

The impact of green productivity strategy on environmental sustainability through measurement of the management support: A field study in industry sector in Jordan

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ABSTRACT

This study intends to distinguish the green productivity concepts, its strategy and the roadmap of its implementation throughout the adaption of green products, green production, and green innovation process dimensions. Further, it studies the impact of green productivity on environmental sustainability by identifying the mediating role of the management support to these green practices in the Jordanian factories. Methodology population of this study entails industry mining firms listed in the Amman Stock Exchange (ASE). A purposive sample was adapted in this study and consisted of specialized employees in terms of operating factories in general and in green production specifically. 100 questionnaires were precisely collected and analyzed via Smart Partial Least Square (PLS) statistics in order to analysis the mediation role. The study results point out a statistically significant impact of the independent variables, namely, the green productivity on environmental sustainability as a dependent variable in the existence of the mediating variable. Further, the results demonstrate the partial mediating effect of the dependent variable. However, there is no mediating effect of the independent to the mediator variable. Accordingly, the study recommends companies to concentrate on the roles played by the top management in the efforts towards green productivity adoption and strategic implementation in the Jordanian environment. The implementation of green productivity is considered at the early stages in Jordan. Thus, the value of the study lies in the search for issues that are eco-friendly practices.

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1. Introduction

Over the last few decades, environmental problems have grown and have travelled more quickly than forest fires, which have a significant impact on anthropogenic climate change. These accompanied by depletion of physical resources and increased industrial pollution, which has a significant influence on fauna and flora, human lives and numerous contagious diseases (Khan et al., 2017). As such, It is no longer adequate for businesses to rely solely on making a profit - they also need to offer something beneficial to society as a whole, lessen their detrimental effects on the ecosystem and take some responsibility for their suppliers' actions on concerns such as child labor, healthcare and safety, and pollution (Khan & Qianli, 2017). The concept of a green supply chain alleviates ecological harm and regulates air, water and waste pollution through green initiatives (Agi & Nishant, 2017). The underlying philosophy behind the green concept is obviously to promote environmental sustainability (Evangelista, 2014). Nevertheless, companies embracing the green concept can minimize potential pollute and cost of production, as well as boost economic growth, create competitive advantages in terms of enhanced customer satisfaction, positive brand and image, and more significant export opportunities for environmental-friendly countries (Khan et al., 2017; Shahzad, Qu, Javed, Zafar, & Rehman, 2020). The notion of green production and supply chain practices is expanded

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to include the innovation efforts to protect the environment and consolidate the internal operations of the firm whereby the firm can cut down the cost of the production and gain competitiveness (Chang, 2011). One avenue that businesses can work towards achieving environmental sustainability goals is green product production and innovation. Green products, distinguished as products that consume minimal energy, have less environmental burdens and risks and already in the design process deter waste generation (Dangelico, 2016). The belief that greening the production and supply chain brings in new business beneficial avenues and reflects a fresh vision for sustainable production has shaped the manufacturing literature (Centobelli, Cerchione, & Esposito, 2017). The use of green initiatives across the industrial sector gains increasing strategic concern from the management in order to support production and customers interests in achieving environmental sustainability (Maas, Schuster, & Hartmann, 2014). Thus, the investigation of the real impact of green initiatives, including green products, green innovation and green processes on environmental sustainability is becoming essential to determine the actual outcomes of implementing these initiatives (Dangelico & Pujari, 2010; Ma, Hou, & Xin, 2017). Further, management support and commitment of top management towards the actual implementation of such initiatives is a critical success factor (Dai, Montabon, & Cantor, 2014). The management support can facilitate the implementation by offering necessary resources, gaining employees commitments towards these initiatives, and creating the supporting culture and attitudes towards these initiatives (Centobelli et al., 2017; Hojmosse, Brammer, & Millington, 2012). Although the relationship between green production initiatives and environmental sustainability has reached a saturation level in developed countries, this is not the case in developing countries (Shahzad et al., 2020). Further, management commitment and supports needs to be addressed as a crucial factor in affecting the relationship between green initiatives and environmental sustainability (Dai et al., 2014). Hence, this study aims to investigate this multi-facet relationship between green initiatives and environmental sustainability in the industry sector, in addition to examining the management support factor as a mediator influencing this relationship.

2. Literature Review

2.1 Environment Sustainability

Sustainability is established on the concept of maintaining, nourishing, or promoting a phenomenon, and/or enhancing or developing it (Sumner, 2005). The most universally accepted definition of sustainability is based on enhancing the quality of human life without ruining the climate and ecological system capability (Brundtland, Khalid, Agnelli, Al-Athel, & Chidzero, 1987; Jang, Zheng, & Bosselman, 2017). Major environmental issues were discussed at the national level, and environmental sustainability was included in government programs in many countries. In this vein, by taking into consideration green production practices and initiatives, businesses can play a pivotal role. Social and environmental certified organizations attract more buyers because they favor dealing with people who follow corporate social responsibility (Awan, Khattak, & Kraslawski, 2019). As per Wang, Tong, Takeuchi, and George (2016), the adoption of social responsibility practices can lead to a reduction of destruction to the environment by reducing industrial scrap recycling and minimizing the cost of production. One way that businesses can contribute to achieving environmental sustainability goals is green product development. This is attributed to this kind of products use fewer resources and harmful material which result in lower environmental impacts and risks. Further, these principles of production are incorporated into the design phase in order to avoid waste creation (Dangelico, 2016). Green product innovation acknowledged as the driver of a distinct frontier of growth and superior life quality through the development of prosperity and competitiveness. Given the point that environmental concerns have been marginalized in the innovation body of research for several years, however, this is not the case lately because sustainability has been distinguished as a critical driver of innovation (Nidumolu et al., 2009). As a result, over the past few years, research related to green product innovation has gained increasing attention from scholars and practitioners alike (Dangelico, 2016; Shahzad et al., 2020). The current literature confirmed the existence of reciprocal relationship between green innovation practices and environmental sustainability dimensions (Rantala, Ukko, Saunila, & Havukainen, 2018). For example, the findings from Saunila, Ukko, and Rantala (2018) suggested that venture in green innovation is linked to the appraisal of a broad spectrum of sustainability dimensions, whereby the most valued dimensions are economical and institutional. Furthermore, the introduction of green practices is advantageous in terms of profitability and environmental performance for organizations. (Rekik & Bergeron, 2017).

2.2 Green productivity practices

The Green Productivity concept is derived from the fusion of multiple essential developmental strategies comprises productivity improvement and environment preservation. In essence, productivity gives the framework for continuous improvement, while the foundation for sustainable development lies in protecting the environment. Green Productivity is thus a tool for increasing productivity and environmental sustainability for socio-economic growth as a whole. In other words, it is the process of employing suitable techniques, technologies and management systems to manufacture products and services which are environmentally friendly (Hwa, 2001). The green supply chain is more and more consideration for numerous industries and a provocation for 21st-century logistics management. Of remarkable interest is how to boost environmental awareness among organizations to integrate environmental management practices into their logistics activities. According to Zhu, Sarkis, and Lai (2008), Green supply chain management encompasses a variety of environmental management practices that support logistics management which is structured to take environmental issues into forward and invert logistics. The management practices of green supply chain management encompass packaging and waste reduction, environmental assessment of suppliers efficiency, production of more environmentally friendly goods and reduction of the carbon emissions linked with goods

transportation (Diabat & Govindan, 2011). However, greening the supply chain does not seem a small feat. Still, a judicious, strategic and coherent approach is necessary to reshape the supply chain at all levels (Davies & Hochman, 2007) in such a way that it becomes a solution for addressing ever-increasing environmental issues and raising environmental footprint (Chakraborty, 2010). It needs a critical and strategic approach to the associated sections of organizations to strike the right balance between economic and environmental performance to gain sustaining viability for their businesses (Kramer, 2007). The business' longevity and prosperity come from its ability to provide the right product to the right consumer at the right time, cost, price, amount and quality. At the same time, they must remain focused on their objectives of improved profitability through lower inventory rates, shortened lead times in manufacture, improved efficiency, accurate forecasting, cutting costs and optimal resources allocation (White, Masanet, Rosen, & Beckman, 2003), leading to higher market share and improved brand recognition, consumer loyalty and, ultimately, environmental sustainability (Ali, Kaur, Ersöz, Lotero, & Weber, 2019). Furthermore, Shrivastava (1995) advocates that businesses can distinguish their products, enhance the quality of the product and minimize manufacturing costs by innovating their products and processes. They may also broaden the environmental concept to considerations relating to packaging design. Green innovation is categorized into three major groups, according to different scholars: green product innovation, green process innovation and green production. (Chen, 2008; Chiou, Chan, Lettice, & Chung, 2011; Khan, 2020). They are described as follows:

2.3 Green production

In many aspects and contexts, the term green is broadly adopted. Green is commonly seen as a general term for a variety of principles such as 'environmentally conscious' production, 'ethical,' "clean" and "fair business" when considered in a manufacturing setting (Baines, Brown, Benedettini, & Ball, 2012). The core concept behind green manufacturing is to enhance the process and product innovations and organizational capacities by advanced technology to control the flow of waste generation in order to mitigate and eventually eliminate negative consequences on the environment and to increase the productivity of resources (Ali et al., 2019).

2.4 Green product innovation

Green product innovation relates to fresh or updated products to reduce environmental influences (Ma et al., 2017). It has been acknowledged among the crucial components for development, environmental sustainability and better lifestyle standards. The perception of green product innovation as a consequence of the interplay between innovation and environmental sustainability has become a top imperative for research and practice (Dangelico & Pujari, 2010). Managers should, therefore, encourage an organization which promotes innovative culture to encourage suppliers to refurbish their goods, reduce energy consumption and material content to a minimum and eventually produce new green products in order to remain competitive on the market and value sustainable practices (Dai et al., 2014).

2.5 Green process innovation

Green process innovation concentrates on brand-new or adjusted manufacturing facilities, along with procedures and methods for minimizing the environmental burden (Shrivastava, 1995). Indeed, green process innovation is essentially the primary component of the green innovation strategy (Ma et al., 2017). It can assist the manufacturing firms in mitigating the negative environmental impacts in the production process (Christmann, 2000). In general, environmental protection is the driving force of innovation in the green processes and proves that the firm is adhering to the social responsibility practices (Guoyou, Saixing, Chiming, Haitao, & Hailiang, 2013; Ma et al., 2017).

2.6 Management Support

In most organizations, upper management, namely the CEO and his immediate corporate policy subordinates (Green, 1995), play a central role as influential in the evolution of diverse management practices which affect business performance. Top-level managers play a pivotal part in guaranteeing the financial and operational resources required for executing different plans and projects within their businesses (Thong, Yap, & Raman, 1996). Not far from that is the innovation activities such as green innovation practices to achieve environmental sustainability. The environmental impacts have pressure on organizations policy, and the top-level managers are responsible for acting accordingly to respond to these institutional and customers pressures (Bansal, 2003). In order to ascertain the pace and scope of environmental activities, the role of top management is strongly emphasized (Bansal, 2003). Even though ability and commitment can be produced throughout all managerial levels in the organization, the act of top managers represents a vital role as their decision influences actions that affect environmental policy-related decisions such as resource allocation and deployment (Chu, Yang, Lee, & Park, 2017). These pressures come from internal and external stakeholders alike. Pressure from stakeholders is often identified as a critical external and internal driver of implementing environmental management. Key stakeholders consist mainly of staff, clients or customers, government agencies, shareholders, NGOs and society (Dai et al., 2014). The managerial role from the top echelon is to respond to different stakeholders' requirements and implications, whether internally or externally. In particular, the employees are internal stakeholders who can undertake the environmental protection initiatives at the company (Cantor, Morrow, & Montabon, 2012). In order to hire and maintain a skilled employee with an apparent inclination for working in companies with a proactive

orientation towards environmental management, top management necessitates creating a culture that shows that environmental management concerns are valued at the company(Chan, He, Chan, & Wang, 2012). It indicates that top management would embrace sustainability programs to counter the environmental burden from internal stakeholders (employees)(Dai et al., 2014). Regarding external stakeholders, the pressure is more fierce is this may include some regulatory and legal concerns (Dai et al., 2014). These parties impose that the company must obey to environmental management practices (Jang et al., 2017). Thus, the management commitment and support are certain undertakings to link the green production and supply chain management activities with the external pressures towards sustaining the environment (Dai et al., 2014).

3. Test Hypothesis

3.1 Hypothesis Model

Based on the review of academic literature, this study addresses and proposes a study model that explores the impact of green productivity strategies on environment sustainability. Moreover, it evaluates the effect of green productivity and environmental sustainability in species. The proposed model as well stress on how the management support mediates this role as an important factor in the firms that applied green production to steadily support employee by adopting the green management view and culture of green production eco-friendly adoption.

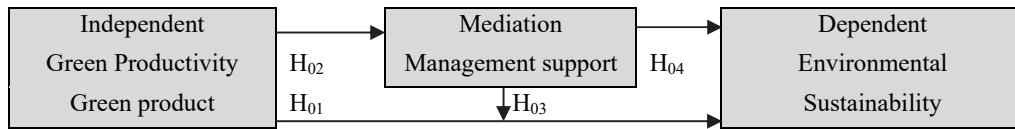


Fig. 1. The proposed model

3.2 Research Hypothesis.

H₀₁: Green productivity has no impact on environmental sustainability.

H₀₂: Green productivity has no impact on Management support.

H₀₃: Management support has no impact on environmental sustainability.

H₀₄: There is no mediation effect on the relationship between green productivity and environmental sustainability.

4. Research Methodology

This study adopted the descriptive analytical approach as a study methodology to explain the research phenomena. Which are crucial to propose a well-assumed model according to a Rather than experimental and real phenomena, imperceptible abstraction (al-Omoush, 2020). In order to test the study hypothesis and theoretical model, the PLS analysis using SPSS software was used. Further, the study applied the Structural equation modeling (SEM) to test the mediating role, enhance the accuracy in errors measurement

4.1 Study Population and Sample

The population of this study entails mining industry firms operate in Jordan and listed on the (ASE). The study sample consisted of departments, section managers, and worker who have the expert in terms of green manufacturing (Al Omoush, 2020). The study applies the purposive sample composed of 150 respondents. Thus, the questionnaire was administered to them, and the number of useful items for the data analysis was 100 questionnaires represented in Fig. 2.

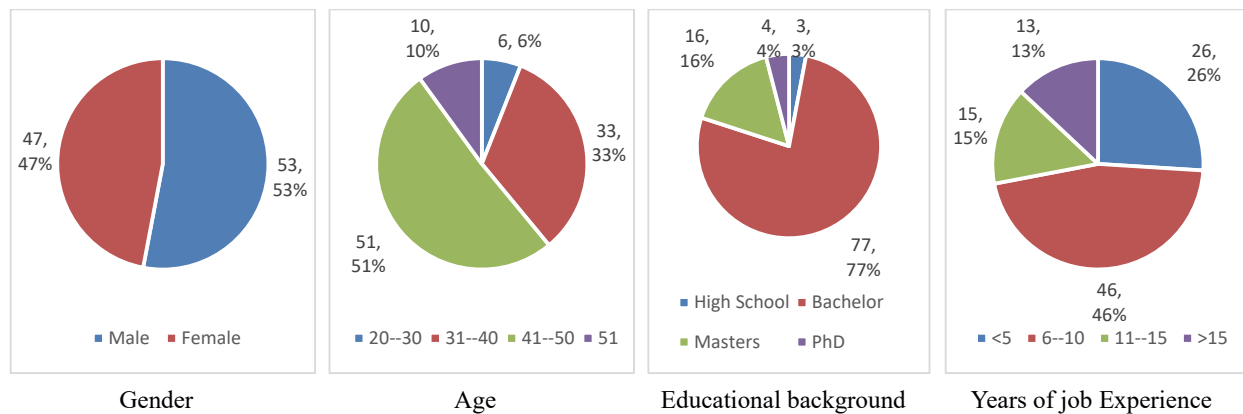


Fig. 2. Personal characteristics of the participants

4.2 Validity and reliability

Cronbach Alpha and Composite Reliability (CR) to analysis readability for variables on study model

Table 1

The results of Factor Loading

Factor	Items	Factor loadings
Green product	1	0.790
	2	0.859
	3	0.811
	4	0.801
	5	0.784
Green production	1	0.814
	2	0.837
	3	0.880
	4	0.728
	5	0.774
Green process	1	0.710
	2	0.818
	3	0.829
	4	0.856
	5	0.805
Management support (mediator MV)	1	0.801
	2	0.865
	3	0.880
	4	0.692
Environmental sustainability	1	0.689
	2	0.768
	3	0.754
	4	0.870
	5	0.766
	6	0.817
	7	0.731
	8	0.720

Table 1 illustrates the values of the standardized loading of the items. The results of the standardized loading are to reflect satisfactory levels of validity as it is greater than 0.50. Further, all items fall in the accepted range as the standardized path loadings for all indicators were above 0.55, and thus they are all significant (Falk & Miller, 1992).

4.3 Reliability and validity construct

The findings in Table 2 indicate the validity of the factors, namely the values of Average Variance Derived (AVE). The agreed cut-off values must be greater than 0.50, representing the quantities of variation shared by the items a factor. The effects of all variables, with the exception of green productivity, are compatible with the cut-off point of the AVE above 0.5, as its value is (0.447) but the value is similar (0.50) and could be acknowledged. For all the Composite Reliability (CR) The layout is over 0.7 its approved, the models used in the model of the analysis display a high degree of internal accuracy as Cronbach's alpha values ranged from 0.82 to 0.91 As a result, both objects are accepted on the basis of Saunders et al. (2009).

Table 2

Results of Convergent Validity and Reliability Analysis Using Confirmatory Factor Analysis (CFA) Composite (CR) And Cronbach Alpha (CA)

	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
(Green productivity)	0.910	0.923	0.447
Environmental sustainability	0.899	0.919	0.587
Green product	0.869	0.905	0.655
Green production	0.867	0.903	0.653
Management support	0.827	0.885	0.661
Green process innovation	0.863	0.902	0.649

4.4 Fornell-Larcker Criterion

Table 3 through discriminative validity of the standard was to assess the validity of differentiation as per Standard Fornell-Lacker (1981). This form of validity means that the variable correlates with enabling a rational degree. The square root of the (AVE) displayed in bold and diagonally is another significant indicator of discriminate validity. This sign means that its value is greater than the other correlations with the other variables between them (al Omoush, 2020).

Table 3
The results of discriminating validity

	(Green productivity)	Environmental sustainability	Green product	Green production	Management support	green process innovation
(Green productivity)	0.669					
Environmental sustainability	0.773	0.766				
Green product	0.811	0.596	0.809			
Green production	0.812	0.672	0.450	0.808		
Management support	0.639	0.691	0.456	0.602	0.813	
Green process innovation	0.868	0.651	0.595	0.558	0.521	0.805

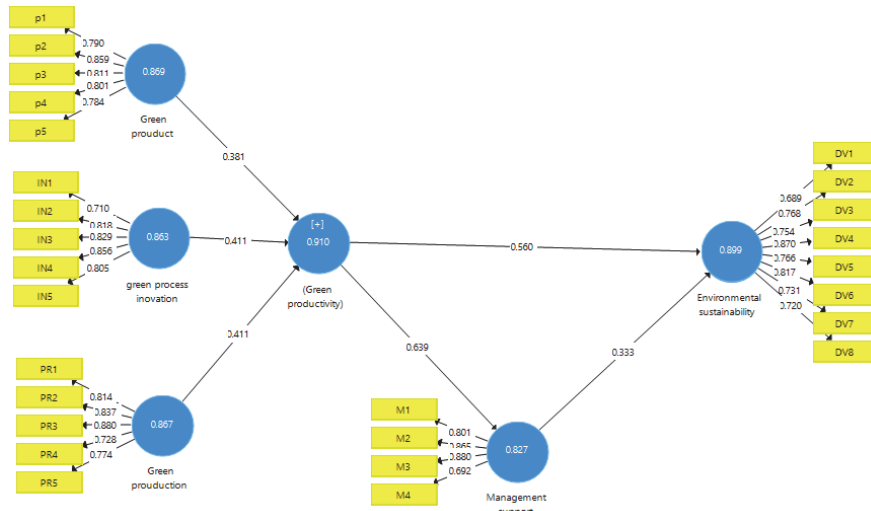


Fig. 3. Model of structured loading and path coefficients discriminate validity for the trimmed model

The findings in Table 4 display the outcomes of the structural model centers' prediction-oriented findings. In detail, it shows the R2 values of the management support variable's mediating mechanism.

Table 4
The summary of the results of R-Square values

	R Square	R Square Adjusted
(Green productivity)	1.000	1.000
Environmental sustainability	0.663	0.656
Management support	0.408	0.402

The R² value of the dependent latent (Environmental Sustainability and Management Support) was above 25% on the basis of Table 4, which showed an acceptable level of estimation in scientific studies (Gaur and Gaur, 2006).

4.5 The results of Q²

The Q² significance of the predictive relevance is also confirmed by the R² findings.

Table 5
Q² (Squar) Test

Factor	Q ² (=1-SSE/SSO)
(Green productivity)	0.431
Environmental sustainability	0.373
Management support	0.247

The results in Table 5 display Q² values, all of which are higher than zero, as noted. The findings show the predictive significance of the PLS pathway model, according to the innervations procedure suggested by Chin (1998). We used the bootstrap

procedure and 100 cases were chosen. In addition, there was no substantial improvement in the choice to determine the significance of the pathway coefficients (Hair et al., 2013).

4.6 Hypotheses testing

Table 6

Total Effects Standardized

Hypotheses	B	Standard Error	T Statistics	Prob(P-Value)
Green productivity → Environmental sustainability	0.564	0.07	8.045	0.000
Green productivity → Management support	0.643	0.067	9.486	0.000
Management support → Environmental sustainability	0.334	0.081	4.139	0.000

1- Testing findings of the first major hypothesis:

H₀₁: Green productivity has no impact on environmental sustainability. (at 0.05 level).

Findings in Table 6 illustrate that the impact value of manufacturing techniques on competitive priority was represented by the regular beta coefficient (0.564), which was measured to be statistically significant since the resulting probability (0.000) was < 0.055.

Resultantly, the null hypothesis represented by the key one is rejected, concluding to facilitate the impact on environmental sustainability (green productivity)

2- Testing results of the second major hypothesis:

H₀₂: Green productivity has no impact on Management support at 0.05 level).

As described in Table 7, the results illustrate that the impact value of ' standardized beta coefficient is (0. 643). Thus, the resulting probability value (0.000), which is less than 0.05, is significantly positive.

Resultantly, the null hypothesis is rejected to infer that the impact of green productivity on management support.

3- Testing results of the third major hypothesis:

H₀₃: Management support has no impact on environmental sustainability.

The results given in table (7) show that the impact value calculated as the standardized beta coefficient of the management support is (0. 0.334). Thus, since the corresponding probability value is (0.000) and less than 0.05, the value is significantly positive.

Resultantly, the null hypothesis of concluding management support for environmental sustainability is rejected.

4- Testing results of the fourth major hypothesis:

H₀₄: There is no mediation effect on the relationship between green productivity and environmental sustainability at 0.05 level of management support at 0.05 level).

Table 7

The results of direct and indirect effects

	Direct Effect		Indirect Effects		VAF (%)	Total effect
	B	Prob.	Value	Prob.		
Green productivity → Environment sustainability	0.779	0.000	0.213	0.000	27.55	0.773
Green productivity → Management support	0.639	0.000				
Management support → Environmental sustainability						

(VAF < 20 no mediation, 20 to < 80 partial mediation and 80 + full mediation)

The findings in Table 7 show that the amount of the indirect influence of Management Support on the relationship between Green Productivity and Environmental Sustainability (0.213) was calculated to be significantly positive since the probability value (0.000) was (< 0.05). The findings explain the direct impact significance of Green Productivity on sustainability of the environment. Based on al Omoush (2020) the dependent variable (in the existence of the mediator) was (0.779); the total effect is the sum of the two values mentioned (0.564). The mediation effect was assumed to have a partial effect on the relationships between the independent and dependent variables since the significance of the relationship was the same before and with the mediator being available. As shown, the value of the variance accounted for (VAF) is (27.55 percent), indicating the proportion of all indirect effects relative to the overall effects shown. This therefore suggests a partial role of mediation. A positive effect was the effect of two paths of the mediator variable to imply a compatible one. Concluding that support for process management mediates the relationship between green productivity and the sustainability of the environment at a value of 0.05. Hence the null hypothesis is thus rejected.



Fig. 4. Indirect effect – R²



Fig. 5. T Test – P value

5. Result and Conclusion

The results of data analysis and according to the inputs from the Jordanian industrial environment as a sample of the developing countries. There is a huge intends towards the adoption of the green economy, whoever, these efforts and regulations do not replace the concept of sustainable development. However, they resulted in the growing conviction that achieving the required sustainable development will only be achieved through the promotion of the idea of a green economy after decades of environmental destruction. Further, it supports the green productivity as the community will not attain the Millennium Development Goals without achieving sustainability, which in turn is based on the idea of a green economy that is why the idea for this study came.

1. The illogical hypothesis designated by the main one is dismissed as a statistical finding, concluding that (green productivity) has an effect on environmental sustainability.
2. The illogical hypothesis is dismissed as a statistical outcome, assuming (Green efficiency effect on support for management.)
3. As a consequence, the null hypothesis is dismissed, concluding that the effect on environmental protection is assisted by management.
4. As a statistical consequence, the direct effect benefit of Green Productivity ON Protection of the Ecosystem indicates that.
5. The mediation effect partially affected the correlation between the independent and dependent variables

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Appendix

Dear Respondents: Please put the sign (√) to the right of each clause in the appropriate column.

The Item	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
green product					
Our company's management emphasizes on producing green environmentally friendly products.					
Our company's management focuses on ensuring the safe use of its customers by adopting green production.					
The management of our company's considers the environment one of the competitive precedents that enables it to achieve superiority over competitors.					
The management of our company's focuses on developing its products in a manner that suits the needs and desires of its customers without harming the environment					
The company selects some materials that complement or enhance the production, which consume the least amount of energy and resources and have less impact on the environment.					
Green process					
The management of our company's applies international specifications standards related to its green operations.					
Our company's has the ability to provide innovative designs for its operations on an ongoing basis with the aim of preserving the environment.					
Our company's management is keen to fulfill its obligations towards moral society by doing green operations.					
Our company's management does not mind reducing the proportion of profit margin which is achieved if you follow the style of green processes.					
Workers contribute to better redesign of production processes to reduce emissions and waste.					
Green production					
The company is committed to using raw materials (improvers) that do not cause harm to the environment.					
The company takes some measures to reduce pollution from the source, such as checking the ore for radioactive contamination before refining it.					
The company is seeking to replace materials and processes environmentally questionable ones do not occur Environmentally harmful.					
The company takes environmental requirements into consideration when designing its operations.					
The company seeks to use green production technology in its production processes					
Environmental Sustainability					
Our company's management adopts internationally recognized environment reports					
Our company's uses environmentally friendly materials by studying their properties and specifications					
Our company's management cooperates with governmental environmental organizations or non-profit to achieve environmental sustainability					
Our company's is under constant pressure by the government and organizations interested in the environment in order to increase interest in preserving the environment					
Our company's management has a clear policy urges environmental awareness in every process of production processes to the final supply					
The management of our company works to reduce the emissions of gases from its activities					
The management of our company's emphasizes the preservation of its resources and their use in a manner that ensures the preservation of the share of future generations					
Our company's management is interested in reducing the quantities of greenhouse gases					
Management support					
The top management is committed to encouraging green production practices					
Middle management managers support green productivity practices at the level of every department in the company					
There is coordination and cooperation between all functions and departments within the company to implement environmental improvements					
Top management applies TQM practices					



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