

# Uncertain Supply Chain Management

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## The effect of green supply chain on sustainability: Evidence from the pharmaceutical industry

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### ABSTRACT

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This study came with the aim of identifying the impact of the green supply chain on sustainability. This research targeted managers at the senior and middle levels of the Pharmaceutical Industry in Jordan, as they were formulating the company's strategies and determining its policies. A purposive sample consisting of 258 managers was selected. To gather the data needed for the analysis, a self-report questionnaire was used formulated electronically through Google Forms. AMOS software was used to examine the research hypotheses. The study concluded that there was an impact of the green supply chain with its dimensions (Eco-Design, Green Distribution, Green Purchasing, Green Manufacturing, and Green Reverse Logistics) on sustainability. Based on this result, the researcher recommends pharmaceutical companies in Jordan to take green initiatives and the trends towards implementing a green supply chain approach that reduces the consumption of non-renewable resources and waste, and to establish special laws and regulations in the company that oblige employees to apply the green approach in their practices within the work.

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## 1. Introduction

Companies endure intense scrutiny from a wide range of stakeholders, including government authorities, labour, and non-profit organizations. Of course, this scrutiny exceeds the growing desire for more environmentally friendly activities from at least some customer categories (Alshawabkeh et al., 2022; Vachon & Klassen, 2006). Over the last decade, there has been a considerable increase in the pressure on manufacturing businesses to adopt environmentally friendly methods and generate environmentally friendly products (Al-Nawafah et al., 2022). Manufacturing companies have acknowledged the relevance of their supply chain partners in environmental management. As a result, many manufacturing companies have turned to their suppliers and consumers for creative solutions to environmental problems (Aityassine et al., 2022; Al-khawaldah et al., 2022; Vachon, 2007).

The growing concerns about climate change and the environment in recent years, along with the tensions arising from social inequalities and poverty issues, have shed light on sustainable development, as it is considered one of the popular topics that

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has drawn the attention of many academic researchers. Sustainable development was expressed as a resource investment to meet the needs of the present without compromising the future generations' ability to meet their own needs (Imperatives, 1987). Sustainability significantly influences consumer preference judgments for product attributes when provided with calculated environmental impact values for all product design configurations (Goucher-Lambert & Cagan, 2015). A strict set of sustainability criteria also increases the cost of producing energy crops (Smeets & Faaij, 2010). Quality and Sustainability Marks on Product Sensory Acceptance, Purchasing Intent, and Quality Perception of Quality and Sustainability Classified Products (de Andrade Silva, Bioto, Efraim, and de Castilho Queiroz, 2017). The affirmative influence of sustainability disclosure (environmental, social, and governance) on the company's value was also noted.

GSCM has also been starting to gain wide admission, especially in emerging economies such as China and Malaysia (Laosirihongthong, Adebajo & Choon Tan, 2013). External Green Supply Chain Management (GSCM) practices i.e., "Customer Collaboration" (CC) and "Green Procurement" (GP) affect the environmental performance (EP) of organizations (de Sousa Jabbour, Vazquez-Brust, Jabbour & Latan, 2017). The results showed positive and significant effects of green supply chain practices (green manufacturing, green information systems, customer collaboration, and environmental design) with the exception of green purchasing in predicting business organizational performance (Khan & Qianli, 2017). Indeed, the follow of GSCM practices by manufacturing organizations progress environmental and economic performance alike, which positively reflects on operational performance and the whole organizational performance (Green, Zelbst, Meacham & Bhaduria, 2012). Moreover, the Management of the Green Supply Chain (GSCM) has substantial leverage on the total environmental performance of any firm utilizing advanced supply chain operations, and could also improve sustainability outcomes (Chin, Tat & Sulaiman, 2015). Based on a review of the theoretical literature related to the impact of the green supply chain on sustainability, it was evident that there is a gap in the Arabic literature that relates these two variables together. Hence, the current study sought to identify the impact of the green supply chain on sustainability.

## 2. Theoretical foundation and hypotheses building

### 2.1 Green supply chains

In the past many years, environmental and ethical responsibilities have been incorporated as huge strides into the cultural foundations of today's business world (Al-Quran et al., 2020). With the growing interest in such responsibilities, numerous companies have been determining "greening" initiatives as competitive strategic approaches (Min & Kim, 2012). Green Supply Chain Management (GSCM) is acquiring raised attention in the research sphere and among practitioners of operations management. The increasing significance of Green Supply Chain Management (GSCM) is fundamentally driven by the progressive environmental deterioration, for instance, diminishing raw material, flooding of waste sites, and increasing pollution levels (Srivastava, 2007).

Supply chain management (SCM) is the coordination and management process of the complicated network of relationships that aim to deliver an appropriate product to the end-user or consumer (Ninlawan et al., 2010). Green Supply Chain Management is also a connotation of the incorporation of environmental considerations into Supply Chain Management (SCM) (Chin, Tat & Sulaiman, 2015). Kumar et al. (2011) defined Green Supply Chain Management (GSCM) as an approach aimed at the comprehensive optimization of material and information flows along the value chain. Likewise, Green Supply Chain Management (GSCM) emerges as a managerial axiom aimed at generating company profit while maintaining environmental efficiencies for the complex processes involved in each stage of the product life cycle (Barari, Agarwal, Zhang, Mahanty & Tiwari, 2012). GSCM was also defined as "the process of using environmentally friendly inputs and transforming these inputs into outputs that can be reclaimed and reused at the end of their life cycle", thus creating a sustainable supply chain (Dube & Gawande, 2011). GSCM has been determining a proactive path to enhance the environmental achievement of processes and products that fulfil the requirements of environmental regulations (Hsu & Hu, 2008). Recently, it has emerged as a significant organizational philosophy and proactive strategy for dominating the potential environmental risks (Diabat et al., 2013).

Vachon and Klassen (2006) identified green practices for the supply chain in two sets of environmental activities represented by environmental cooperation and environmental monitoring. de Sousa Jabbour et al. (2017) noted that external green supply chain management practices are "Cooperation with Customers" (CC) and "Green Purchasing" (GP). Laosirihongthong et al. (2013) included green purchasing practices, eco-design practices, reverse logistics practices, and legalization and regulation. GSC practices are also measured by three variables, including green transportation, green distribution, and green purchasing (Khan, Qianli & Zhang, 2018). GSCM practices include (Chin, Tat, & Sulaiman, 2015) green procurement, green manufacturing, green distribution, and green logistics. It was agreed with (Mutingi, Mapfira & Monageng, 2014) and (Ninlawan et al., 2010). Green supply chain practices were measured by five variables, including green manufacturing, green purchasing, and green information systems. Information systems, cooperation with customers, and eco-design (Khan & Qianli, 2017). Accordingly, in this research, it relied on the dimensions of green practices of the supply chain, represented in eco-design, green distribution, green purchasing, green manufacturing, and green reverse logistics.

Environmental design is the systematic incorporation of environmental factors into product design and development (Tukker, Eder, Charter, Haag, Vercauteren & Wiedmann, 2001). Distribution also refers to the movement of the product from the production stage to the customer in the supply chain, and green practices in distribution range from reducing the scale of non-renewable energy sources and ozone-harmful substances used in assembly and recycling to an expanded focus on land during transportation (Mumbi, Karanja & Kiarie, 2021). Green procurement practices are the company's adjusting its demands

towards greener products (such as designing disassembly and recycling products), selecting suppliers that offer environmentally friendly products in a greener method (such as reducing waste and ISO certification), and working collaboratively with suppliers in order to improve green performance (e.g., joint planning activities and supplier engagement) (Blome, Hollos & Paulraj, 2014). That is, ensuring that the purchased things have environmentally desirable characteristics, such as the absence of hazardous components and their reusability. Green manufacturing is defined as a system that incorporates product and process design challenges that affect manufacturing planning and control in a way that identifies, estimates, and streams environmental waste with the goal of minimizing environmental effect while simultaneously maximizing resource efficiency (Maruthi & Rashmi, 2015). Green reverse logistics is a form of reverse logistics that protects the environment. It is used as a tool for scheduling and designing the production flow and controlling end-of-life products (used and destroyed) to improve the level of recovery of used products and return them from the consumer to the producer for recycling, refurbishment, maintenance or disposal. This includes ways that maintain the stability of the environment and not deplete it by reducing pollution and waste products.

## 2.2 Sustainability

The idea of sustainability arose from a series of gatherings and reports during the 1970s and 1980s and was as persuasive to natural events and disasters as concerns about material pollution and asset depreciation (Rajput & Datta, 2020). In the past two decades, networks of various activators have been formed, alliances have been also built, and specialist institutions and organizations have been established. Further, numerous projects have been applied and huge money has been spent to promote awareness of sustainability (Scoones, 2007). In the recent survey, which data was collected from 18 countries in the last quarter of 2014, attention to environmental issues increased more than in 2012, as well as it indicated that the developing countries were likely to adopt sustainable consumption habits. India, China, South Korea, and Brazil were examples of some of the countries at the top of the list of more sustainable consumers (de Sousa Jabbour, Vazquez-Brust, Jabbour & Latan, 2017). Sustainable development also adopts a triple outcome of its dimensions, represented in social sustainable development, environmental sustainable development, and sustainable economic development.

The core significance of sustainability in the corporate environment is reflected in the turnout from investors who are looking for companies that consider sustainability as a part of their best practices. The behavior of these investors tends to indicate an implicit expectation that their investment performance will eventually improve (de Francesco & Levy, 2008). Siegrist & Hartmann (2019) indicated that increasing consumer knowledge about the environmental impact of food may lead to the consumption of more sustainable foods. Shou, Shao, Lai, Kang & Park (2019) showed that the orientation towards sustainability promotes sustainable supply management practices (SSM). The results of the study (Abdi, Li & Càmara-Turull, 2020) supported the positive relationship between the degree of the two pillars of sustainability (environment and governance) and market value and the company's financial performance. The study (Bodhanwala & Bodhanwala, 2018) reveals an important positive relationship. Between sustainability and company performance (return on invested capital, return on equity, return on assets, and return on equity), it also indicates that companies that practice significant sustainable development strategies report higher profitability. Number et al. (2019) showed that sustainability management that seeks to raise financial performance should proactively pursue quite high levels of corporate sustainability to meet the investors and other stakeholders needs. It was found (Yu & Zhao, 2015) that sustainability performance has a positive relationship with company value. (Eccles, Ioannou & Serafeim, 2014) indicated that the sustainable companies' performance has a noticeable higher than other companies in the long horizon, especially in their stock market and accounting outcomes. As confirmed by (Schindler, Graef, König, Mchau, Saidia & Sieber, 2016), however, a sustainable development path that considers social, economic, and environmental issues simultaneously could enhance food security.

## 2.3 Green supply chains and sustainability

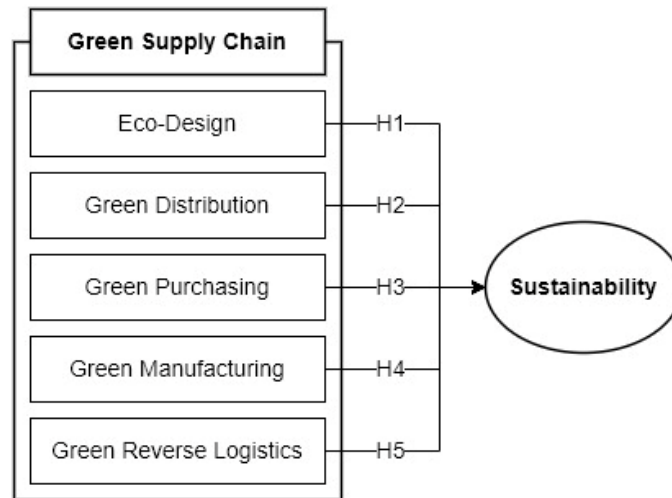
Green supply chain initiatives play a substantial role in obtaining the "triple sum" of social, environmental, and economic benefits, thus supporting the sustainable evolution of society (Eltayeb & Zailani, 2009). Foo et al. (2018) also highlighted sustainable supply chain management practices (GSCM) as a strategic approach to achieve sustainability performance, as well as it was found that the relation among supplier selection and supplier evaluation with sustainability performance is not significantly important. Although cooperation with customers is highly related with sustainability practices, it is negatively related to sustainability performance. The goal of (Khan, Zhang, and Nathaniel, 2020) study is to determine the relationship between green logistics operations as part of green supply chain performance and economic and environmental sustainability indicators. Its result indicated that green logistics businesses had a positive relationship with foreign direct investment flows, renewable energy consumption, and energy demand. However, it demonstrated that there was a significant negative relationship with carbon dioxide emissions. Green logistics is being driven by foreign direct investment and renewable energy, both of which improve environmental sustainability.

Singh et al. (2020) provided evidence of how Green Supply Chain Management (GSCM) impacted lean practices, specifically those related to Kaizen and innovation management practices, on organizational sustainability. They pointed out the negative potential of Kaizen Group, innovation management, and government policies on the environmental comprehension of the supply chain members. Although the innovation and Kaizen management strategies individually had a favourable impact on the environmental supply chain, the government policies should be reviewed to improve this impact on environmental considerations achievement based on supply chain practices oriented to reducing pollution. Economic performance,

environmental performance, and competitive performance are also significantly improved by implementing Kaizen and innovation management through the Green Supply Chain Management GSCM (Metabis, A., & Al-Hawary, 2013). Environmental cooperation in a green supply chain environment, according to Jo and Kwon (2022), it is a major driver of green innovation capability for Korean manufacturing-based SMEs. Moreover, Green innovation was discovered to have a favourable impact on financial success via environmental performance. It provided a theoretical foundation for a thorough investigation of the systematic mechanisms of green supply chains and their recommended strategic paths for appropriate implementation of manufacturing-based GSCM Green Supply Chain Management. Yu, Golpıra, and Khan (2018) argued that green logistics indicators have a high positive correlation with green energy sources, FDI flows, and trade openness. However, they noticed that these indicators have a negative relationship with greenhouse gas emissions and carbon emissions. Furthermore, they considered renewable energy as a driving force behind green logistics and supply chain operations that promote environmental and economic sustainability. Based on the above, we can build the research hypothesis as:

**Main hypothesis:** *There is an impact of green supply chains on sustainability.*

Fig. 1 shows the structure of the proposed study.



**Fig. 1.** Research model

## 4. Research Method

### 4.1 Population and sample

Data related to the impact of the green supply chain on sustainability were collected from four pharmaceutical companies in Jordan. This research targeted managers at the senior and middle levels, as they are formulating the company's strategies and determining its policies. A purposive sample consisting of 420 managers was selected. The research questionnaire was sent to them via e-mail, and they were asked to return it within a week. Moreover, it was emphasized that the questionnaires will be treated with strict confidentiality. A total of 380 responses were received including 22 responses that contained incomplete answers or ambiguous information, therefore it was omitted from the analysed data. However, 258 responses were kept valid for analysis with a response rate of 61.43%.

Among the valid responses, it was found that 77.90% of them were males, while 22.1% were females. Regarding age, most of the responses 80.62% were in the category "less than 40", followed by 11.62% within the category "40-less than 50", and finally 7.76% of those within the category "50 or older". Moreover, most of the respondents were well educated, as the results showed that 47.67% of them obtained a master's degree, 32.94% obtained a bachelor's degree, and 19.84 obtained a PhD degree.

### 4.2 Measures

According to the research objectives, a model has been developed that includes an independent variable represented by the green supply chain and a dependent variable which is sustainability. To gather the data needed for the analysis, a self-report questionnaire was used that was formulated electronically through Google Forms. All elements of this survey were originally developed in English, as specialists were invited to translate them into Arabic and then back into English using common reverse translation procedures. The survey included a section to determine the demographic characteristics of the research sample (gender, age, education level), which were categorical variables, in addition to two sections allocated to the main research variables in which responses were determined using the five-point Likert scale.

*Green supply chain*: this variable was measured through 22 items adapted from Khanet al., (2022). This scale was used to assess respondents' perceptions of implementing green supply chain practices of the pharmaceutical companies in Jordan. The green supply chain was discussed as a second-order construct divided into six first-order constructs. Eco-design was measured by four items “e.g., a company strives to design products that can be recycled and recover their materials and components”. Green distribution was measured through five items “e.g., company uses recyclable boxes when distributing products in the markets”. Green purchasing was measured using four items “e.g., company focuses on environmental audit procedures to assess and manage supplier relationships”. Green manufacturing was measured by four items “e.g., company emphasizes an operational strategy that minimizes waste and optimizes resource investment”. Green reverse logistics was measured by five items “e.g., company follows a policy of selling scrap and redundant capital items”.

*Sustainability*: This variable was measured through 9 items that correspond to Alshehhi et al. (2018). This scale was used to assess respondents' perceptions of the extent to which pharmaceutical companies in Jordan were aware of the requirements to achieve sustainability. Sustainability was discussed as a first-order construct that includes “e.g., company develops production methods that consume less energy, and company is active in community circles by supporting charities”.

## 5. Research Results

### 5.1 Measurement model evaluation

A confirmatory factor analysis (CFA) was conducted to evaluate the measurement model for examining the impact of green supply chain on sustainability. CFA is widely used in similar research to determine the validity and reliability of the research instrument used in collecting primary data (Keith, 2019). This technique depends on the covariance matrix and the maximum likelihood method in calculating the convergent and discriminant validity, along with the composite reliability for all first-order constructs using in the research. Table 1 reported the results of these indicators.

**Table 1**  
Tests of validity and reliability

Constructs	Codes	Lod.	AVE	MSV	$\sqrt{\text{AVE}}$	CR.
Eco-design	EDE1	0.739	0.579	0.405	0.761	0.846
	EDE2	0.715				
	EDE3	0.772				
	EDE4	0.813				
Green distribution	GDS1	0.706	0.605	0.483	0.778	0.884
	GDS2	0.831				
	GDS3	0.792				
	GDS4	0.751				
	GDS5	0.803				
Green purchasing	GPU1	0.730	0.595	0.346	0.771	0.854
	GPU2	0.761				
	GPU3	0.776				
	GPU4	0.816				
Green manufacturing	GMA1	0.671	0.565	0.462	0.751	0.838
	GMA2	0.799				
	GMA3	0.746				
	GMA4	0.786				
Green reverse logistics	GRL1	0.718	0.545	0.411	0.738	0.857
	GRL2	0.737				
	GRL3	0.708				
	GRL4	0.712				
	GRL5	0.811				
Sustainability	SUS1	0.764	0.594	0.475	0.771	0.929
	SUS2	0.824				
	SUS3	0.805				
	SUS4	0.767				
	SUS5	0.725				
	SUS6	0.761				
	SUS7	0.758				
	SUS8	0.712				
	SUS9	0.815				

The results presented in Table 1 indicated that the association of the observed variables with their latent construct expressed by the item loadings were within the range (0.671-0.824). The values of average variance extracted (AVE) were greater than

the 0.50 minimum threshold adopted for this indicator. Hence, these values confirm the convergent validity of the research instrument, since the values of the indicators exceed the minimum limits mentioned by (Webber et al., 2020). Moreover, Heterotrait-Monotrait ratio of correlations (HTMT) showed that the values of AVE were superior to all values of maximum shared variance (MSV), as well as it demonstrated that the square root of AVE was higher than all correlation coefficients between the research constructs. Therefore, the research instrument was considered to have discriminant validity according to (Yusoff et al., 2020). Regarding reliability, the McDonald's Omega coefficients that ranged within (0.838-0.929) indicated appropriate composite reliability levels, as they exceed 0.70 the minimum recognized threshold for this indicator.

5.2 Descriptive analysis

The means, standard deviations, and correlation coefficients among the search variables were listed in Table 2. Means were used to determine the trend of respondents' perceptions of the research constructs, while standard deviations measured the dispersion of answers and the difference in perceptions. Moreover, Pearson's correlation coefficients played a key role in emphasizing that the data was free of multicollinearity.

**Table 2**  
Descriptive statistics and correlation

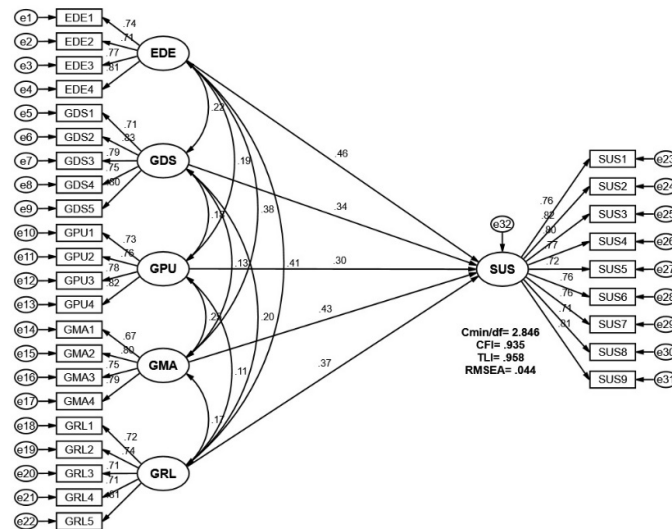
Constructs	M	SD	1	2	3	4	5	6
1. Eco-design	3.78	0.814						
2. Green distribution	3.64	0.703	0.465***					
3. Green purchasing	3.75	0.866	0.402**	0.398*				
4. Green manufacturing	3.62	0.931	0.480***	0.476***	0.419**			
5. Green reverse logistics	3.70	0.657	0.415**	0.426**	0.405*	0.442***		
6. Sustainability	3.58	0.773	0.522***	0.572***	0.551***	0.498***	0.581***	

**Note:** \*  $P < 0.05$ , \*\*  $P \leq 0.01$ , \*\*\*  $P \leq 0.001$ .

According to the results in Table 2, the relative importance levels of green supply chain constructs were within the high and moderate levels, where eco-design (M= 3.78, SD= 0.814) was ranked first at a high level, followed by green purchasing (M= 3.75, SD= 0.866) at a high level, then green reverse logistics (M= 3.70, SD= 0.657) which was in the third rank with a high level. Despite this, green distribution (M= 3.64, SD= 0.703) was ranked fourth with a moderate level, and green manufacturing (M= 3.62, SD= 0.931) was ranked last with the same level of relative importance. Sustainability (M= 3.58, SD= 0.773) was within the moderate relative importance level. Furthermore, all correlation coefficients between the research constructs were statistically significant, although they did not exceed the value ( $r = 0.581$ ). Hair et al. (2019) pointed that correlation coefficients that do not reach the limit of 0.80 are an indication that we have no multicollinearity problem. Therefore, the green supply chain constructs were autonomous, and the problem of multicollinearity did not affect the research results.

5.3 Hypotheses testing

In this study, AMOS software was used to test the hypotheses that included the impact of the green supply chain dimensions on sustainability of the pharmaceutical industry in Jordan. Figure 2 illustrates the structural model used to test the research hypotheses.



**Fig. 2.** SEM for the impact of green supply chain on sustainability

It is clear from the results in Figure 2 that the chi-squared ratio to the degrees of freedom (Cmin/df) was 2.846 which is less than 3. The values of CFI and TLI were respectively 0.935 and 0.958 which are above the 0.90 threshold. In addition, the value of RMSEA was 0.044 which is less than 0.08 the upper bound for this indicator. Based on these results, the model for measuring the impact of the green supply chain dimensions on sustainability was suitable for the research data and had good construct validity (Savalei, 2021). Table 3 presented the extracted effect coefficients to judge the research hypotheses.

**Table 3**  
Structural equation modeling for direct effect

Path			Estimate	S.E.	$\beta$	t	p
Eco-design	→	Sustainability	0.511	0.062	0.461	8.242***	0.000
Green distribution	→	Sustainability	0.350	0.068	0.344	5.147**	0.008
Green purchasing	→	Sustainability	0.325	0.074	0.297	4.392*	0.03
Green manufacturing	→	Sustainability	0.453	0.071	0.428	6.380***	0.000
Green reverse logistics	→	Sustainability	0.402	0.077	0.372	5.220**	0.005

**Note:** \*  $P < 0.05$ , \*\*  $P \leq 0.01$ , \*\*\*  $P \leq 0.001$ .

The first hypothesis (H1) expected that eco-design positively impacts sustainability. Table 3 showed the results of testing this hypothesis, where the eco-design effect coefficients on sustainability were ( $\beta = 0.461$ ,  $t = 8.242$ ,  $P = 0.000$ ), therefore this hypothesis was supported. The second hypothesis (H2) argued that green distribution positively impacts sustainability. The results showed that the effect coefficients of green distribution on sustainability were ( $\beta = 0.344$ ,  $t = 5.147$ ,  $P = 0.008$ ), which was evidence to support this hypothesis. As for the third hypothesis (H3), it was considered that green purchasing had a positive impact on sustainability. The results indicate that the effect coefficients related to testing this hypothesis were ( $\beta = 0.297$ ,  $t = 4.392$ ,  $P = 0.03$ ), which was an indication of support for the hypothesis, and green purchasing positively impacts sustainability.

Besides, the fourth hypothesis (H4) considered that green manufacturing had a positive impact on sustainability. The results indicated that the effect coefficients for examining this relationship were ( $\beta = 0.428$ ,  $t = 6.380$ ,  $P = 0.000$ ), which is considered evidence to support the hypothesis, and green manufacturing had a positive impact on sustainability. The fifth and last hypothesis (H5) argued that green reverse logistics had a positive impact on sustainability. The results of the effect coefficients ( $\beta = 0.372$ ,  $t = 5.220$ ,  $P = 0.005$ ) confirmed supporting this hypothesis.

## 6. Discussion

This study found an impact of the green supply chain with its dimensions (Eco-Design, Green Distribution, Green Purchasing, Green Manufacturing, and Green Reverse Logistics) on sustainability, and this is due to the fact that green practices allow the management of companies to increase sustainability opportunities by working in ways that limit environmental degradation, such as decreasing raw material resources, increasing pollution levels, and flooding waste sites, and that supply chains are the most important part of industrial organizations, as they gain their importance from their large size compared to the rest of the organization, in light of this, and with the growing demand for greener companies, green practices have been integrated into supply chain activities, resulting in many practices such as Eco-Design, which integrates environmental factors into the basic design and development of the product, contributing to sustainable environmental development, as well as Green Distribution, which reduces energy consumption from non-renewable sources, preserving the environment. It also minimizes the emissions of ozone-depleting gases from machinery used in distribution, such as vehicles and others, which helps to preserve the environment from pollution and hence the ozone layer from further damage.

Green Purchasing also works towards verifying the selection of environmentally friendly materials before purchasing them, such as purchasing reusable and recyclable products or materials made from renewable and non-hazardous resources, and this supports sustainable development, while green manufacturing contributes to achieving sustainability through product design. Practicing environmentally friendly manufacturing processes such as design, planning, operations, and control of the manufacturing process in a way that reduces the consumption of non-renewable resources, encourages the use of renewable resources such as solar energy and wind energy, and reduces the flow of waste, reduces the negative impact on the environment and helps its sustainability. Green Reverse Logistics also contributes to sustainable development by collecting used or damaged goods and reusing or recycling them, thus minimizing the use of non-renewable resources. This contributes to long-term growth.

This study accords with the study of Khan et al. (2020), which found a positive association between green logistics operations as part of the performance of the green supply chain and economic and environmental sustainability indices. Yu et al. (2018) provided insight into the association between green logistics performance as part of green supply chain performance and economic and environmental indicators at the national level. Eltayeb and Zailani (2009) also showed that green supply chain initiatives can play an important role in achieving the "triple bottom line" for social, environmental, and economic benefits, thus contributing to the sustainable development of society. Jo & Kwon (2022) find that environmental cooperation in a green supply chain environment is an important driver of green innovation capacity for Korean manufacturing-based SMEs. It was

also found that the ability of green innovation has a positive impact. It was also found (Cankaya & Sezen, 2018) that all eight dimensions of GSCM green supply chain management are related to at least one of the dimensions of sustainability performance, except for green procurement. Singh et al. (2020) revealed the importance of green supply chain management (GSCM) and its impact on lean practices, specifically Kaizen and innovation management practices, on organizational sustainability. Foo et al. (2018) highlighted GSCM practices as strategies for achieving sustainability performance.

### 7. Recommendations, limitations, and future research.

The study found an impact of the green supply chain (Eco-Design, Green Distribution, Green Purchasing, Green Manufacturing, and Green Reverse Logistics) on sustainability. Based on this result, the researcher recommends pharmaceutical companies in Jordan to take initiatives green and the trend towards implementing a green supply chain approach that reduces the consumption of non-renewable resources and waste, and to establish special laws and regulations in the company that oblige employees to apply the green approach in their practices within the work; we also recommend periodic monitoring within the company to ensure that everyone adheres to the company's regulations and laws for green initiatives.

The study focused on the influence of the green supply chain on sustainability, but another study may look at the impact of the green supply chain on organizational performance, firm competitiveness, or company image. The study dimensions the green supply chain (Eco-Design, Green Distribution, Green Purchasing, Green Manufacturing, Green Reverse Logistics), and another study can add "Cooperation with Customers" (CC), and legislation and regulation, or to deal with environmental cooperation and environmental monitoring. The study dealt with the variable of sustainability as a whole. Another study can deal with sustainability in its dimensions represented by the economic, social, environmental, and governance dimensions, or address one of the dimensions alone, as the study dealt with pharmaceutical companies as a population for the study, another study can deal with car factories.

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