

# **Green - Lean Practices and Reverse Logistics: Evidence from Manufacturing Industry of a Developing Economy**

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## **Abstract**

The past literature has seen considerable growth in lean and green concepts in the context of developed countries. However, despite the increasing interdependencies between developing and developed economies, little is known in the context of developing economies. This study investigates the impact of green and lean practices, and reverse logistics on organizational performance in the context of a developing economy. We employ a quantitative research design, where a sample of 170 responses was generated from senior managers of manufacturing firms in Pakistan – a developing economy. The analysis uncovers those green practices have a significant positive nexus with organizational performance in a developing economy like Pakistan. Further, we find that lean practices and reverse logistics serially mediate the relationship between green practices and organizational performance. We thus suggest green practices, lean practices, and reverse logistics as key levers to enhance performance and gain a competitive advantage for the firms in the developing economy like Pakistan. This is among the few studies testing serial mediation of lean practices and reverse logistics between green practices and organizational performance. The findings offer numerous contributions to both theory and practice.

## **Keywords**

Green Practices; Lean Practices; Reverse Logistics; Organizational Performance.

## **1. Introduction**

Due to the developments in past decades, the world has become globally more connected. Transportation of materials and goods from developing countries to developed countries is more rapid than it was in the past. Growing awareness and concerns which are spreading all around the globe regarding the environment are urging the manufacturing firms of developing countries to transform the traditional manufacturing processes and adopt new environmentally friendly manufacturing processes. As such, environmentally friendly green practices, lean practices, and reverse logistics have become the topmost priority for manufacturing firms, small or large. Azevedo, Carvalho, and Machado (2011) suggested several green practices, including atmosphere-friendly packaging, reverse logistics, waste minimization, lowering the consumption and usage of toxic and hazardous materials, environmentally friendly product designing, ISO certifications, collaboration with customers regarding environmentalism. Digalwar, Tagalpallewar, and Sunnapwar (2013) further added that green practices should be sheltered all over the product manufacturing cycle. That is, starting from the selection of the manufacturing process to its usage and then the end-of-life scenario needs to be environmentally friendly. And then recycling or reuse of the product should be made possible. Ninlawan, Seksan,

Tossapol, and Pilada (2010) mentioned three categories for green practices: green procurement, green manufacturing, and green distribution.

Given the hyper-competitive business environment, every organization desire to get different advantages, such as financial, environmental and operational performance advantage, over its competitors. Prior research shows a positive relationship between financial advantage, competitive advantage, environmental advantage, operational performance advantage, and reverse logistics (Yu, Tianshan, and Din, 2018). The concept of reverse logistics has been introduced for decades and different researchers defined it in many different ways. In the recent decade, due to the overall environmental concerns, which have been spread internationally, the concepts of reverse logistics have received more attention. Reverse logistics comprises several activities that are involved in the collection of already used products from final users to the producers to re-use, recycle them, or for the proper disposal of the products (Agrawal, Singh, and Murtaza, 2015). Reverse logistics might be a critical part of lean and green approaches as the concept of reverse logistics may cut costs by reducing processes and materials and so might be its effect on achieving green approaches (Fernando and Tew, 2016).

Reverse logistics practices are more established in developed countries than in developing countries. But developed countries are somehow dependent on developing countries as developing countries import reverse logistics material from developed countries. This is because they could provide cheap labor for reverse logistics processes. This transportation and processing are effective in terms of cost but at the same time, they are very dangerous. Because proper setups for recycling and remanufacturing are not available in abundance in developing countries (Li and Tee, 2012).

As such, lean practices also become the focus of top manufacturing companies nowadays, in addition, to reverse logistics. The purpose of lean practices is to provide complete satisfaction to the consumers with the least possible waste during the production processes. The waste has many forms like the wastage of time, raw materials, manpower, energy resources, movement, unwanted processes, or inventory (Demeter and Matyusz, 2011). Karlsson and Åhlström (1996) stated that an enterprise that wants to become a lean enterprise, it should make sure that the lean cycle is completed. That cycle comprises the lean product development process, lean procurement process, lean manufacturing process, and lean distribution process.

Demeter and Matyusz (2011) stated that total quality management, human resource management, total productive maintenance, and just-in-time practices are lean manufacturing bundles. Rose, Deros, Rahman, and Nordin (2011) mentioned many lean practices in their research study. They have urged manufacturing firms, especially small manufacturing firms, to adopt lean practices. Their mentioned lean practices include 5S, continuous flow, cell layout, QTC, preventive maintenance, Kanban, set up time reduction, visual control, supplier management, multifunction employee, training, small lot size, quality circle, standard operation, focused factory, teamwork, standard operation, uniform workload, TQM, supplier management, etc.

In this study, we examine the impact of green practices on operational performance and mediating role of lean practices and reverse logistics. The resource-advantage theory provides theoretical ground for the development of our model explaining the need for the implementation of improved and environmentally friendly processes.

## **2. Literature Review**

The main objective is to get a glimpse of previous research on the involved variables, which are green practices, reverse logistics, and lean practices and to find the knowledge gaps in past studies.

### **2.1 Green practices and organizational performance**

Green manufacturing remained an attractive topic for top researchers, but it had become a more compelling topic in the past two decades. The reasons are growing environmental concerns that are spreading in the modern world and pressure on firms from environmental activists, governments, and NGOs to adopt green practices (Scur and Barbosa, 2017). A significant positive impact of green practices has been identified in the past literature. For example, green practices help sustain supply chain performances (Çankaya and Sezen, 2019). These are also good at generating positive perceptions about the firms (Jamal et al., 2021). According to the resource-advantage theory, innovations can bring competitive advantages for firms and help them in enhancing their business (Umar, Khan, Yusliza, Ali, and Yu, 2021). We have discussed earlier that the government's policies and society's pressure can accelerate these procedural changeovers. So, any firm which is seeking competitive advantage will naturally look for procedural innovations and

changeovers from conventional practices to advanced practices like green practices. In this way, they can accord with the government's policies and society's expectations and according to resource-advantage theory, this changeover from conventional practices to green practices can help them in gaining competitive advantages over others in the market and enhancing their performance. Therefore, based on the above literature review, we proposed our first hypothesis as follows:

H1: Green practices have a positive impact on organizational performance.

## **2.2 Green practices and lean practices**

Santos, Lannelongue, and Gonzalez-Benito (2019) argued that because of the pressure imposed by clients, societies, governments, and markets on firms, they are directed to keep environmental concerns during supply chain processes. These environmental concerns are proven to be fruitful in the operational performances of firms. This means that these green practices can help manufacturing firms in multiple ways, for example in enhancing their performance and so profit. They are useful in satisfying customers that they are using a product that has been made through environment-friendly processes. Research shows that green practices are more beneficial when they are jointly established with the customers and main product suppliers (Gunasekaran et al. 2015).

Alhuraish et al. (2016) argued that there is a clear difference in the performance of manufacturing companies that have implemented lean practices and those that have not implemented lean practices. They have discovered these differences from different domains including supply chain performance, financial performance, operational performance, etc. Although these findings are very impressive, there is a need for a practical framework for lean practices implementation. Green practice and lean practices both could be used to serve a common objective which is the satisfaction of the final consumer. And another aspect of these two useful practices is that this satisfaction should be achieved by using minimal possible resources (Carvalho et al. 2010).

We have discussed earlier that the implementation of green practices helps lower the waste generated from operations, preventing hazardous emissions from manufacturing operations, and enhancing supply chain performances. Lean practices implementation could also serve many identical purposes which include lowering waste generation, minimizing the steps required for manufacturing the products and enhancing the supply chain performances (Yousaf, 2021). According to resource advantage theory, innovations can bring competitive advantages for firms and help them in enhancing their business. As such, a firm that is seeking competitive advantage will naturally look for procedural innovations and changeovers from conventional practices to advanced practices like green practices. Such firms will tend to look for more areas for improvement and gain more competitive advantages. According to the resource advantage theory, competitive advantages may be gained by using those resources from which products are made with minimum cost and cost could be minimized by adopting lean practices according to past studies (Buer, Semini, Strandhagen, and Sgarbossa, 2021). So, this may lead the firms towards the adoption of lean practices. By doing so, they will be able to get more competitive advantages according to resource advantage theory. Therefore, based on the above literature review, we proposed our second hypothesis as follows:

**H2: Green practices have a positive relationship with lean practices.**

## **2.3 Green practices and reverse logistics**

Green practices have multiple types. Cousins, Lawson, Petersen, and Fugate (2019) argued that GSCM practices are linked with operating cost and environmental performances in such a way that they enhance them and help the adopting companies in getting themselves ahead of their competitors in markets. They used cross-sectional techniques so the findings are more perceptual as they have arrived from the second type of data to discover the nature of the relationship between green practices and performance. Green practices are linked directly to the company's supply chain performance. They increase company performance regarding the supply chain's matters. Also, if a company does not focus on adopting green practices to the maximum extent, there is a threat that its overall reputation as a good company may get affected (Schmidt et al. 2017).

Vlachos (2016) urged manufacturing companies to adopt reverse logistics practices to maximize their profit and supply chain performance. The study shows that manufacturing companies should set reverse logistics practices as their major priority as it has been proven that these practices help improve consumer satisfaction as well as are helpful in the reduction of the final cost of the product. But their study does not reveal several aspects of reverse logistics practice implementation as it has a vast domain of effects on manufacturing firms' performance. Nowadays, because of the growing awareness regarding environmentalism, companies are focusing more on reverse logistics as its connections

with environmentalism have been proven. Also, governments from different regions of the world are asking manufacturing firms to consider the green aspect during their manufacturing processes. This has led manufacturing firms to implement reverse logistics to compete with others in the market. Companies implementing reverse logistics processes are performing far better in terms of supply chain performance and maximizing their profits (Kumar, Kumar, Brady et al. 2017). Although the findings in their study are not completely made after analyzing the real manufacturing processes and are finalized by analyzing deterministic assumed data. Green practices are proven to have links with various supply chain practices. Especially with logistics practices that make up the larger portion of supply chain practices. The concepts of both green practices and logistic practices like reverse logistics have been introduced to serve a common goal and that is to protect mankind from the harmful impacts of traditional logistic practices (Mousazadeh et al. 2014).

Green practices focus on limiting the hazardous impacts of manufacturing operations during the product cycle. They focus on recycling and reusing manufactured products. Also, they emphasize the proper disposal of manufactured products in an environmentally friendly manner. Reverse logistics practices could be served for a lot of purposes which include recycling and reusing the manufactured products, return of manufactured products for proper disposal in an environmentally friendly manner, and enhancing the supply chain performances of firms. According to resource advantage theory, innovations can bring competitive advantages for firms and help them in enhancing their business. So, a firm that is seeking competitive advantage will naturally look for procedural innovations and changeovers from conventional practices to advanced practices like green practices. Such firms will tend to look for more areas for improvement and gain more competitive advantages. According to the resource advantage theory, competitive advantages may be gained by using those resources from which products are made with minimum cost. As previous studies have revealed that input costs could be minimized through the implementation of practices like reverse logistics. So, a green firm will naturally look to adopt reverse logistics practices to enhance its performance according to resource advantage theory. So, based on the above literature review, we propose the third hypothesis of our research work as follows:

**H3: Green practices have a positive relationship with reverse logistics.**

## **2.4 Lean practices and organizational performance**

Lean practices, if adopted with full determination, can bring remarkable improvements in processes comprising the whole product cycle. Their implementation can bring huge advantages for the company in terms of a decrease in the product's cost and other expenditures (Zokaei and Simons, 2006). Buehlmann and Fricke (2016) also found that smaller companies have more reluctant behaviours towards lean practices implementation because of less awareness and knowledge.

Lean practices implementation has significant positive impacts on operational performance for smaller-scale manufacturing companies. Even though they could not implement most of the lean practices due to limited resources. But studies have suggested that managers of smaller-scale manufacturing companies should look to implement lean practices like 5S, SPC (Statistical Process Control), productive maintenance, pull system, employee involvement, customer involvement, quick changeovers, etc. But first, they should assess the condition and facilities in their companies then they should implement lean practices accordingly (Yadav, Jain, Mittal, Panwar, and Lyons, 2019). Despite their impressive findings that give directions for smaller-scale manufacturing companies, their study only reveals the impacts of lean practices on operational performance and its impacts on financial performance, environmental performance, social performance, etc. still need to be explored

Several previous studies have hinted towards the benefits of implementing lean practices when they are implemented with a complete understanding of lean principles and lean tools. Their impacts on supply chain performances, input costs, business enhancement, process development, idle time saving, lowering waste generation, process innovation, etc., have been identified. resource advantage theory says that competitive advantages may be gained by using those resources from which products are made with minimum cost and cost could be minimized by adopting lean practices according to past studies. So, according to resource advantage theory, by taking innovative steps like the adoption of lean practices, a firm can enhance its performance and business. Therefore, based on the above literature review, we anticipate our fourth hypothesis as follows:

**H4: Lean practices have a positive impact on organizational performance.**

## **2.5 Reverse logistics and organizational performance**

In the present era, the importance of reverse supply chain / reverse logistics has been recognized all over the world.

Reverse Supply Chain / reverse logistics have been adopted in highly developed and underdeveloped countries. One reason for this is that in traditional supply chain management, the concerns about the end of the products are not taken very seriously and this thing is not considered a very healthy practice due to the growing environmentalism in the modern world. And due to this, reverse supply chain / reverse logistics is becoming the most likely topic for modern researcher (Govindan and Soleimani, 2017). The present literature does not provide clear directions about the existence of the relationship between reverse logistics and financial performance, environmental performance, supply chain performance, and operational performance of organizations (Agrawal et al., 2015).

In conventional forward logistics practices disposal of products at the end of life is not considered, which is not only harmful from an environmental point of view but also unable the manufacturing firms to make savings by recycling and reusing the products. Whereas, by implementing reverse logistics practices manufacturing industries might be able to focus on returning manufactured products to recycle them, reuse them, or properly dispose of them so that they could not cause any harm to the external environment. In this way, they are also helpful in lowering input costs. According to resource advantage theory, firms seeking competitive advantages should focus on process innovations. Another way of gaining a competitive advantage is to manufacture products with minimum input costs. As past studies have revealed that through the implementation of reverse logistics, the input cost could be minimized. Therefore, the implementation of reverse logistics will help manufacturing firms in enhancing their performance in the context of resource advantage theory. Therefore, based on our literature review above, we proposed the fifth hypothesis of our research study:

**H5: Reverse logistics have a positive impact on organizational performance.**

## **2.6 Serial impact of lean practices and reverse logistics**

Panwar, Jain, Rathore, Nepal, and Lyons (2018) found a massive difference in the performances of companies that have acquired lean practices to a larger extent. They have found benefits after improvements in different domains including the product's on-time deliveries, less waste emission from manufacturing processes, better management of waste materials, reductions in the overall cost of products, etc. They have also stated that such manufacturing companies were found much better in productivity enhancement and were excellent in managing their inventories. Therefore, through lean practices adoption, the overall operational performance of manufacturing companies will be enhanced. They also stated that these findings are not limited to progressed countries only that have larger economies but the adoption of lean practices can bring massive advantages for manufacturing companies in less progressed countries with developing economies. So, there has been left no confusion about lean practices' adoption and improvement in companies' progress. Despite their brief and useful findings, they have not mentioned any clear framework for lean practices adoption, especially for smaller-scale manufacturing companies.

Phoosawad et al. (2019) stated that those companies which have focused more on reverse logistics have gained a prominent competitive advantage over others as well as enhanced their operational performances. By adopting reverse logistics, a company could minimize the cost which could be spent otherwise on acquiring resources if reverse logistics is not applied. Vlachos (2016) urged manufacturing companies to adopt reverse logistics practices to maximize their profit and supply chain performance. The study says that manufacturing companies should set reverse logistics practices as their major priority as it has been proven that these practices help improve consumer satisfaction as well as are helpful in the reduction of the final cost of the product. But their study does not reveal several aspects of reverse logistics practice implementation as it has a vast domain of effects on manufacturing firms' performance.

Green practices are related to the firm's financial performance as well as indicate the firm's position in the future, competing with other companies in the market. Green practices have major influences on a firm's financial performance as they are proven to be the main environmental drivers (Miroshnychenko et al. 2017). But these results were derived from large industries and do not provide a clear view of green practices implementation's impact on medium and small-size industries. Another very important green practice is green manufacturing practice. But its implementation is a more lengthy process as compared to other green practices. As it includes removing the environmental hazards which obtain from conventional manufacturing processes and re-designing the manufacturing cycle of a product keeping in view the environmental aspect. But its outcomes are also very large in number.

For example, through green manufacturing practices implementation, there is a significant reduction in waste material which will otherwise be obtained from conventional manufacturing processes. Also, significant reductions in cycle times, idle times, and human effort were observed through the green manufacturing practices implementation. So,

their positive impacts on an organization's performance both financially and economically are very clear (Subramanian and Gunasekaran, 2015). But the major limitations of their study were that their area of research was very limited and does not cover all the important sectors for example construction and pharmaceutical sectors etc.

Many common purposes could be served through the implementation of green practices, lean practices, and reverse logistics. For example, customer satisfaction, minimizing waste generation, sustaining supply chain performance, enhancement of overall profits, raising good reputations about the implementing companies, etc. This reveals the synergism between these useful practices. Gaining a competitive advantage is the natural desire of every firm. According to resource advantage theory, the search for competitive advantage will lead the firms to procedural evolution. They will be looking for better and improved processes to finalize their products. The government's policies, society's pressure, and competitors' actions will accelerate this process. So, this may lead the firms towards the adoption of environmentally friendly practices like green practices. This will help them in enhancing their performance as we have discussed earlier that past studies have revealed that performance could be improved through the implementation of green practices. We have also discussed that competitive advantages may be gained by using those resources from which products are made with minimum cost and previous studies have mentioned that input costs could be minimized by implementing lean practices and reverse logistics. So, a green firm can further enhance its performance if it keeps focusing on other useful practices like lean practices and reverse logistics. In this way, they can enhance their businesses according to the resource advantage theory. Therefore, based on the above literature review, we proposed our sixth hypothesis as follows (Figure 1):

**H6: Lean practices and reverse logistics serially mediate the relationship between green practices and organizational performances.**

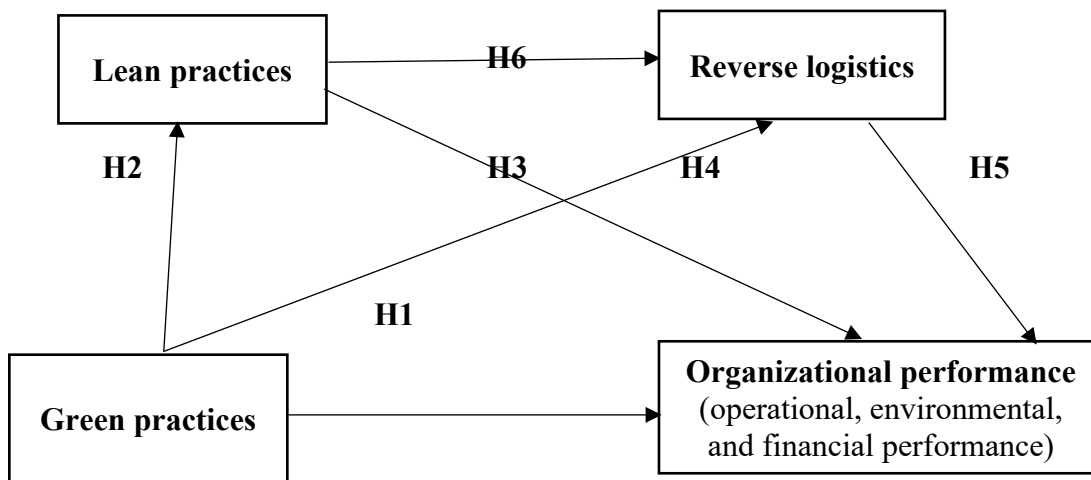


Figure 1. Theoretical framework

### 3. Research Methods

#### 3.1 Procedure

This research used a survey questionnaire for acquiring quantitative data asking relative questions from different types of industries, including pharmaceutical industries and manufacturing industries for example gear manufacturing industries, textile industries, etc. We analyzed this data using SPSS software.

#### 3.2 Measures

A six-item scale from Huo et al. (2013) was borrowed to measure the implementation of reverse logistics in industries. A 13-item scale from Rahman, Laosirihongthong, and Sohal (2010) was used to measure the implementation of lean practice in industries. A 16-item scale from Suganthi (2019) was used to measure the implementation of green practices in industries. A 17-item scale from Suganthi (2019) was used to measure the organizational performance of

industries. All items were measured on a 5-point Likert scale, extending as 1 (Not at all), 2 (small extent), 3 (moderate extent), 4 (large extent) and 5 (very large extent).

### 3.3 Data Collection

Using professional and personal links, the questionnaires were circulated among employees of different manufacturing firms in Pakistan. Responses were also taken through Google forms. Most of the respondents were senior managers, deputy managers, and assistant managers, from well-known firms. A suitable technique for sampling was used and the sample size was determined with the help of a formula.

## 4. Numerical Results

### 4.1 Descriptive Statistics

In the survey questionnaire, the sample contains 170 respondents data comprising 151 males (88.8%) and 19 females (11.2%). While in terms of work experience, 122 (71.8%) respondents had less than ten years of experience, 43(25.3%) had more than ten years of experience, and 5 had more than 20 years of experience. The correlation of the constructs is shown in Table 1.

Table 1. Correlations Analysis

		Mean	Std. Deviation	1	2	3	4
1	ALL	2.9620	0.95584	(0.770)			
2	LP	3.7957	0.84121	0.378**	(0.848)		
3	GP	3.8757	0.60195	0.303**	0.416**	(0.849)	
4	OP	3.8958	0.67859	0.406**	0.543**	0.504**	(0.864)

Note\*\*showing a correlation that is significant at a level of 0.01 and it is signed up to 2-tailed.

### 4.2 Correlation

Reverse logistics is significantly and positively correlated with organizational performances ( $r=0.404$ ,  $p<0.01$ ), positively and significantly related to green practices ( $r=0.303$ ,  $p<0.01$ ), and is positively and significantly related to lean practices ( $r=0.373$ ,  $p<0.01$ ). Lean practices are significantly and positively correlated with organizational performances ( $r=0.543$ ,  $p<0.01$ ), and it is positively and significantly related to green practices ( $r=0.416$ ,  $p<0.01$ ). Green practices are significantly and positively correlated with organizational performances ( $r=0.504$ ,  $p<0.01$ ).

### 4.3 Hypothesis Testing

The regression analysis was performed to test the hypotheses. The analysis shows that green practices have a significant positive impact ( $\beta = 0.504$ ,  $p < 0.01$ ) on organizational performance, thus supporting H1. The green practices have a significant positive impact on lean practices ( $\beta=0.416$ ,  $p<0.01$ ), corroborating H2. The results of H3 show that green practices have a positive impact ( $\beta =0.303$ ,  $p<0.01$ ) on reverse logistics Likewise, lean practices have a significant positive impact ( $\beta=0.543$ ,  $p<0.01$ ) on organizational performance. The analysis of H5 shows a significant positive impact ( $\beta= 0.406$ ,  $p<0.01$ ) of reverse logistics on organizational performance. H6 investigates the serial mediation of lean practices and reverse logistics between green practices and organizational performance (Figure 2). The confidence interval for indirect effect on organizational performance didn't include 0 between the upper and lower limit confidence interval (LLCI=0.1471; ULCI=0.3141). Therefore, these results are indicating the serial mediation of lean practices and reverse logistics (direct effect = 0.3427,  $p<0.01$ , indirect effect = 0.2254,  $p<0.01$  Total effect= 0.5681 $p<0.01$ ) between green practices and organizational performance (Table 2, Table 3 and Table 4).

Table 2. Mediation Analysis (GP, OP, LP, RL)

		Effect	SE	L.L.C.I	U.L.C.I
1	<b>Total effect</b>	0.5681	0.0751	0.4198	0.7164
2	<b>Direct effect</b>	0.3427	0.0747	0.1953	0.4901

Table 3. Mediation Analysis (GP, OP, LP, RL)

	Effect	Boot SE	Boot L.L.C.I	Boot U.L.C.I
<b>Total</b>	0.2254	0.0427	0.1471	0.3141
<b>Ind 1</b>	0.1630	0.0350	0.1027	0.2395
<b>Ind 2</b>	0.0362	0.0169	0.0048	0.0710
<b>Ind 3</b>	0.0262	0.0127	0.0060	0.0552

Table 4. Summary of the Hypotheses

Hypothesis	Variables	Relation	Hypothesis Supported
<b>H1</b>	GP, OP	Direct	Yes
<b>H2</b>	GP, LP	Direct	Yes
<b>H3</b>	GP, RL	Direct	Yes
<b>H4</b>	LP, OP	Direct	Yes
<b>H5</b>	RL, OP	Direct	Yes
<b>H6</b>	GP,LP,RL,OP	Mediation	Yes

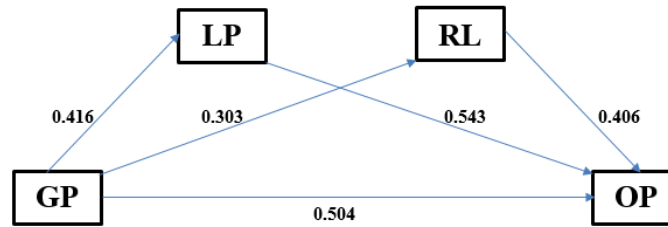


Figure 2. Validated statistical model

## 5. Discussion and conclusions

Our research study aims to find out the impact of green practices on organizational performances with serial mediation of lean practices and reverse logistics. We have generated six hypotheses depending on the literature review. After that, we tested them. Results have shown that green practices have positive impacts on organizational performance. Green practices also have positive impacts on lean practices and reverse logistics. Results have also depicted the positive impacts of lean practices and reverse logistics on organizational performance. Furthermore, the serial mediation of lean practices and reverse logistics on the relationship between green practices and organizational performance was also tested. Results from the process macro for SPSS which has been shaped by (Hayes and Scharkow, 2013) confirm the proposed serial mediation.

Hypothesis 1 depicts the impacts of green practices on organizational performance. Results have shown that green practices have a significant positive impact on organizational performance. These findings are in line with past research carried out by (Khan and Qianli, 2017) which was to figure out the impact of implementing green practices on organizational performance. Several types of green practices have been found to have impacts on organizational performance according to studies carried out by (Chiu and Hsieh, 2016) and (Khan and Qianli, 2017) which explore that implementation of green practices will help organizations in enhancing their performances. Hypothesis 2 depicts the impacts of green practices on lean practices. Results have shown that the implementation of green practices has positive impacts on lean practices. These findings are in line with past research done by (Carvalho et al., 2010) and (Simpson and Power, 2005) which say that both these practices are synergetic to one other, and implementation of one will have positive impacts on the other. Hypothesis 3 depicts the impacts of green practices on reverse logistics. Results have revealed that green practices implementation will have positive impacts on reverse logistics. These findings are in line with past research done by (Mousazadeh et al., 2014) which says that Both green practices and reverse logistics are synergetic to each other and both are directed towards identical objectives.

Hypothesis 4 depicts the impacts of lean practices on organizational performance. Results have shown that the implementation of lean practices will enhance organizational performance. These findings are in line with past research carried out by



(Resta, Dotti, Gaiardelli, and Boffelli, 2016) and (Bashir, Suresh, Proverbs, and Gameson, 2011) which say that the adoption of lean practices will bring a lot of advantages for the firms and will be helpful for them in enhancing their performance.

Hypothesis 5 depicts the impacts of reverse logistics on organizational performance. Results have shown that the implementation of reverse logistics will enhance organizational performance. These findings are in line with past research carried out by (Beleya, Bakar, and Chelliah, 2017) and (Chinda, 2017) which say that the adoption of reverse logistics will help firms in improving their performance and will bring competitive advantages for them.

Hypothesis 6 was to investigate the serial mediation of lean practices and reverse logistics between green practices and organizational performance. To prove this serial mediation, we have used a process macro for SPSS that has been shaped by (Hayes and Scharkow, 2013). The findings are in line with past research carried out by (Panwar et al., 2018) and (Simpson and Power, 2005). The results have shown that green practices have a positive impact on organizational performance and the serial mediation of lean practices and reverse logistics has also been proven between green practices and organizational performance.

Past studies have indicated that green practices, lean practices, and reverse logistics are very useful practices, and their implementation can help firms in improving their performances. But when it comes to finding supportive links between these practices, there was still a gap, especially in the context of a developing economy like Pakistan. We find that the implementation of green practices has positive impacts on organizational performance. Our study also investigates the serial mediation of lean practices and reverse logistics between green practices and organizational performance. Results of our present study depict that green practices, lean practices, and reverse logistics have positive impacts on organizational performance, and lean practices and reverse logistics serially mediate between green practices and organizational performance.

### **5.3 Directions for Future Researchers**

As the present research does not explore the linkages, which lie between the performance benchmarks and facilitators of these practices, for this, future researchers might use ANP to investigate those linkages. Furthermore, future researchers might take society's awareness as a moderating variable and investigate the impacts of green practices, lean practices, and reverse logistics on the performance of industries.

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