JOURNAL OF THE AMERICAN INSTITUTE
ISSN: 3066-3776
United States

# Investigating Environmental Performance and Competitive Advantage with the perspective of Green Supply Chain Management

**Rana Umer Farooq**[1]

Email Correspondent: ranaumerf@gmail.com

**Keywords:**
Green Supply Chain Management (GSCM), Environmental Performance (EP), Competitive Advantage, Environment Management System, Firm Size.

**Abstract**

Green supply chain management is a modern practice adopted by manufacturing firms having greater influence on environmental sustainability. This study, based on the resource-based view theory, advances in the current debate by determining the impact of GSCM practices and moderating role of environment management system and firm size on environmental performance by leading towards the competitive advantage. By using questionnaire as a tool and taking purposive sampling of 209 organizations of Punjab, Pakistan, this study tried to fill the gaps of previous literature and determined the influence of five dimensions of GSCM practices (green design, green purchasing, green manufacturing, green distribution and packaging and green marketing) on environmental performance and competitive advantage. The results revealed that GSCM dimensions influence directly to the environmental performance and indirectly to the competitive advantage for large sized firms while this response is dull in case of small size firms while effective environment management system accelerates the strength of these relationships. This study contributes theoretically by providing a lens to judge the GSCM and EP relationship in the context of firm size and provide guidelines to industrial practitioners for implementing GSCM strategies in order to get long-term competitive advantage under the umbrella of environmental sustainability.



## INTRODUCTION

Plastic industry is growing day and night due to its eco-friendly nature. In Pakistan, this industry is equipped with all modern manufacturing plants to contribute a major portion in GDP of Pakistan (15%). Its manufacturing sector consist of approximately 11000 small, medium and large processing units (Punjab Board of Investment & Trade, 2020). In Pakistan, the plastic manufacturing sector significantly contributes to environmental challenges due to substantial waste generation and resource consumption. This scenario underscores the imperative for adopting Green Supply Chain Management (GSCM) practices to mitigate environmental impacts and enhance organizational performance (R. U. Khan et al., 2023). The idea of supply chain management was initiated in 1950s and organizations incorporated green concept in their inventory chain in 1990s (Abdallah & Al-Ghwayeen, 2020). The trend of green concept in customer market and regulations of government

[1] Department of Business Administration, Superior University, Lahore, Pakistan, ranaumerf@gmail.com

bodies are compelling the organizations to adopt ecological perspective in their supply chains (Lin & Ho, 2011). So, the green supply chain management (GSCM) is relatively a bright idea in market to avoid violations and degradations (Kirchoff et al., 2016). GSCM can be stated as a parameter to improve environmental performance by upgrading its supply chain in terms of its product design, operational activity management and customer relationship by the integration of all organizational processes to ultimately satisfy the consumer (Pourjavad & Shahin, 2018). For instance, a study on Pakistani manufacturing firms found that GSCM practices positively influence environmental performance, with institutional pressures acting as a significant moderator in this relationship (Nazir et al., 2024). Another research indicates that GSCM practices have a positive impact on green innovation, environmental performance, and competitive advantage (S. J. Khan et al., 2021).

On the other hand, manufacturing firms are the key contributors for emerging environmental issues which are disturbing health and safety measures for the workers and surrounding (Ahmed et al., 2018; Beamon, 1999). So, due to this industrialization, global warming has adverse effect on the environment which is of major concern for the world and nations across the globe are paying attention to reduce this severe impact on environment (Sharma & Gandhi, 2016). Supply chain is also in line with this impact by having resource consumption activities so all regulations and law mainly focus on manufacturing units to accept the agenda of energy saving (Zhu et al., 2017). So environmental challenges and worldwide regulations are compelling the manufacturer to shift their activities towards environment friendly ecosystem, called sustainability by adopting green supply chain management activities revealing the modern concept of supply chain which was specifically concerned with reduced cost and improved services instead of considering environmental aspects. However, with the passage of time, the companies are now designing environment conscious supply chain systems, due to many factors like peer pressure, epigonic forces (Dubey et al., 2017). Thus, these contributors are enhancing organizational competitiveness (Zhu et al., 2012).

Over the last few decades, the trend for GSCM is appreciable and many organizations in world have been implemented it as a tool to enhance their competitive edge in market (Dubey et al., 2017), by working on environmental objectives and included it in their agenda through improving the practice of recycling, sustainable sourcing and remanufacturing (Al-Sheyadi et al., 2019).

On the other hand, firm size may also play a role, with larger firms possibly having more resources to implement comprehensive GSCM practices, while smaller firms might exhibit greater flexibility and innovation in adopting such practices. A study examining the relationship between GSCM and corporate performance among listed firms in Pakistan highlights the significance of these factors (Tarek et al., 2022). Thus, in developing countries, concept of GSCM is well understandable and successfully implemented, but in Pakistan, its linkage is at initial level. Collective stress and environmental reserve community is demanding the organizations to implement GSCM practices to make the pollution and global warming controllable. So, due to limited research on GSCM practices and its specific impact on environmental performance in order to get competitive advantage, a small amount of industry is implementing it (Sarwar et al., 2021). Therefore, this research has the objectivity to dig out environmental performance of the industry after implementing green concept of supply chain which will ultimately lead the organization to attain competitive advantage. For this research, plastic manufacturing industries of Pakistan, have been considered to measure the effect of GSCM practices on environmental performance and competitive advantage and since there exist small, medium and large scale industry so this factor will add value in it respectively. Moreover, deep roots of GSCM have been investigated by considering five dimensions of GSCM which are green design, green purchasing, green manufacturing, green distribution and packaging and green marketing, which will have its significant impact on environmental performance leading towards competitive advantage. The above mentioned dimensions were also investigated in literature to establish a strong

relationship with environmental performance and competitive advantage (Uddin, 2021) by highlighting the opportunities to incorporate new directions to make it more established especially within the context of other demographic regions like Pakistan. Furthermore, literature reflects that GSCM has a significant impact on environmental performance in the presence of an important variable firm size which stimulates the relationship positively (Fianko et al., 2021), so there has been found a gap to illustrate resource-based view theory with the perspective of GSCM dimensions having influential effect on competitive advantage within the consideration of firm size, as different sized industries will have a different influence on environmental performance. So, there is a need to relate theoretical foundations to illustrate the impact as mentioned above. Therefore, by implementing GSCM practices, industries depending upon their size, will be able to select suppliers on eco-friendly basis and minimize environmental risk associated with their supply chain activities through enhanced business opportunities and be able to compete in the market.

So, above all discussions track to determine the following objectives:

O1- To investigate the effect of green supply chain management (GSCM) practices on environmental performance.

O2- To investigate the moderating role of environment management system (EMS) between GSCM practices and environmental performance.

O3- To investigate the moderating role of firm size (FS) between GSCM practices and environmental performance.

O4- To investigate the effect of GSCM practices on competitive advantage through environmental performance.

The outcomes of these objectives will contribute to the existing literature by linking GSCM practices to competitive advantage especially in the context of Pakistan, where plastic sector is divided into small, medium and large size. In addition to it, this study contributes that how GSCM practices improve environmental performance and competitive advantage indirectly and the extent to which environment management system and firm size moderates the relationship strength especially for the case of plastic industry demographically surrounded in the area of Pakistan. This study will definitely add a direction to understand the theory of resource-based view where GSCM practices will relate its impact on environmental performance in the scenario of environment management system and firm size moderation and will connect its scope to cover competitive advantage for the case of under-developing country like Pakistan. Moreover, all level of management serving in plastic sector will be able to understand the concept of GSCM practices in their national level context and will appreciate their efforts to make the industry eco-friendlier and consumer attractive in the market. Furthermore, contribution of plastic sector industry to implement green concept will be appreciated on the basis of strong findings reflected by this study and thus, the overall image of country will establish an attractive package to minimize its effort to save the atmospheric blessings.

## METHOD

### Sample and data collection procedure:

Since plastic manufacturing industry is growing day by day and it has major contribution in GDP of Pakistan so study was sector specific to plastic manufacturing plants where extrusion-based production activities take place. Since environment management system is our core concern so list of certification bodies which are eligible to certify a company as per requirements of ISO 14001 was taken from accreditation body of Pakistan which is PNAC (Pakistan National Accreditation Council). There was total 9 certification bodies, eligible to make any company certified on environment management system (EMS). Researcher sent a request to those certification bodies for sharing a list

of extrusion-based plastic manufacturing organizations of Punjab, Pakistan. Out of nine, only five certification bodies shared their list while other four bodies refused. So, after compiling the list of those five certification bodies, 303 plastic manufacturing units were named out so population was those 303 companies which were EMS certified. Point of contact was established by taking the concern of environment management system and supply chain as a base for which some people respond and some referred to concern person in that organizations. After contacting relevant persons and inquiring either they were following green practices and strictly ensuring the rules and regulations of environment department, 267 organizations were sort out to be the sample size of this study using purposive sampling technique which were insured that those are willing to take part in this study and their responses will be kept confidential and will only be used for study purpose. Participant who will fill the questionnaire must have knowledge of their supply chain, EMS, and be designated as general manager, manager, officer or any other management post. Mode of communication used for questionnaire-based survey was telephone, email, postal and face to face interview and 219 organizations responded from which ten questionnaire was discarded due to incomplete filling while 209 were taken into account with a response rate of 82.02 %.

**Questionnaire and pre-test:**

Questionnaire was adapted from different studies like six-items for green purchasing (GRP) variable were adapted from Zhu et al. (2013), six-items for green design (GRD) construct from Zhu et al. (2010), five-items of environment management system (EMS) construct from (Zhu et al., 2013), six-items green marketing (GRMT) scale from by (Shang et al., 2010), green distribution and packaging (GRDP) construct from (Perotti et al., 2012), five-items environmental performance (EP) scale from (Chien & Shih, 2007) and five-items competitive advantage (CA) measurement were adapted from (López-Gamero & Molina-Azorín, 2016). 5-point Likert scale was used as a response evaluator, representing value 5 for low perceptional response (strongly disagree) and value of 1 for high perceptional response (strongly agree).

Content validity was assured by sharing the designed instrument with 3 managers of supply chain and environment within the industry and 2 assistant professors having specialized education in supply chain and business specialization. In addition to make it clearer, pilot testing was conducted by sending questionnaire to 30 respondents in order to seek their feedback and after their response it was observed that no amendment was required so it was finally implemented by sharing with relevant respondents comprising of 50 questions having section I with 7 questions for demographic and organizational information and section II with 43 questions related to scope of study.

Demographic findings showed that out of 209 participants, 83.3% (174) were male and 16.7% (35) were female. The majority of the employees were fall in two categories with 43.5% within 31 to 40 years and 28.7% within 41 to 50 years while remaining percentage of 15.3% falls within the age of 21 to 30 years and 12.4% with the age more than 50 years. In terms of qualification, 14.8% (31) of participants were matric pass, followed by 58.4% (122) with degree of graduation, 22.5% (47) had masters or post graduate diploma and the remaining 3.3% (7) were uneducated.

Meanwhile, 32 (15.3%) respondents were general managers by designation, 126 respondents were positioned as manager with the majority percentage of 60.3%, 38 (18.2%) were of officer rank and rest of them 13 (6.2%) were designated on other positions. As far as personal certification is concern, 55 (26.3%) respondents had EMS related certification in their past, 38 (18.2%) had QMS related certification, 50 (23.9%) had any other kind of personal certification while 66 (31.6%) had none of the personal certification. The results relating to their length of service, found that 11.5% (24) had one to three years job experience, 25.8% (54) of participants had 4–6 years of experience, while 34% (71) had 7–10 years of experience and remaining 28.7% (60) had 10+ years

of job experience in their respective firms.at the last, firm size as an important moderator exhibit that 50 (23.9%) respondents were working in small industry having employees in between 6 to 29, 75 (35.9%) were working in medium sized industry having employees in between 30 to 99 while remaining 84 respondents (40.2%) were going to work in large sized industry with employees more than 100 in their respective industries.

## RESULT AND DISCUSSION

Initially data was summarized on Microsoft excel and demographic information was analyzed using SPSS. PLS-SEM was used for testing of hypothesis and other validity measurements because it is widely used software now a days in all business perspectives. The study was conducted to investigate all constructs regarding the perspective of resource-based view by using PLS-SEM being assumed as flexible technique for model assessment (Ringle et al., 2005) and being able to proceed at less sample size as compared to other softwares like AMOS (Hair et al., 2017). Moreover, two techniques of PLS which are algorithm and bootstrapping are used to determine the outer (factor) loadings along with the testing of construct validity and consistency reliability (Ali et al., 2018) and path coefficients. So, firstly measurement calculations were performed and then structural model assessment was performed to reach out at final results.

### Common Method Biasness

Common method biasness (CMB) is a common error which can be produced in our data due to the reason that data was collected cross-sectionally and from management level employees. Past studies reflect that full collinearity test could be used to determine the extent to which data may be affected from this error while using structural equation modeling in PLS (Kock, 2015) so, variance inflation factors (VIF) were computed through full collinearity test. The cut-off value for VIF is 3.3 and if the values of our results lie above to 3.3 then there exist an error of CMB but in our case, all the values of VIF lie below the cut-off value, so it is assured that our data is not contaminated with the error of common method biasness. Therefore, we can claim that CMB is not an issue with our study and we may proceed for further empirical analysis.

### Measurement Model Assessment

In order to determine measurement model assessment, convergent validity was determined through the factors of outer loadings, average variance extract and competitive reliability. Table 1 shows that except few of the factor loading values, all other values are more than recommended value of 0.50 which is acceptable. Moreover, the factor having value below 0.5 are also deleted but that are not more than 20 % of the whole construct items. In case of composite reliability, the recommended value is 0.7 and it can be observed that all the values are exceeding from it. As far as average variance extract is concern, all the values are more than the recommended value of 0.5 (Sarstedt et al., 2021). On the other hand, discriminant validity was measured through Hetrotrait-Monotrait Ratio (HTMT) which can be seen that all the values are less than 0.85 which is a cut-off value (Kline, 2011) which confirms that discriminant validity is not the harm to our study.

**Table I.** Convergent Validity

| Construct | Items | Loadings | Cronbach's Alpha | CR | AVE |
|---|---|---|---|---|---|
| Competitive Advantage | CA1 | 0.743 | 0.804 | 0.746 | 0.732 |
| | CA2 | 0.662 | | | |

| | | | | | |
|---|---|---|---|---|---|
| | CA3 | 0.699 | | | |
| | CA4 | 0.751 | | | |
| | CA5 | 0.837 | | | |
| EMS | EMS1 | 0.818 | 0.883 | 0.875 | 0.791 |
| | EMS2 | 0.926 | | | |
| | EMS3 | 0.738 | | | |
| | EMS4 | 0.849 | | | |
| | EMS5 | 0.765 | | | |
| Environmental Performance | EP1 | 0.841 | 0.902 | 0.884 | 0.687 |
| | EP2 | 0.875 | | | |
| | EP3 | 0.826 | | | |
| | EP4 | 0.748 | | | |
| | EP5 | 0.783 | | | |
| Firm Size | FS1 | 0.782 | 0.792 | 0.901 | 0.698 |
| | FS2 | 0.685 | | | |
| | FS3 | 0.798 | | | |
| Green Design | GRD1 | 0.738 | 0.862 | 0.913 | 0.735 |
| | GRD4 | 0.749 | | | |
| | GRD5 | 0.785 | | | |
| | GRD6 | 0.839 | | | |
| Green Distribution and Packaging | GRDP1 | 0.807 | 0.879 | 0.873 | 0.576 |
| | GRDP2 | 0.867 | | | |
| | GRDP4 | 0.877 | | | |
| | GRDP5 | 0.768 | | | |
| | GRDP6 | 0.726 | | | |
| Green Manufacturing | GRMF1 | 0.682 | 0.911 | 0.764 | 0.627 |
| | GRMF2 | 0.839 | | | |
| | GRMF3 | 0.848 | | | |
| | GRMF4 | 0.795 | | | |
| | GRMF5 | 0.868 | | | |
| Green Marketing | GRMT1 | 0.786 | 0.828 | 0.902 | 0.72 |
| | GRMT2 | 0.718 | | | |
| | GRMT3 | 0.83 | | | |
| | GRMT4 | 0.792 | | | |
| | GRMT5 | 0.892 | | | |
| | GRMT6 | 0.832 | | | |
| Green Purchasing | GRP1 | 0.787 | 0.883 | 0.847 | 0.672 |
| | GRP2 | 0.723 | | | |
| | GRP3 | 0.831 | | | |
| | GRP4 | 0.795 | | | |
| | GRP5 | 0.843 | | | |
| | Green Design * EMS | 0.674 | | | |

| | |
|---|---|
| Green Design * FS_ | 0.536 |
| Green Distribution & Packaging * EMS | 0.753 |
| Green Distribution & Packaging * FS_ | 1.011 |
| Green Manufacturing * EMS | 0.603 |
| Green Manufacturing * FS_ | 0.942 |
| Green Marketing * EMS | 0.918 |
| Green Marketing * FS_ | 0.95 |
| Green Purchasing * EMS | 1.088 |
| Green Purchasing * FS_ | 0.964 |

Note: CR Competitive Reliability= and AVE=Average Variance Extract

Table 2. Discriminant Validity (HTMT Ratio)

| | CA | EMS | EP | FS_ | GRDEMSEP | GRDFSEP | GRDPEMSEP | GRDPFSEP | GRMFEMSEP |
|---|---|---|---|---|---|---|---|---|---|
| CA | | | | | | | | | |
| EMS | 0.845 | | | | | | | | |
| EP | 0.824 | 0.838 | | | | | | | |
| FS_ | 0.194 | 0.159 | 0.146 | | | | | | |
| GRDEMSEP | 0.489 | 0.454 | 0.532 | 0.048 | | | | | |
| GRDFSEP | 0.052 | 0.062 | 0.081 | 0.079 | 0.034 | | | | |
| GRDPEMSEP | 0.469 | 0.438 | 0.507 | 0.066 | 0.792 | 0.056 | | | |
| GRDPFSEP | 0.066 | 0.068 | 0.101 | 0.072 | 0.059 | 0.743 | 0.066 | | |
| GRMFEMSEP | 0.387 | 0.369 | 0.304 | 0.036 | 0.719 | 0.046 | 0.768 | 0.022 | |
| GRMFFSEP | 0.058 | 0.043 | 0.05 | 0.021 | 0.007 | 0.678 | 0.014 | 0.721 | 0.475 |
| GRMTEMSEP | 0.462 | 0.455 | 0.436 | 0.069 | 0.842 | 0.002 | 0.784 | 0.029 | 0.743 |
| GRMTFSEP | 0.074 | 0.088 | 0.092 | 0.048 | 0.023 | 0.836 | 0.05 | 0.814 | 0.009 |
| GRPEMSEP | 0.457 | 0.424 | 0.412 | 0.048 | 0.765 | 0.035 | 0.793 | 0.004 | 0.753 |
| GRPFSEP | 0.066 | 0.065 | 0.065 | 0.071 | 0.006 | 0.81 | 0.035 | 0.838 | 0.027 |
| GRD | 0.813 | 0.814 | 0.758 | 0.139 | 0.587 | 0.063 | 0.552 | 0.072 | 0.325 |
| GRDP | 0.795 | 0.807 | 0.793 | 0.155 | 0.513 | 0.075 | 0.505 | 0.074 | 0.324 |
| GRMF | 0.833 | 0.795 | 0.631 | 0.175 | 0.197 | 0.039 | 0.21 | 0.042 | 0.315 |
| GRMT | 0.807 | 0.831 | 0.825 | 0.163 | 0.366 | 0.077 | 0.369 | 0.091 | 0.368 |
| GRP | 0.821 | 0.827 | 0.82 | 0.186 | 0.375 | 0.046 | 0.369 | 0.062 | 0.335 |

| | GRMFFSEP | GRMTEMSEP | GRMTFSEP | GRPEMSEP | GRPFSEP | GRD | GRDP | GRMF | GRMT | GRP |
|---|---|---|---|---|---|---|---|---|---|---|
| CA | | | | | | | | | | |
| EMS | | | | | | | | | | |
| EP | | | | | | | | | | |
| FS_ | | | | | | | | | | |
| GRDEMSEP | | | | | | | | | | |
| GRDFSEP | | | | | | | | | | |
| GRDPEMSEP | | | | | | | | | | |
| GRDPFSEP | | | | | | | | | | |
| GRMFEMSEP | | | | | | | | | | |
| GRMFFSEP | | | | | | | | | | |
| GRMTEMSEP | 0.024 | | | | | | | | | |
| GRMTFSEP | 0.84 | 0.036 | | | | | | | | |
| GRPEMSEP | 0.023 | 0.744 | 0.02 | | | | | | | |
| GRPFSEP | 0.719 | 0.038 | 0.85 | 0.029 | | | | | | |
| GRD | 0.031 | 0.435 | 0.055 | 0.428 | 0.043 | | | | | |
| GRDP | 0.058 | 0.408 | 0.099 | 0.397 | 0.067 | 0.784 | | | | |
| GRMF | 0.067 | 0.303 | 0.102 | 0.288 | 0.093 | 0.804 | 0.745 | | | |
| GRMT | 0.095 | 0.406 | 0.126 | 0.388 | 0.095 | 0.842 | 0.821 | 0.795 | | |
| GRP | 0.077 | 0.386 | 0.092 | 0.383 | 0.074 | 0.845 | 0.801 | 0.799 | 0.792 | |

**Structural Model Assessment**

As per measurement evaluation, model is reliable and valid, structural modeling is performed to testify the hypothesis which had been supposed in this study by measuring path coefficients, t-value and standard errors in order to determine whether model and relationships are significant with collected data or not. By using smart PLS, bootstrapping technique was adopted to evaluate the main and moderating effects (Ringle et al., 2005). After applying bootstrapping, it was clear that all dimensions of green supply chain management including green design, green purchasing, green manufacturing, green distribution and packaging and green marketing, all have significant relation with environmental performance which ultimately supports H1, H2, H3, H4 and H5 respectively. Additionally, results revealed that environment management system which is acting as a mediator has also positive contact with environmental performance by supporting H6. Moreover, when impact of environment management system as a moderator was determined with green design, green purchasing, green manufacturing, green distribution and packaging and green marketing along with environmental performance, it was reflected that all p-values were less than 0.5 by supporting H7, H8, H9, H10, H11. As, we have two mediators, so, impact of firm size was also test with environmental performance which showed that firm size has valuable effect on environmental performance which strengthen the H12 and when this mediator was checked with all dimensions of green supply chain coving green design, green purchasing, green manufacturing, green distribution and packaging and green marketing, results of t-value and p-value confirm the positivity of moderator in between environmental performance and green supply chain dimensions by validating H13, H14, H15, H16 and H17. At the end, impact of environmental performance was judged with competitive advantage and all values support the claim of H18. So, in general, it was concluded that, all 18 hypotheses were tested and results revealed that there exists a significant relationship between all the model drawn connections. Table 3 shows all those values which have been claimed in above paragraph.

**Table 3.** Hypothesis Testing

| | Relationships | Beta-Value | STDEV | T-Value | P-Values | Decision |
|---|---|---|---|---|---|---|
| H1 | Green Design -> Environmental Performance | 0.284 | 0.032 | 4.954 | 0.043 | Supported |
| H2 | Green Purchasing -> Environmental Performance | 0.404 | 0.045 | 8.984 | 0.021 | Supported |
| H3 | Green Manufacturing -> Environmental Performance | 0.387 | 0.039 | 14.028 | 0.011 | Supported |
| H4 | Green Distribution & Packaging -> Environmental Performance | 0.284 | 0.050 | 5.339 | 0.034 | Supported |
| H5 | Green Marketing -> Environmental Performance | 0.217 | 0.035 | 6.228 | 0.076 | Supported |

| | | | | | | |
|---|---|---|---|---|---|---|
| H6 | EMS -> Environmental Performance | 0.226 | 0.030 | 7.441 | 0.073 | Supported |
| H7 | GRDEMSEP -> Environmental Performance | 0.255 | 0.042 | 7.772 | 0.071 | Supported |
| H8 | GRPEMSEP -> Environmental Performance | 0.315 | 0.051 | 8.017 | 0.025 | Supported |
| H9 | GRMFEMSEP -> Environmental Performance | 0.393 | 0.039 | 8.492 | 0.024 | Supported |
| H10 | GRDPEMSEP -> Environmental Performance | 0.267 | 0.041 | 5.227 | 0.070 | Supported |
| H11 | GRMTEMSEP -> Environmental Performance | 0.214 | 0.049 | 6.063 | 0.069 | Supported |
| H12 | FS_ -> Environmental Performance | 0.492 | 0.038 | 9.784 | 0.032 | Supported |
| H13 | GRDFSEP -> Environmental Performance | 0.325 | 0.034 | 8.342 | 0.024 | Supported |
| H14 | GRPFSEP -> Environmental Performance | 0.287 | 0.038 | 5.512 | 0.048 | Supported |
| H15 | GRMFFSEP -> Environmental Performance | 0.294 | 0.059 | 5.597 | 0.061 | Supported |
| H16 | GRDPFSEP -> Environmental Performance | 0.198 | 0.074 | 4.976 | 0.091 | Supported |
| H17 | GRMTFSEP -> Environmental Performance | 0.238 | 0.068 | 7.315 | 0.075 | Supported |
| H18 | Environmental Performance -> Competitive Advantage | 0.378 | 0.05 | 8.419 | 0.047 | Supported |

## Discussion

This study suggests significant understanding by adding value addition in current literature of green supply chain management, environmental performance and competitive advantage. Particularly, it showed a path to connect key antecedents of green supply chain practices with competitive advantage in the mediation circle of environmental performance which is a key focus area in manufacturing industry of Pakistan and is also gaining fame specifically in plastic manufacturing organizations. Additionally, Environmental Management Systems (EMS) and firm size

significantly moderate the relationship between GSCM practices and environmental performance. Firms with established EMS frameworks, such as ISO 14001, demonstrate higher levels of environmental and operational efficiency. This finding is supported by (Nazir et al., 2024) and corroborated by global studies like that of (Al-Sheyadi et al., 2019), which identified EMS as a critical enabler of green initiatives. Firm size also plays a pivotal role. Larger firms in Pakistan's plastic sector have more resources to implement advanced GSCM practices, as noted by (Ahmad et al., 2022). Smaller firms, while resource-constrained, often exhibit greater agility in adopting innovative, cost-effective practices, mirroring findings from global studies (Wagner, 2015). Additionally, a study by Wiredu et al. (2022) found that supply chain competitive advantage mediates the effect of GSCM practices on corporate environmental performance, highlighting the importance of firm capabilities in this relationship (Wiredu et al., 2024). The results revealed that all dimensions of green supply chain practices have significant relationship with environmental performance and that produces competitive advantage which are in line with previous studies (Han & Huo, 2020; Reza et al., 2021; Yildiz Çankaya & Sezen, 2019). Moreover, in terms of competitive advantage, there has been observed a positive influence of environmental performance on competitive advantage which enhances brand reputation and company's goodwill in the society and market. Improved environmental performance leads to better compliance with regulations, cost reductions, and enhanced corporate reputation, thereby fostering competitive advantage. Ahmed, Khan, and Zafar (2023) observed that Pakistani firms adopting GSCM practices experience increased customer loyalty and market differentiation (R. U. Khan et al., 2023). Globally, Bag et al. (2022) highlighted that firms integrating eco-innovation into their supply chains are better positioned to access green markets and meet the growing demand for eco-friendly products (Bag et al., 2022). Furthermore, a study by Ilyas et al. (2021) in Pakistan's manufacturing sector indicated that GSCM practices positively impact firms' performance, emphasizing the role of environmental performance in achieving competitive advantage (S. A. R. Khan & Qianli, 2017). By strengthening the stream of previous studies (Khahsar et al, 2015), this research claims that green supply chain practices are valuable chain of resources that enhance the eco-friendly nature of any organization which in return produces favorable competitive advantage. On an international scale, García Alcaraz et al. (2022) emphasized that green supply chain practices reduce waste and emissions, contributing to better environmental performance (García Alcaraz et al., 2022). In the plastic manufacturing sector, adopting sustainable materials and energy-efficient technologies has proven to be effective in mitigating environmental impact (Tariq, Shahzad, & Ali, 2023). Additionally, a study by Khan et al. (2022) in Pakistan's construction industry found that GSCM practices are positively associated with sustainable organizational performance, further supporting these findings (Jabeen et al., 2023). Since, green supply chain practices enable a firm to work in such a way that it designs the product which produces least pollution, production activities reduce waste emissions and green marketing attracts the customer with priority of green behaviour to purchase the items along with the consideration of cost effectiveness at each and every step of product life cycle and effective use of resources towards the achievement of corporate sustainable goals.

## Theoretical Contribution

This study plays a significant role for theoretical contribution in many ways. Firstly, it provides a lens to see the resource-based view by examining the role of green supply chain management practices, environment management system and firm size on the environmental performance and ultimately with the competitive advantage in a specific framework. This lens is also contributing to study the theory in Pakistani context where specific green practices and organizational activities are needed to be consider, to make it align with environmental performance and extend it to observe competitive advantage by considering different sizes of firms. Secondly,

although many studies have observed direct impact of GSCM practices on environmental performance (Heras-Saizarbitoria et al., 2020; Kalyar et al., 2019), but this study offers the role of environmental performance as a mediator to corelate the impact of GSCM practices with competitive advantage which will be absolutely enhance with the condition of improved environmental performance which is ultimately associated with green practices.

Finally, a gap has been found to corelate the moderating effect of environment management system and firm size with the relationship of green practices and environmental performance. So, this angle offers a novel contribution to see the environmental performance which may vary with the size of firm. Therefore, this study affirms that EMS and firm size are key contributors in predicting environmental performance of manufacturing firms and thus, beneficial in implementing GSCM practices in order to get better EP and competitive advantage in market. So, by concluding we can say that, this research adds a valuable contribution in the existing literature that would be beneficial for use in coming future.

## Practical Implications

This study is practically beneficial by a number of ways. Firstly, this study offers an opportunity to the firms to enhance their competitive advantage by adopting green concept in their operations. According to this study, supply chain managers should align their activities with smart environment and business objectives which will not only improve their environmental sustainability but also will support to obtain competitive advantage for organizations. So, this linkage acts as motivation for manufacturing firms of developing countries like Pakistan where firms are afraid of adopting green supply chain practices due to huge initial cost but now, they will observe its long-term benefits and will consider it for true implementation. Secondly, in order to facilitate the implementation of GSCM practices, it is suggested that administrative management should design and implement green strategies and establish green targets while middle and lower-level management should welcome, communicate and share the green information among all other employees of the firm and all stakeholders should involve in it to make it practically implemented at floor level. Thirdly, companies show negligence in adopting green practices in their operations (Zahu et al, 2005) which may affect their competitive image in the market. So, this study provides a motivation to implement green supply chain practices which will definitely boost their competitive image through spreading the green culture of manufacturing and provides a direction to strategy makers and other managers to utilize the resources at their optimum level to attain desired level of sustainability in their manufacturing process.

Finally, HRM managers should take steps to spread knowledge, abilities and interest related to green supply chain activities so that employees may understand the need and benefits of adopting green practices and they may enhance their competencies so that they may act as key contributors to make their firm environment friendly and to get competitive advantage. In addition to it, Pakistani government should also take steps to provide necessary infrastructure, provide incentives and formulate the rules and regulations to monitor and boost the adoption of green practices. Moreover, Pakistani firms should invest in designing and implementing green systems with green inputs, green operations and green outputs so that future of Pakistan may occur with green approach.

## Limitations and Future Directions

Although this study provides absolute results but there exist some limitations that may be use as future directions. Firstly, data was collected from plastic manufacturing organizations and from one province of Pakistan only, which may limit the generalizability of our findings to consider the concept of environmental performance and competitive advantage potentially in other sectors like

textile, hospitality, banking etc. and in other demographic locations of the country. Secondly, data was collected cross-sectionally from single resources, that may resist the drawing of conclusions on broader scope. Additionally, our research reports no errors for CMB and validity and reliability were ensured by the use of statistical tools but future studies may consider mixed method approach to overcome the limitations of quantitative approach. Thirdly, this study determined only one dimension of sustainable development that is environmental performance, while other dimensions may also take into consideration for comparing with green supply chain management practices. Finally, the designed model which has been studies with the lens of resource-based view theory, may also be adopted for future studies with the perspective of other management theories which play a remarkable contribution in the context of manufacturing firms. Also investigating the role of organizational culture and leadership in the successful implementation of GSCM practices could also be a fruitful area for future research.

## CONCLUSION

This study explores the moderating role of environment management system and firm size in improving the environmental performance through the adoption of green supply chain practices which in results enhances the competitive advantage of the manufacturing firms. This study explored that firms with large size have more resources and they adopt the green practices more efficiently as compared to small organizations and when environment management system is implemented properly, it will enhances the chances of green supply chain practices to be more reliable and will achieve greater results in terms of ecological sustainability and the firms which are considering environmental performance in their day to day activities, they are getting competitive advantage in the market and their reputation and brand image is getting fame in the market. So, plastic sector must pay further attention in implementing green concept so that this sector may also contribute positively in more effective way in current business scenario of the country.

## REFERENCE

Abdallah, A. B., & Al-Ghwayeen, W. S. (2020). Green supply chain management and business performance: The mediating roles of environmental and operational performances. *Business Process Management Journal*, *26*(2), 489–512.

Ahmad, A., Ikram, A., Rehan, M. F., & Ahmad, A. (2022). Going green: Impact of green supply chain management practices on sustainability performance. *Frontiers in Psychology*, *13*, 973676.

Ahmed, W., Ahmed, W., & Najmi, A. (2018). Developing and analyzing framework for understanding the effects of GSCM on green and economic performance: perspective of a developing country. *Management of Environmental Quality: An International Journal*, *29*(4), 740–758.

Al-Sheyadi, A., Muyldermans, L., & Kauppi, K. (2019). The complementarity of green supply chain management practices and the impact on environmental performance. *Journal of Environmental Management*, *242*, 186–198.

Ali, F., Rasoolimanesh, S. M., Sarstedt, M., Ringle, C. M., & Ryu, K. (2018). An assessment of the use of partial least squares structural equation modeling (PLS-SEM) in hospitality research. *International Journal of Contemporary Hospitality Management*, *30*(1), 514–538.

Bag, S., Dhamija, P., Bryde, D. J., & Singh, R. K. (2022). Effect of eco-innovation on green supply chain management, circular economy capability, and performance of small and medium enterprises. *Journal of Business Research*, *141*, 60–72.

Beamon, B. M. (1999). Measuring supply chain performance. *International Journal of Operations & Production Management*, *19*(3), 275–292.

Chien, M. K., & Shih, L.-H. (2007). *An empirical study of the implementation of green supply chain management practices in the lectrical and electronic industry and their relation to*

*organizational performances*.

Dubey, R., Gunasekaran, A., & Papadopoulos, T. (2017). Green supply chain management: theoretical framework and further research directions. *Benchmarking: An International Journal*, *24*(1), 184–218.

Fianko, S. K., Amoah, N., Jnr, S. A., & Dzogbewu, T. C. (2021). Green supply chain management and environmental performance: the moderating role of firm size. *International Journal of Industrial Engineering and Management*, *12*, 163–173.

García Alcaraz, J. L., Díaz Reza, J. R., Arredondo Soto, K. C., Hernandez Escobedo, G., Happonen, A., Puig I Vidal, R., & Jiménez Macías, E. (2022). Effect of green supply chain management practices on environmental performance: case of Mexican manufacturing companies. *Mathematics*, *10*(11), 1877.

Hair, J., Hollingsworth, C. L., Randolph, A. B., & Chong, A. Y. L. (2017). An updated and expanded assessment of PLS-SEM in information systems research. *Industrial Management & Data Systems*, *117*(3), 442–458.

Han, Z., & Huo, B. (2020). The impact of green supply chain integration on sustainable performance. *Industrial Management & Data Systems*, *120*(4), 657–674.

Heras-Saizarbitoria, I., Boiral, O., García, M., & Allur, E. (2020). Environmental best practice and performance benchmarks among EMAS-certified organizations: An empirical study. *Environmental Impact Assessment Review*, *80*, 106315.

Jabeen, R., Khan, K. U., Zain, F., & Atlas, F. (2023). Buy green only: Interplay between green marketing, corporate social responsibility and green purchase intention; the mediating role of green brand image. *Business Strategy & Development*, *6*(3), 503–518.

Kalyar, M. N., Shoukat, A., & Shafique, I. (2019). Enhancing firms' environmental performance and financial performance through green supply chain management practices and institutional pressures. *Sustainability Accounting, Management and Policy Journal*, *11*(2), 451–476.

Khan, R. U., Saqib, A., Abbasi, M. A., Mikhaylov, A., & Pinter, G. (2023). Green Leadership, environmental knowledge Sharing, and sustainable performance in manufacturing Industry: Application from upper echelon theory. *Sustainable Energy Technologies and Assessments*, *60*, 103540.

Khan, S. A. R., & Qianli, D. (2017). Impact of green supply chain management practices on firms' performance: an empirical study from the perspective of Pakistan. *Environmental Science and Pollution Research*, *24*, 16829–16844.

Khan, S. J., Kaur, P., Jabeen, F., & Dhir, A. (2021). Green process innovation: Where we are and where we are going. *Business Strategy and the Environment*, *30*(7), 3273–3296.

Kirchoff, J. F., Tate, W. L., & Mollenkopf, D. A. (2016). The impact of strategic organizational orientations on green supply chain management and firm performance. *International Journal of Physical Distribution & Logistics Management*, *46*(3), 269–292.

Kline, R. B. (2011). 26 convergence of structural equation modeling and multilevel modeling. In *The SAGE handbook of innovation in social research methods* (pp. 562–589). SAGE Publications Ltd.

Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of E-Collaboration (Ijec)*, *11*(4), 1–10.

Lin, C.-Y., & Ho, Y.-H. (2011). Determinants of green practice adoption for logistics companies in China. *Journal of Business Ethics*, *98*, 67–83.

López-Gamero, M. D., & Molina-Azorín, J. F. (2016). Environmental management and firm competitiveness: the joint analysis of external and internal elements. *Long Range Planning*, *49*(6), 746–763.

Nazir, S., Zhaolei, L., Mehmood, S., & Nazir, Z. (2024). Impact of green supply chain management practices on the environmental performance of manufacturing firms considering institutional pressure as a moderator. *Sustainability*, *16*(6), 2278.

Perotti, S., Zorzini, M., Cagno, E., & Micheli, G. J. L. (2012). Green supply chain practices and company performance: the case of 3PLs in Italy. *International Journal of Physical Distribution & Logistics Management*, *42*(7), 640–672.

Pourjavad, E., & Shahin, A. (2018). The application of Mamdani fuzzy inference system in evaluating green supply chain management performance. *International Journal of Fuzzy Systems*, *20*, 901–912.

Reza, M. N. H., Malarvizhi, C. A. N., Jayashree, S., & Mohiuddin, M. (2021). Industry 4.0–technological revolution and sustainable firm performance. *2021 Emerging Trends in Industry 4.0 (ETI 4.0)*, 1–6.

Ringle, C. M., Wende, S., & Will, A. (2005). Customer segmentation with FIMIX-PLS. *Proceedings of PLS-05 International Symposium, SPAD Test&go, Paris*, 507–514.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling. In *Handbook of market research* (pp. 587–632). Springer.

Sarwar, A., Zafar, A., Hamza, M., & Qadir, A. (2021). The effect of green supply chain practices on firm sustainability performance: Evidence from Pakistan. *Uncertain Supply Chain Management*, *9*(1), 31–38.

Shang, K.-C., Lu, C.-S., & Li, S. (2010). A taxonomy of green supply chain management capability among electronics-related manufacturing firms in Taiwan. *Journal of Environmental Management*, *91*(5), 1218–1226.

Sharma, S., & Gandhi, M. A. (2016). Exploring correlations in components of green supply chain practices and green supply chain performance. *Competitiveness Review*, *26*(3), 332–368.

Tarek, D., Ahmed, M. M., Hussein, H. S., Zeyad, A. M., Al-Enizi, A. M., Yousef, A., & Ragab, A. (2022). Building envelope optimization using geopolymer bricks to improve the energy efficiency of residential buildings in hot arid regions. *Case Studies in Construction Materials*, *17*, e01657.

Uddin, M. (2021). Exploring Environmental Performance and the Competitive Advantage of Manufacturing Firms: A Green Supply Chain Management Perspective. *International Journal of Economics & Management*, *15*(2).

Wagner, M. (2015). A European perspective on country moderation effects: Environmental management systems and sustainability-related human resource benefits. *Journal of World Business*, *50*(2), 379–388.

Wiredu, J., Yang, Q., Sampene, A. K., Gyamfi, B. A., & Asongu, S. A. (2024). The effect of green supply chain management practices on corporate environmental performance: Does supply chain competitive advantage matter? *Business Strategy and the Environment*, *33*(3), 2578–2599.

Yildiz Çankaya, S., & Sezen, B. (2019). Effects of green supply chain management practices on sustainability performance. *Journal of Manufacturing Technology Management*, *30*(1), 98–121.

Zhu, Q., Qu, Y., Geng, Y., & Fujita, T. (2017). A comparison of regulatory awareness and green supply chain management practices among Chinese and Japanese manufacturers. *Business Strategy and the Environment*, *26*(1), 18–30.

Zhu, Q., Sarkis, J., & Lai, K. (2012). Green supply chain management innovation diffusion and its relationship to organizational improvement: An ecological modernization perspective. *Journal of Engineering and Technology Management*, *29*(1), 168–185.

Zhu, Q., Sarkis, J., & Lai, K. (2013). Institutional-based antecedents and performance outcomes of internal and external green supply chain management practices. *Journal of Purchasing and Supply Management*, *19*(2), 106–117.