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Effects of Individual and Institutional Factors for Sustainable Chains and Production

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ABSTRACT

Purpose: This study aims to examine the impacts of institutional pressures and individual adaptation performance on the adoption of green supply chain practices and reverse logistics, and their effects on production-based CO_2 emissions, focusing on emerging markets with a detailed case study of Türkiye.

***Methodology*:** The research methodology employed structural equation modeling (SEM) and SmartPLS for the analysis of the data. This approach allowed for an in-depth examination of the relationships between institutional pressures, individual adaptive performance, green supply chain practices, reverse logistics, and CO_2 emissions.

Findings: The findings reveal a nuanced relationship where institutional pressures directly impact reverse logistics but show minimal direct influence on green supply chain practices or CO_2 emissions reduction. In contrast, individual adaptive performance is crucial in enhancing both green supply chain practices and reverse logistics. Notably, reverse logistics is significantly effective in reducing CO_2 emissions.

Originality: This study enriches the literature by revealing how institutional pressures and individual adaptive performance influence green supply chain management in emerging markets, particularly demonstrating through the case of Türkiye that the impact of within-field variability on the adoption of superior practices depends on individual adaptive performance.

Keywords*:* Green Supply, Green Supply Chain Management, Institutional Pressures, Individual Adaptive Performance, CO_2 Emissions.

JEL Codes: M1, M11, Q01.

Tedarik Zincirleri ve Üretim için Bireysel ve Kurumsal Faktörlerin Etkileri

ÖZET

Amaç: Bu çalışma, gelişmekte olan pazarlar üzerinde odaklanarak, kurumsal baskılar ve bireysel uyum performansının yeşil tedarik zinciri uygulamaları ve tersine lojistiğin benimsenmesi üzerindeki etkilerini ve bunların üretime dayalı CO_2 emisyonları üzerindeki etkilerini Türkiye örneği üzerinden ayrıntılı olarak incelemeyi amaçlamaktadır.

***Yöntem*:** Araştırma yönteminde verilerin analizi için yapısal eşitlik modellemesi (SEM) ve SmartPLS kullanmıştır. Bu yaklaşım, kurumsal baskılar, bireysel uyum performansı, yeşil tedarik zinciri uygulamaları, tersine lojistik ve CO_2 emisyonları arasındaki ilişkilerin derinlemesine incelenmesine olanak sağlamıştır.

Bulgular: Kurumsal baskıların tersine lojistiği doğrudan etkilediği, ancak yeşil tedarik zinciri uygulamaları veya CO_2 emisyonlarının azaltılması üzerinde minimum doğrudan etki gösterdiği nüanslı bir ilişki, bulgularla ortaya koyulmaktadır. Buna karşılık, bireysel adaptif performansın hem yeşil tedarik zinciri uygulamalarını hem de tersine lojistiği geliştirmede çok önemli olduğu bulunmuştur. Özellikle, tersine lojistiğin CO_2 emisyonlarının azaltılmasında önemli ölçüde etkili olduğu vurgulanmaktadır.

Özgünlük: Bu çalışma, kurumsal baskıların ve bireysel uyum performansının gelişmekte olan pazarlarda yeşil tedarik zinciri yönetimini nasıl etkilediğini ortaya koyarak ve özellikle Türkiye örneği üzerinden alan içi değişkenliğin üstün uygulamaların benimsenmesi üzerindeki etkisinin bireysel uyum performansına bağlı olduğunu göstererek literatürü zenginleştirmektedir.

Anahtar Kelimeler*:* Yeşil Tedarik, Yeşil Tedarik Zinciri Yönetimi, Kurumsal Baskılar, Bireysel Uyum Performansı, CO_2 Emisyonları.

JEL Kodları: M1, M11, Q01.

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1. INTRODUCTION

Integrating technical and behavioral dimensions of green supply chain management (GSCM) is crucial for enhancing organizational performance and achieving environmental sustainability. The technical practices of GSCM, such as eco-design, reverse logistics, and green manufacturing, significantly reduce environmental impact and improve sustainability. Additionally, the behavioral practices of GSCM, supported by top management and involving stakeholders, are essential for effectively implementing GSCM and gaining a competitive advantage. The theoretical framework of socio-technical systems provides a basis for understanding the integration of tangible (technical) and intangible (social) subsystems in GSCM, which is relevant for comprehending the impact of GSCM on reverse logistics' effectiveness. In summary, integrating technical and behavioral dimensions of GSCM, supported by socio-technical systems and institutional pressures, is essential for enhancing organizational performance and achieving environmental sustainability, thereby influencing the effectiveness of reverse logistics.

Integrating technical and behavioral dimensions of green supply chain management (GSCM) is crucial for enhancing organizational performance and achieving environmental sustainability (Nureen et al., 2022; Zampese et al., 2016). The technical practices of GSCM, such as reverse logistics, and green production, play a significant role in reducing environmental impact and improving sustainability (Ortiz-de-Mandojana et al., 2016). Additionally, the behavioral practices of GSCM involving employees are essential for the effective implementation of GSCM and for gaining a competitive advantage (Riaz et al., 2020; Novitasari and Agustia, 2021; Tjahjadi et al., 2023). In summary, integrating technical and behavioral dimensions of GSCM, supported by socio-technical systems and institutional pressures (Rakhmawati et al., 2020)., is essential for enhancing organizational performance and achieving environmental sustainability, thereby influencing the effectiveness of reverse logistics. Consequently, this article discusses the effects of individual adaptive performance and institutional pressures on green supply chains and reverse logistics.

Institutional pressures, which can be coercive, normative, or mimetic, influence organizations differently based on their specific institutional context (Chu et al., 2017). Moreover, the degree of exposure to institutional pressures can shape how supply chains respond to contexts, and effectively understanding and managing these pressures are important (Ahworegba et al., 2022). Additionally, research has demonstrated that these pressures positively impact the adoption of green supply chain management practices in logistics operations (Jazairy and Von Haartman, 2020). However, Kauppi and Hannibal (2017) emphasized the need for empirical research on the impact of external factors on sustainability choices. The authors also discussed the shortage of empirical research on the importance of understanding the origins of institutional pressures for supply chains.

While the direct relationship between individual adaptive performance and green supply chain performance is not explicitly addressed in the literature, the positive impact of green supply chain practices on various performance dimensions suggests that individual adaptability, which is crucial for implementing and sustaining green practices (Amui et al., 2017), may directly contribute to higher green supply chain performance. So, there has been a still important gap wheter individual adaptive performance is related to green supply chains.

Moreover, job-specific frameworks often used multiple, more specific dimensions to describe contextual performance. Thus, it has been not clearly defined whether green supply chain context is significantly related to individual behaviors that support the organizational, social, and psychological environment in which the technical core must function (Borman and Motowidlo, 1993; Koopmans et al., 2011).

Additionally, there is a more research needed for the anslyzing the importance of the role of human resources in reverse logistics and their impact on the performance of the system (Giri and Glock, 2017). Moreover, the active participation of individuals in the various stages of reverse logistics, such as the assembly process, meticulous inspection, and the management of transportation, plays an essential role. The influence of human intervention in these processes is profound and its importance should never be underestimated, as it significantly impacts the efficiency and effectiveness of the entire reverse logistics framework (Aryee and Adaku, 2023).

There is a positive relationship between supply chain management practices and manufacturing organisations' performance; these practices directly impact production processes and outcomes (Samuel et. al., 2022). The impact of production on supply chains is vital for organizational performance and efficiency. Supply chain integration (SCI) is important in improving information-sharing, decision-making, and collaboration among manufacturers and supply chain partners, particularly during the production phase (Shou et al., 2018). This integration enhances information-processing capabilities and fosters collaborative relationships, ultimately influencing organizational production processes. The effectiveness of supply chain management practices, such as strategic collaboration and joint decision-making, depends on the specific characteristics of internal production systems.

Strategies to improve transportation infrastructure quality and institutional standards to boost economic growth must also significantly impact real sector productivity (Arshed et al., 2022a). This indicates that enhancing green supply chain practices can help mitigate CO_2 emissions throughout production. For example, recent research highlights the correlation between supply chain competitiveness and cleaner production in decreasing CO_2 emissions at each production level (Arshed et al., 2022b). Moreover, the importance of green supply chain management was significant for manufacturing to reap the performance benefits (Zhu et al., 2012).

The existing research highlights important gaps in understanding the green supply chain. One gap is the unclear direct relationship between individual adaptive performance and the effectiveness of green supply chain practices, highlighting a need for more exploration into how individual behaviors contribute to sustainable supply chain outcomes. Another gap exists in the lack of comprehensive frameworks to connect green supply chain contexts with individual behaviors that support broader organizational and environmental goals. Additionally, there is limited insight into the specific mechanisms through which supply chain management practices directly influence production processes and outcomes, particularly in the context of environmental sustainability- CO_2 emissions in the production.

To explore the research gaps mentioned above, this article explores various factors influencing the implementation of environmentally sustainable practices in supply chains, highlighting the significance of green human capital readiness, government regulations, and institutional pressures. It discusses how individual adaptive performance and job-specific behaviors may impact green supply chain performance, despite a gap in direct literature connections. Additionally, the articles analyze the relationship between supply chain management practices and organizational performance, emphasizing the role of supply chain integration in enhancing production processes and the potential of green supply chain practices to mitigate CO_2 emissions and improve economic productivity.

Main research questions of this research are listed below.

RQ1. How do the institutional and behavioral dimensions of green supply chain management (GSCM) collectively impact organizational performance and environmental sustainability?

RQ2. In what ways do institutional pressures influence the adoption and effectiveness of GSCM practices within organizations?

RQ3. What is the relationship between individual adaptive performance and the performance of green supply chains?

RQ4. How does supply chain integration (SCI) enhance organizational efficiency and performance within the context of GSCM?

The order of the article is as follows: The first chapter begins with an introduction that outlines the significance of the study, particularly in relation to emerging markets, and establishes the research objectives. Following this, the methodology section details the use of structural equation modeling (SEM) to analyze the relationships among variables. The findings section presents the results, highlighting that institutional pressures significantly influence reverse logistics but have minimal direct effects on broader green supply chain practices, emphasizing the critical role of individual adaptive performance in driving sustainability initiatives. The discussion then contextualizes these findings within the existing literature, addressing the gaps related to the role of human resources in reverse logistics and the need for integrating technical and behavioral dimensions of GSCM. Finally, the article concludes with recommendations for future research, advocating for a more holistic approach to understanding the complexities of sustainable supply chain practices and the necessity of further exploration into the interactions between individual and institutional factors.

2. LITERATURE REVIEW

Integrating technical and behavioral dimensions of green supply chain management (GSCM) is crucial for enhancing organizational. This article addresses literature gaps in green supply chain management (GSCM), focusing on the role of human resources in reverse logistics and the relationship between institutional pressures and organizational responses. Fostering a culture of sustainability and equipping employees with the necessary skills and motivation, human resources can significantly enhance the effectiveness of GSCM initiatives, engagement is essential for the effective execution of GSCM strategies (Handoyo, 2024). Moreover, institutional theory emphasizes the role of legitimacy. However, organizations are not entirely passive; they can act as change agents, with some individuals, initiating and implementing changes. So, this text emphasizes the importance of employee participation in GSCM which is highly ignored in the literature. The article also highlights the need for integrating technical and behavioral dimensions of GSCM, a topic that has been underexplored in previous literature. This holistic approach

helps organizations achieve sustainability through effective GSCM practices, enhancing organizational performance and environmental sustainability.

2.1. Institutional Pressures

Sometimes, logistics have to do things a certain way because other big companies or the government tell them to. They do this to make sure they have what they need and don't get left behind. Other times, companies copy what other successful companies do to be safe and not waste time looking for new ways to do things. And sometimes, companies follow certain rules and ways of doing things because they learned it in environment or from other people in their job.

Research indicates that these pressures play a significant role in shaping logistics practices. For instance, coercive pressures are crucial in driving organizations to initiate environmental management practices such as reverse logistics (Hsu et al., 2013). Mimetic pressures, on the other hand, can be exerted by the urban environment on logistics service providers, influencing their decisions and actions (Rose et al., 2016). Normative pressures, which are influenced by stakeholders such as suppliers, customers, and competitors, also impact logistics practices, pushing firms to adopt sustainable practices in their supply chains (Hemed and Ibrahim, 2022).

Coercive pressures in organizational contexts stem from external entities. Organizations face coercive pressures from external sources such as government agencies, powerful corporations, and regulatory bodies, which enforce conformity to certain standards and procedures to maintain competitive advantage and compliance, leading to adaptation by organizations to avoid sanctions or loss of resources (Kauppi and Luzzini, 2022; Latif et al., 2020).

Mimetic pressure is the rooted from the encouragement of organizations to emulate the successful strategies of their competitors and peers, especially in uncertain environments, to minimize risks and streamline the decision-making process, and the influence of consultants (George et al., 2020).

Normative pressures, on the other hand, arise from professional standards and shared norms within industries, professional associations, and educational networks, shaping employees' behaviors and practices (Ahmad et al., 2022). These pressures are driven by employees' adherence to explicit professional norms and training, leading to a pool of interchangeable employees with similar worldviews and behaviors across organizations (Ahmad et al., 2022). Professional networks, formal education, and industry events like trade fairs and vendor exhibitions facilitate the exchange of information and best practices, reinforcing normative pressures within industries (Ahmad et al., 2022).

Moreover, these pressures are interconnected and can influence each other. For example, antecedents from institutional pressures, mimetic, and normative pressures can induce companies to adopt varying levels of sustainable practices in logistics (Dallasega et al., 2022).

In summary, coercive pressures compel organizations to comply with external mandates, mimetic pressures drive imitation of successful practices, and normative pressures influence behaviors based on professional standards and shared norms, collectively shaping organizational practices and behaviors in various contexts. Moreover, institutional theory posits that institutionalized activities occur due to influences on three levels: individual, organizational, and interorganizational (Oliver, 1997). As a result, this study research institutional and employees effects depending on the fact that resource-based insights with organizational theory to explain firm heterogeneity and sustainable competitive advantage through a blend of internal culture, external institutional influences, and the crucial roles of both resource and institutional capital (Miles, 2012).

2.2. Effects of Institutional Pressures on Green Supply Chains

Research has shown that government regulations, environmental standards, and subsidies significantly influence the adoption of green supply chain initiatives, as evidenced by the increasing focus on green products and the participation of enterprises and consumers in green supply chain management (Ghomi et al., 2016; Mu et al., 2022; Xu and Zhou, 2014). Thus, coercive pressures shape greeen supply chains.

Institutional theory suggests that a firm will consider the actions of other organizations when they determine their organizational practices (Zhu et al., 2013). Research has demonstrated a positive correlation between green supply chain management practices and competitiveness (Rao and Holt, 2005). As a natural result, among competing firms, institutional forces affect green supply chain practices like in mimetic pressures.

The interplay between institutional pressures and organizational responses is crucial, as organizations need to navigate and adapt to these pressures to ensure legitimacy and effectiveness (Boon et al., 2009). The quality of disclosure and organizational practices can vary significantly across different institutional contexts due to the influence of institutional forces (Perrault Crawford and Williams, 2010). However,

professional standards and shared norms within industries force green supply chains to pertain or relating to an ideal green supply chain models as in normative pressures.

H1: Institutional pressures increase green supply practices.

2.3. Effects of Institutional Pressures on Reverse Logistics

A change in the “institutional environment” affects the conditions under which reverse logistics activities should be conducted (Halldórsson and Skjøtt-Larsen, 2006).

Institutional pressures significantly impact reverse logistics practices by influencing firms to engage in product return and recovery activities (Kaihan and Chin, 2021; Morgan et. al, 2018; Wu and Barnes, 2016). institutional pressures, including those from competitors, customers, regulators, and environmental interest groups, drive firms to adopt product return and recovery practices in reverse logistics (Huang et al., 2016; Kaihan and Chin, 2021).

The literature suggests that institutional pressures influence top management attitudes and behaviors towards reverse logistics implementation (Kaur, 2021). For example, Huang et al. (2016) show that managerial decisions, driven by coercive, mimetic, and normative isomorphism, are key in aligning organizations' practices with external expectations in reverse logistics. Moreover, laws and regulations imposed by institutions create a framework that guides manufacturers in implementing reverse logistics practices, impacting the overall performance and sustainability of their operations (Khor et al., 2016).

H2: Institutional pressures significantly and positively affect reverse logistics.

2.4. Effects of Individual Adaptive Performance on Green Supply Chain

Individuals' ability to adapt to new challenges, embrace innovative practices, and adjust to changing environmental requirements is crucial for the successful implementation of green initiatives (Griffin et al., 2010). Adaptive mechanisms can be driven either from the bottom up, focusing on human capabilities and performance, or from the top down, aligning with environmental characteristics (Baard et al., 2014).

Individual adaptive performance is closely linked to supply chain management effectiveness. The adaptability of individuals within the supply chain, including managers, influences the overall performance and success of supply chain operations. For example, the adaptability of a supply chain manager has been highlighted as a factor that can enhance their effectiveness in managing supply chain operations (Richey et al., 2006). Additionally, by being adaptable, individuals can contribute to the successful implementation of green initiatives, support environmental responsibility, and enhance overall environmental performance outcomes (Koopmans et al., 2011)”. In that sense, green supply chain management adaptibility can lead to a stronger environmental adaptability compared to traditional supply chains managers applications (He, 2021) because an adaptable supply chain manager is likely to function more effectively than a less adaptable candidate (Richey et al., 2006).

Furthermore, the relationship between orgaizational goal orientation and performance orientation on adaptive performance outcomes has been explored, suggesting the potential value of interventions aimed at shaping individuals' goal orientations (Jundt et al., 2015). However, it is not clear whether individuals’ goal orientations for the green supply chains are necessary for their adaptation. Nevertheless, the synergy between green human resource management and green supply chain management has been shown to create value in performance (Acquah et al., 2021). The implementation of green supply chain management practices requires individuals within the organization to be adaptable and responsive to changing environmental requirements and sustainability goals (Green et al., 2012). Individuals who exhibit adaptive performance are more likely to embrace and effectively implement green initiatives, contributing to the overall success of green supply chain practices (Rao and Holt, 2005).

Additionally, individual adaptive performance can enhance collaboration and communication within the supply chain, facilitating the integration of green practices across different stages of the supply chain (Sunarya et al., 2023). By being adaptable and open to change, individuals can effectively engage in green supply chain collaborative efforts, leading to improved environmental performance outcomes (Zeng et al., 2022).

Thus, it can be concluded that adaptation of individual performance will positively affect green supply chain mangement.

H3: Adaptive individual performance positively and significantly affects green supply chain.

2.5. Adaptive Individual performance and Reverse Logistics Relationships

Human resources, particularly human capital, are identified as critical factors in the implementation of reverse logistics within companies (Ho et al., 2012; Waqas et al., 2018). Research has demonstrated that individual-level human capital positively affects individual performance, with high-quality functional unit-level human capital resources strengthening this connection (Crocker and Eckardt, 2014). Because, Giri and Glock (2017) explored models where worker experience influences the production and inspection processes, affecting the quality and quantity of reverse logistics.

The presence of skilled green manpower benefits organizations in running sustainability programs effectively and contributes to improved performance in reverse logistics and remanufacturing operations (Bag and Gupta, 2019). Skilled employees or intellectual human capital created is the base for individual performance which is a dynamic view (Lentjušenkova and Lapina, 2016). In another words, human capital is one of the components of intellectual capital and performance is the existing element in the scientific literature (Wang et al., 2015).

A number of different components of individual performance have been identified within the literature. These include technical proficiency, job dedication, teamwork, and citizenship (Ones et al., 2001). Employees' ability to adapt to changing job demands, environments, and technologies is essential for achieving high levels of performance and productivity. Consequently, to adapt the components of individuals in organizations will result high levels of performance.

Dowlatshahi (2000) emphasized the importance of adaptability in individuals for the successful implementation of green initiatives. Moreover, Waqas et al. (2018) found that lack of human resources is one of the highest priority barriers in reverse logistics. Thus, it is obvious that not only adaptive performance of individuals is necessary for higher peformance in logistics, lack of adaptive individual performance is an important barrier in reverse logistics processes. In conclusion, adaptability is a critical factor in individual performance, influencing employees' ability to navigate complex work environments, learn new skills, and contribute effectively to reverse logistics.

H4: Adaptive individual performance is increasing reverse logistics performance.

2.6. Effects of Green Supply Chain Practices on Production Based CO_2 emissions

Environmental and resource productivity indicates whether economic growth is becoming greener with more efficient use of natural capital and capture aspects of production that are rarely quantified in economic models and accounting frameworks. Production-based CO_2 productivity reflects the economic value generated (in terms of real GDP) per unit of CO_2 emitted. Production-based emissions refer to gross direct CO_2 emissions from fossil fuel combustion emitted within the national territory. They exclude bunkers, sinks, and indirect effects (OECD, 2017).

The production processes in organizations significantly influence supply chain dynamics and organizational performance (Leuschner et al., 2013). However, even if the literature suggests that effective supply chain management practices, encompassing logistics performance, green initiatives, and stakeholder engagement, are pivotal in enhancing organizational production processes, the relationship has not been cleared (Green et al., 2008).

Swafford et al. (2006) emphasized the significance of supply chain agility in enabling organizations to produce products efficiently and cost-effectively. The studies underline the critical role of aligning supply chain practices with production systems, enhancing agility, and incorporating innovation to boost sustainability and operational efficiency while also pointing out the importance of simplification, integration's impact on quality and performance, and how the intensity of integration affects product quality (Kim, 2009).

Building operational capabilities through green supply chains can positively impact various organizational performance metrics (Sarkis et al., 2011). Industrial ecology, of which green supply chain management is an important aspect, can help to achieve sustainable development by transforming production through hard and soft developments. Supporting that view, Vachon and Klassen (2008) found that collaboration in supply chains in upstream practices was more closely linked with process-based performance, while downstream collaboration was associated with product-based performance. These findings offer valuable insights into how supply chain (management) practices directly impact organizational green production outcomes.

H5: Green supply practices decrease CO_2 emissions in prodution processes.

2.7. Effects of Green Supply Chain Practices on Reverse Logistics

Reverse logistics, as a concept, emerged alongside other green supply chain practices to enhance sustainability in organizational operations (Zhu et al., 2007). It is important to integrate green initiatives into all phases of the supply chain, including reverse logistics, to achieve a truly green supply chain (Aćimović

et al., 2022; Muma et al., 2006). By incorporating green practices into reverse logistics, such as facilitating the return and recycling of used products, companies can improve their environmental performance and reduce waste, thereby contributing to the effectiveness of reverse logistics. Because research has shown that product return options represent the most important phase of the reverse logistics process (Tang and Wang, 2021).

On the other hand, Laosirihongthong et al. (2013) found that Reverse logistics pro-active practices do not have a significant correlation with green supply chain management practices. They resulted this depending on the weak relationship between production (product) and green desing. In our model reverse logistics is related to production-based CO_2 emissions thus the relationship between reverse logistics and green production should be researched more througly.

H6: Green supply chain practices increase reverse logistics effectiveness.

2.8. Reverse Logistics and production-based CO_2 emissions

Success in reverse logistics for firms is influenced by their use of current manufacturing processes, standardized components, and design for remanufacturability or reassembly (Dowlatshahi, 2000). On the other hand, research showed that reverse logistics on production planning, management, and optimal production and storage capacities, shedding light on how reverse logistics practices can impact production processes and potentially influence CO_2 emissions (Jayant et al., 2014).

Gao (2019) highlighted the efficiency of reverse logistics in reducing environmental pollution and resource waste, which can have implications for reducing CO_2 emissions associated with production activities.

H7: Reverse Logistics reduces production-based CO_2 emissions.

The research model and the hypotheses developed based on the model are shown in Figure 1.

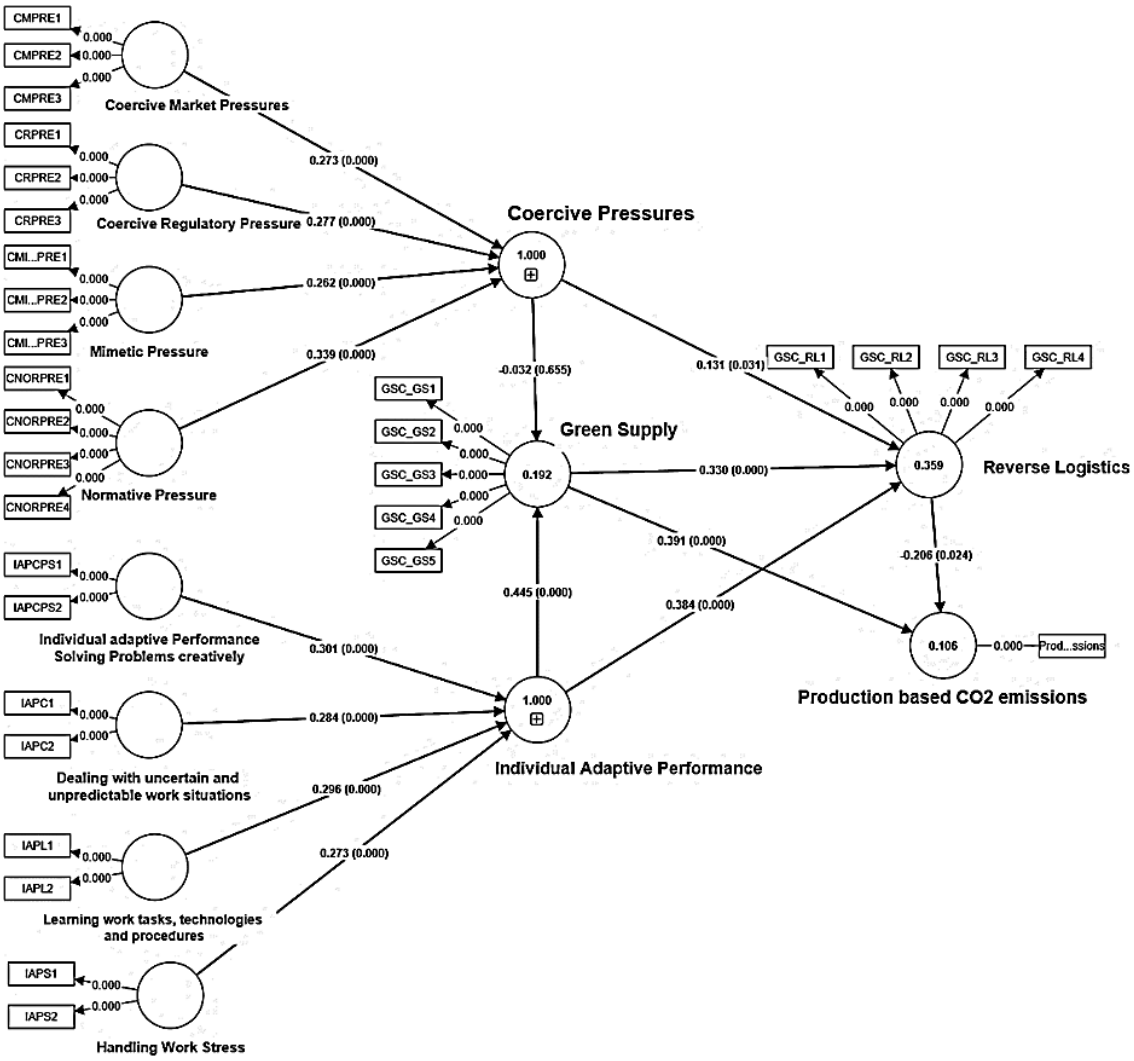

Figure 1: Path analysis of the hypothetical model of the research by structural equation modeling

3. METHODOLOGY

3.1. Research Universe and Sample Selection

The population of the research (research universe) consists of the manufacturing companies (Mining, food, textile, chemistry, agriculture, accommodation and food sectors, etc.) included in the annual industrial and service statistics 2024 report of the Turkish Statistical Institute (TÜİK, 2022). According to the 2022 report of the Turkish Statistical Institute, the number of manufacturers in Türkiye is approximately 140,000 (https://data.tuik.gov.tr/). Since it is not possible to reach all of these companies, the sample of the study consists of manufacturing companies operating in the Thrace Region. According to the 2022 report of the Trakya Development Agency, there are approximately 6000 manufacturers in the Thrace Region (Trakya Development Agency, 2022). There are a number of reasons why companies in the Thrace Region were selected as the research sample. Among these reasons, new production infrastructures have been established in this region in response to the increasing production demands and many of the products with high trade volume around the world are produced by companies operating in this region. In addition, it should be known that manufacturing companies have an important place in the economic development process of not only a region but also a country.

Manufacturers in the Thrace Region of Türkiye were selected as the research sample, but among these companies, companies that could manage their logistics processes were also considered. In Thrace region, there are approximately 2000 companies that are manufacturing companies and can manage logistics processes. The survey created for the research was sent electronically to the people working in senior management positions in these companies included in the sample. The survey questions on the individual adaptive performance scale were sent to people working in the logistics departments of these companies. 572 company managers and 493 company employees answered the questionnaire completely and these data were evaluated.

3.2. Measurements

Green supply scale is adapted from Stekelorum et al., (2021). The green supply scale consists of a single dimension and four items. Items of the green supply scale consist of eco-labeling the products in the company, cooperating with suppliers for environmental targets, conducting environmental audits in the internal management of suppliers, and ISO 14000 certification of suppliers. The reverse logistics scale is adapted from the study of (Chaves et al., 2020). The reverse logistics scale is a single dimension with four items. Items of the reverse logistics scale is about waste transportation and disposal, recycling firms' materials as much as possible, trying to reuse materials as much as possible, and reducing consumption as much as possible.

The Coercive pressures scale was adapted from the study of (Kauppi and Luzzini, 2022). The Coercive pressures scale consists of four dimensions (coercive market pressure, coercive regulatory pressure, mimetic pressure, and normative pressure) and thirteen items. There are 3 items in the coercive market pressure dimension, and examples of these items are: “the firm pressures external customers to adopt certain practices or initiatives in their purchasing procedures”, “pressures certain customers to adopt certain practices or initiatives in their purchasing procedures and to cease their contracts if they do not meet their demands”, and “major suppliers to not comply with requests to adopt certain practices or initiatives in their purchasing procedures.” It is about suspending their contracts in case of the coercive regulatory pressure dimension has 3 items, and questions of these items are about; “The existence of numerous regulations and restrictions that apply to the firm's industry and that also affect its purchasing procedures”, “government regulations affecting the firm's purchasing decision-making powers”, and “frequent government inspections or audits of the firm's purchasing practices to ensure compliance with laws and regulations”. The mimetic pressure dimension has 3 items and questions of these items are about “paying attention to purchasing practices and tools that appear to benefit its competitors and peers”, “the adoption of these practices by key competitors”, and “the firm actively comparing the purchasing practices and performance of its key competitors and peers with its practices”. The normative pressure dimension has 4 items, and these items are; “The firm's purchasing staff are influenced by the procedures and tools advocated by the National Purchasing Association”, “the firm follows academic research on purchasing to learn about the purchasing procedures it will implement”, “purchasing procedures about becoming the norm (an established principle) in the firm's industry”, and “about influencing the best practices and opinions of consulting companies and external auditors in purchasing procedures.”

Individual adaptive performance scale is adapted from the study of (Marques-Quinteiro et al., 2015). This scale consists of four dimensions (solving problems creatively, dealing with uncertain and unpredictable work situations, learning work tasks, technologies and procedures and handling work stress) and 8 items. Solving problems creatively dimension has 2 items and these items are about “finding innovative ways to deal with unexpected events” and “developing creative ideas to manage events”. The dealing with uncertain and unpredictable work situations dimension has 2 items and these items are about “how firm devise alternative plans on very short notice as a way of coping with new task demands” and “adapting to

unforeseen situations by changing focus and taking reasonable steps". Learning work tasks dimension has 2 items and these items are; "We periodically update technical and interpersonal competencies as a way to better perform tasks" and "seek and develop new competencies to deal with difficult situations." The handling work stress dimension has 2 items and these items are; "We remain calm and positive under stressful events" and "maintain focus when dealing with multiple situations and responsibilities."

Production-based CO_2 productivity and GDP per unit of energy-related CO_2 emissions are part of the Green Growth Indicators of Organization for Economic Co-Operation and Development (OECD) Statistics (OECD, 2017). CO_2 productivity (production-based) is calculated as real GDP generated per unit of CO_2 emitted (USD/kg). Production-based CO_2 Emission data was obtained from OECD data section.

4. FINDINGS

4.1. Descriptive Statistics

In the study, participants were asked to use a 5-point Likert scale (1 = strongly agree, 5 = strongly disagree) to measure the variables of green supply, reverse logistics, coercive pressures and individual adaptive performance scale. There are 25 items in the first part of the survey. The second part of the survey includes 4 questions that include information about the company, its employees and senior managers. Firstly, the descriptive information of the production enterprises was asked, followed by the reliability analysis of the variables and the relationships between the variables. When the total number of employees in the business was examined, it was determined that the number of employees in the business was scaled between 100-199 people (36%) and 50-99 people (25%). When the age scale of the employees was examined, it was seen that the majority were between the ages of 30-39 (38%) and 40-49 years (21%). When the training fields of the employees were examined, it was determined that the training fields of the employees were concentrated in business education (34%) and logistics training (25%). When the gender of managers was examined, it was determined that 39% were female and 61% were male.

4.2. Data Analysis and Fit Index Values

Hetero-single feature ratio, correlation coefficients and reliability values of green supply, reverse logistics, coercive pressures and individual adaptive performance structures are presented in Table 1. Cronbach alpha (CA) internal consistency coefficient and Composite reliability (CR) coefficient were calculated to reveal the reliability of the constructs. CA internal consistency reliability values and CR values are expected to be 0.70 or higher (Ali Qalati et al., 2021; Brown, 2015; Hair et. al., 2021; Nunnally, 1978: 112). In addition, the convergent validity of the constructs was examined, and in order to ensure convergent validity, the Average Variance Extracted (AVE) value is required to be greater than 0.50 (Fornell and Larcker, 1981). If this ratio is 50% or above, it explains the variance of the latent variable reflective indicators (Taherdoost, 2016; Taherdoost, 2022). The hetero-to-single-trait ratio of correlations (HTMT) has recently become the primary criterion of discriminant validity (Cheung et al., 2023; Voorhees et al., 2016). The HTMT ratio examined for discriminant validity is obtained by calculating the geometric mean of the mean correlation between items of the same structure (Cheung et al., 2023; Henseler et al., 2015; Voorhees et al., 2016). It is generally accepted that the HTMT ratio is below 0.9. If the HTMT value is below 0.90, it means that discriminant validity was detected between a certain pair of reflection structures (Henseler et al., 2015). It was determined that the structures included in the model had sufficient discriminant validity when the HTMT ratios were evaluated. Correlation coefficients, reliability values, heterotrait-monotrait ratios are shown in Table 1.

Table 1. Correlation coefficients, reliability values, heterotrait-monotrait ratios

Variables	*CA*	*CR*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1. Coercive Market Pressures	0.91	0.91	(0.92)	|0.78|	|0.08|	|0.09|	|0.07|	|0.09|	|0.10|	|0.55|	|0.65|	|0.13|	|0.09|
2. Coercive Regulatory Pressure	0.84	0.84	[0.69]	(0.87)	|0.15|	|0.13|	|0.06|	|0.15|	|0.04|	|0.88|	|0.84|	|0.16|	|0.15|
3.Dealing with uncertain and unpredictable work sit.	0.74	0.74	[-0.05]	[-0.12]	(0.89)	|0.46|	|0.88|	|0.93|	|0.98|	|0.10|	|0.09|	|0.14|	|0.50|
4. Green Supply	0.85	0.88	[-0.08]	[-0.02]	[0.38]	(0.79)	|0.53|	|0.38|	|0.47|	|0.12|	|0.11|	|0.30|	|0.55|
5. Handling Work Stress	0.70	0.70	[-0.01]	[-0.02]	[0.60]	[0.43]	(0.88)	|0.81|	|0.95|	|0.15|	|0.15|	|0.14|	|0.53|
6. Individual Adaptive Performance_Sol. Prob. Creatively	0.81	0.81	[-0.06]	[-0.12]	[0.72]	[0.34]	[0.61]	(0.92)	|0.84|	|0.17|	|0.14|	|0.10|	|0.54|
7. Learning work tasks, technologies and procedures	0.73	0.73	[-0.03]	[-0.01]	[0.72]	[0.39]	[0.68]	[0.64]	(0.89)	|0.06|	|0.10|	|0.03|	|0.64|
8. Mimetic Pressure	0.83	0.83	[0.48]	[0.73]	[-0.08]	[-0.08]	[-0.11]	[-0.14]	[-0.03]	(0.86)	|0.96|	|0.07|	|0.06|
9. Normative Pressure	0.85	0.86	[0.57]	[0.71]	[-0.07]	[-0.06]	[-0.11]	[-0.11]	[-0.05]	[0.80]	(0.84)	|0.06|	|0.07|
10. Production based CO_2 emissions	-	-	[-0.12]	[-0.15]	[0.12]	[0.28]	[0.11]	[0.06]	[0.00]	[-0.06]	[-0.04]	-	|0.03|
11. Reverse Logistics	0.86	0.87	[0.08]	[0.13]	[0.40]	[0.49]	[0.42]	[0.45]	[0.51]	[0.01]	[0.01]	[-0.01]	(0.85)

** P< 0.01, CA: Cronbach's alphas, CR: Composite Ratio. [value] = show Correlation. (value) showS square root of AVE. |value| shows Heterotrait–Monotrait Ratio.

5. RESULTS and DISCUSSION

To test our hypotheses, we use SEM. The estimates are generated with SmartPLS. According to path analysis coefficients hypotheses except H1 and H5 are supported. Hypothesis testing results are presented in Table 2.

Table 2. Hypotheses results

Hypotheses	*Independent Variable*	*Dependent Variable*	*Model*	*P*	*Supported/ Unsupported*
H1	Institutional pressures	Green supply	-0.032(ad)	0.655	Unsupported
H2	Institutional pressures	Reverse logistics	0.131*	0.031	Supported
H3	Individual Adaptive performance	Green supply	0.445***	0.000	Supported
H4	Individual Adaptive performance	Reverse logistics	0.384***	0.000	Supported
H5	Green supply	Production based CO_2 emissions	0.391***	0.000	Unsupported
H6	Green supply	Reverse logistics	0.330***	0.000	Supported
H7	Reverse logistics	Production based CO_2 emissions	-0.206*	0.024	Supported

Path coefficients are standardized. ***p < 0.001, **p < 0.01, *p < 0.05, ad; p>0.05.

H1 indicates the relationship between Institutional pressures and freen supply practices. The hypothesis is rejected because of statistical insignificance (p > 0.655 which is greater than 0.05). According to the literature, the integration of Green supply chain practices not only stems from external pressures but also from the economic and environmental performance benefits they offer (Ahmed et al., 2020). So, it is important to understand that in emerging countries like Turkiye, the economic benefits seem to have more importance on green supply chain that institutional pressures have no effect on Green supply chain. Research on the relationship between operational practices and performance in the context of GSCM, especially in emerging countries like China, highlights GSCM as a strategic approach to enhancing organizational performance (Zhu and Sarkis, 2004). This research supports our result that green supply chain practices are not seen as strategic to organizational performance or profit that firms resists institutional pressures.

H2 which indicates positive relationship between Institutional Pressures and Reverse Logistics is accepted (p < 0.05, Standardized ß = .131). According to standardized coefficient, in every one point increase in institutional pressures, there will be 0.1 increase in reverse logistics. In other words, reverse logistics applications will rise by 10% of the institutional pressures. This result is suppported by the literature. The literature emphasizes the relationship between institutional factors especially concerning reverse logistics capabilities (Vlachos, 2016). Regulatory pressures, in particular, can drive manufacturers to adopt reverse logistics processes to comply with environmental regulations and sustainable practices (Kaur, 2021; Khor et al., 2016). This indicates that legal regulations serve as a crucial foundation for the implementation of reverse logistics practices in Türkiye, ensuring compliance and efficient management of product returns. The study by (Altuğ et al., 2012) sheds light on several key reasons for deficiencies in implementing reverse logistics activities in Turkish Companies. According to the author deficiencies are dependent on organizational factors. So, in developing countries it may not be realistic for firms to comply with reverse logistics with the effect of mimetic and normative pressures. In most developing countries firms comply with reverse logistics due to coercive pressures (generally external pressures from law authorities). Consequently, companies in Türkiye engage in reverse supply chain management practices largely due to legal requirements. The study by Erol et al. (2010) highlights that legislative liabilities play a significant role in prompting companies to participate in product returns within the reverse supply chain. Even if Ferdous (2018) emphasizes the significance of compliance in developing countries, suggesting that companies may be incentivized to embrace reverse logistics practices to ensure higher compliance standards this may not be the issue in most emerging countries.

Individual adaptive peformance increases green suply chain management (H3) is supported by our analyses. The workforce in the supply chain is crucial for enhancing service quality and ensuring the smooth functioning of supply chain operations (Aguora, 2022). Improving employees' capacities through training and development programs can lead to better performance and outcomes in supply chain management.

Individual Adaptive performance is increasing reverse logistics performance (H4) is supported (p < 0.000, Standardized ß = .384, Table 2). Abd Kadir (2019) emphasized the significance of adaptability in logistics, particularly in the context of exploring new ideas and integrating best practices. Moreover, the author mentioned the relationship between task performance and adaptive performance, highlighting the need for

cognitive flexibility and the ability to cope with change effectively. Bravo and Ostos (2021) provided insights into the cognitive and attitudinal factors that shape individual adaptation in the context of technology use and migration within work environments. Cognitive and attudinal factors are also important in reverse logistics. For example, Panigrahi et al. (2018) related cognitive factors reverse logistics management, particularly in the retail industry where as Ho et al. (2012) attudinal factors of reverse logistics. Han and Williams (2008) also found the role of cognitive factors in individual adaptive performance, particularly in decision-making contexts influenced by technological advancements at work. The same authors also found that team adaptability reflects the collective abilities of individual team members. In other words, individual adaptive performance is also related to organizational level reverse logistics applications and factors. But according to Pratoom (2022) importance of trait goal orientation in influencing individuals' willingness to engage in learning behaviors. As a result, individual adaptive performance is increasing reverse logistics performance at organizational level. H5, green supply practices decrease CO_2 emissions in prodution processes, is unsupported. According to path analysis, Table 2, even if $p < 0.000$ so that result is statistically significant, Standardized ß equals to .391 in other words, green supply chain practices seem to increase production-based CO_2 emissions.

The role of institutional factors in shaping firms' resource decisions and their ability to earn economic rents is also highlighted. The text suggests that firms must navigate internal and external influences, including industry factors and normative rationalities, to achieve sustainable competitive advantage (Oliver, 1997). However, the importance of adaptibility of employees are more important to the impact of a firm's proprietary sustainability practices than Regulatory pressures (Ortiz-de-Mandojana et al., 2016). Firms are facing strong institutional pressures may struggle to evaluate and adjust their current resource allocations, potentially impeding their competitiveness without adapting their employees. Individual adaptive performance is critical in the extent to which template diffusions proceed to sustain institutional changes to the organizational field and environment (Moufty et al., 2024). Because similarity and conformity are that organizations tend to follow only those institutional pressures should not be simply copy what has already been successfully done by someone else.

Organizations are more inclined to adopt green supply chain management practices when they perceive specific financial and operational benefits (Rao and Holt, 2005). However, according to same authors, lean production is identified as a pivotal strategy to minimize environmental impact during the production phase, leading to enhanced productivity, waste reduction, and improved quality. So, it can be said that green supply chain practices are related to specific production systems. Lean production in Türkiye is not only about eliminating waste but also about improving competitiveness through factors like product quality, continuous improvement, and effective facility layout (Han, 2018). Furthermore, the study by Santos et al. (2019) found that the adoption of green supply chain practices, such as green manufacturing processes or product design modifications, may inadvertently lead to increased energy consumption or emissions if not implemented efficiently. For instance, the use of certain eco-friendly materials or production methods that require more energy or resources could potentially result in higher CO_2 emissions. For example, the integration of new green technologies in manufacturing processes may require additional energy consumption or the use of materials with higher carbon footprints, leading to a net increase in CO_2 emissions (Green et al., 2012). So, while adopting green supply chain practices aims to reduce environmental impact, if not executed efficiently, it could paradoxically lead to higher energy consumption and CO_2 emissions specifically for the firms that are new or naïve about new green technologies. This result also supported by other reserch that If not properly managed, the implementation of green practices, like the adoption of resource-intensive eco-friendly technologies, could lead to unintended consequences, including an increase in CO_2 emissions (Pinto, 2020; Samad et al., 2021).

According to analyses, Green Supply Chain Practices increase Reverse Logistics effectiveness (H6 is supported). According to path analysis, Table 2, resutls are statististically significant ($p < 0.000$) and Standardized ß equals to .330. in other words, every one-point increase in green supply chain activities can increase reverse logistics activities almost 0.33 points. Greening both forward logistics links and reverse logistics systems in the supply chain is essential for sustainable performance (Liang et al., 2019). Reverse logistics is considered the most important and complex activity within a green supply chain, emphasizing its significance in enhancing competitiveness (Aćimović et al., 2020; Weeratunge and Herath, 2017).

H7 is hypothesized Reverse Logistics reduces production-based CO_2 emissions. According to Table 2, $p < 0.024 < 0.05$, Standardized ß = -0.206, every one-point increase in reverse logistics activities decreases CO_2 emissions in production by 0.2 points. This result is very important and interesting that green supply chain management increases CO_2 emissions of the production whereas reverse logistics acts as counter. Green supply chain management (GSCM) and reverse logistics are two essential concepts in modern organizational sustainability practices. However, green supply chain management aims to minimize the environmental impact of the entire supply chain while enhancing economic and environmental performance (Tang and Wang, 2021). On the other hand, reverse logistics focuses on managing product returns,

recycling, and reusing processes to reduce waste, lower disposal costs, and decrease CO_2 emissions. Green supply chain management focuses on implementing environmentally friendly practices across the supply chain, including green procurement, eco-design, and distribution, as well as reverse logistics, which involves managing returns, recycling, and remanufacturing to minimize waste and optimize resource use (Aćimović et al., 2020; Shafique et al., 2017; Weeratunge et al., 2017). Thus, green supply chain management aims to improve overall environmental sustainability by integrating green practices across the supply chain rather than production, reverse logistics focuses on managing the pre-consumer phase of products to minimize waste and emissions. A well-designed reverse logistics network can optimize product reuse and recycling, balancing costs and carbon emissions to enhance environmental performance (Yu and Solvang, 2016).

6. CONCLUSION

This study discusses the relationship between institutional pressures, individual adaptive performance, green and reverse logistics and production-based CO_2 emissions by structural equation modeling (SEM) to test hypotheses related to research model. The results show that institutional pressures do not have a significant effect on green supply chain practices in emerging countries like Türkiye, but there is a positive relationship between institutional pressures and reverse logistics. Additionally, the study supports the idea that adaptive individual performance contributes to both green supply chain management and reverse logistics performance. The literature cited emphasizes the importance of regulatory pressures in driving firms to adopt reverse logistics processes to comply with environmental regulations and sustainable practices. Overall, the resuls highlights the complex relationship between institutional pressures, adaptive performance, and their impact on green supply chain and reverse logistics practices.

In conclusion, our study delves into the intricate dynamics of green supply chain management (GSCM) and reverse logistics within the context of emerging countries, with a special focus on Turkiye. Through the application of SEM for hypothesis testing, we uncover nuanced insights into the role institutional pressures play in shaping green supply practices and reverse logistics. Our findings illuminate the complex interplay between regulatory frameworks, organizational adaptability, and the strategic imperatives of GSCM. While institutional pressures were found to have a negligible effect on the adoption of green supply practices, they significantly influence the implementation of reverse logistics, underscoring the importance of legal compliance and adaptive performance in enhancing GSCM outcomes. By integrating empirical evidence with theoretical insights from recent literature, this study contributes to a deeper understanding of the factors driving GSCM and reverse logistics in emerging economies, offering valuable implications for practitioners and policymakers aiming to foster sustainable supply chain practices.

There are some limitations for this research. First, the study's focus on a single case study in Türkiye, while providing valuable insights, may limit the broader applicability of its findings. Case studies are inherently context-specific, and the unique socio-economic and institutional characteristics of Türkiye may not reflect the experiences of other countries or regions. The variability in institutional contexts across different emerging markets can lead to divergent outcomes in the adoption of green supply chain practices, thus necessitating caution when generalizing the results of this study to other settings. Second, the methodology employed in the research, specifically the use of structural equation modeling (SEM) and SmartPLS, while robust, may impose certain constraints on the findings. The effectiveness of SEM is contingent upon having a sufficiently large and representative sample, which may not always be feasible in emerging markets where data availability can be limited. This raises concerns about the generalizability of the findings beyond the specific context of Türkiye, as the results may not be applicable to other emerging economies with different institutional frameworks and market conditions. Third, the focus on individual adaptive performance as a critical factor influencing green supply chain practices and reverse logistics introduces another layer of complexity. While individual performance is undoubtedly important, the broader organizational and systemic factors that also play a significant role in the adoption of sustainable practices. Lastly, the lack of clarity regarding the specific types of institutional pressures and their varying effects limits the ability to draw comprehensive conclusions about their overall impact on sustainable practices.

Future research should integrate technical and behavioral aspects of green supply chain management (GSCM) to improve organizational performance and environmental sustainability. This includes examining the interplay of green initiatives, emphasizing reverse logistics for product return and recycling.

Further research is needed to understand the impact of human resources in reverse logistics and their influence on system performance. This will help organizations optimize green supply chain practices and navigate institutional pressures, ensuring legitimacy and effectiveness in implementing sustainable practices.

Author Contributions
Saniye Yıldırım Özmutlu: Literature Review, Conceptualization, Methodology, Data Curation, Analysis, Writing-review and editing *Korhan Arun*: Literature Review, Writing-original draft, Methodology, Modelling

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No potential conflict of interest was declared by the authors.

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Compliance with Ethical Standards
For this study, the approval of the Tekirdağ University Social Sciences and Humanities Scientific Research and Publication Ethics Committee was obtained with the decision dated 28.08.2024 and numbered T2024-2108.

Ethical Statement
It was declared by the authors that scientific and ethical principles have been followed in this study and all the sources used have been properly cited.

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