the use of cross-sectional data limits the ability to draw causal inferences. Future research should employ **longitudinal or experimental designs** to capture dynamic transformation processes.

Second, the study focuses on SMEs in a specific regional context in Vietnam, which may limit generalizability. Future studies could examine **different institutional contexts or industries** to validate the findings.

Third, the model explains a moderate level of variance in EGB, suggesting that additional factors such as **organizational culture, digital capabilities, or external institutional pressures** may also play important roles.

Finally, the measurement of BF as a linear moderator may not fully capture its complexity. Future research could explore **non-linear, configurational, or threshold effects**.

Future research directions

Building on these limitations, several avenues for future research are proposed.

First, future studies should adopt a **multi-level approach**, examining interactions between leadership, organizational systems, and external institutional environments.

Second, researchers could integrate additional mediating variables such as **digital culture, innovation climate, or ESG governance**, to provide a more comprehensive understanding of transformation mechanisms.

Third, the use of **advanced analytical techniques**, such as fsQCA or longitudinal SEM, could help uncover complex causal patterns and dynamic relationships.

Finally, future research should explore **comparative studies across countries or sectors**, particularly between developed and emerging economies, to identify context-specific drivers of green transformation.

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