

Does Green Product Innovation affect Performance of Saudi Chemical Industrial Firms?

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Abstract. Although many companies have recognized the concepts of environmental innovation, little research attention has been devoted to the consideration of relations between green product innovation and firm performance. This study aimed to investigate the impact of green product innovation on firms' performance. A structured questionnaire was developed for the purpose of data collection, and 19 Saudi chemical firms were included. The results show that green product innovation has a positive effect on firms' performance. These results can help companies involved in manufacturing green products to create a new environment and enhance their business performance.

Keywords: Green product; firm performance; Saudi Arabia.

1. Introduction

The rapid growth of global economies has had an effect on natural resources and environment, creating the key bottleneck of sustainable economic development that has aroused conflict between economic growths, high energy consumption, and environmental deterioration, all of which represent global challenges (Cainelli et al., 2015). One of the challenges is how to achieve ecologically sustainable living standards (Dangelico, 2015) and how to increase the recognition of new technological products and processes that must embody greener characteristics than in the past (Conway & Steward, 1998). It is widely recognized that the environmental innovations are considered as an important key for sustainability, and the recognized role of businesses in environmental issues has increasing during the last decade (Hasan & Ali, 2015).

The new concept of green economy is green growth, which has attracted a lot of attention in recent years, both for the developed and developing countries. There have also been a lot of discussions at the international level, such as at the G20 and the Rio+20 United Nation Summit in June 2012 (Jacobs & Jolly, 2013). Many new international organizations, including the Global Green Growth Institute (GGGI) and the Organization for Economic Co-operation and Development (OECD) are explicitly devoted to promoting green growth and green innovation by sharing their experiences. Many efforts have been made by industrial sectors to improve their environmental performance and production cycles, which have become a primary objective in many contexts (Cainelli et al., 2015). Given these trends, green marketing research has been growing since 1980s; a lot of literature indicates that consumers' shifting attention towards green products and green marketing will be an approach that businesses can take in the future to achieve their goals alongside the environmental and social roles. Many studies have indicated that consumers are aware of green products and are willing to pay more to "go green" (Rahbar & Wahid, 2011).

As a result, green marketing research has concentrated on the shifting of consumer consumption to green products, in addition to green consumers from developed countries including the USA and Western Europe, who have been found to be more environmentally

conscious (Curlo, 1999). For emerging economies, by contrast, limited numbers of studies have examined the impact of green marketing on consumers (Bhattacharya, 2011). Moreover, many studies have investigated the relation between organizational learning and corporate environmentalism, finding that corporate environmentalism requires the generation and dissemination of environmental information in addition to knowledge that facilitates the translation of environmental values into corporate and functional strategies (Banerjee et al., 2003). Also, the commercialization of environmentally friendly products and services could generate important differentiation advantages, which enable firms to avoid fines and penalties when trying to gain new market opportunities. Green marketing enhances firms' reputations since green practices shape stakeholders' perceptions on the firm's ethical behavior (Chen et al., 2006; Hasan & Ali, 2015).

Environmental responsibility becomes a major issue, not just for governmental and non-governmental environmental organizations, but also for businesses that are forced to incorporate environmental thinking into their business strategies and daily operations as a response to communities' environmental concern. Saudi Arabia's 2015 budget included an expenditure section specifically allocated for environmental issues, to include water supply, sewage issues, and other environmental concerns particularly relevant to that country (Saudi Arabia Sustainable Energy, 2015). In addition, globalization has made the environment a global concern, including Saudi Arabia, which has developed its own green growth strategy. Saudi Arabia is the largest country in the Gulf Cooperation Council (GCC) region in terms of the size of the economy and demography, with a GDP of SAR 2163 billion (US\$577.6 billion) and a total population of 28 million people in 2011. Saudi Arabia accounts for 42 percent of the GCC region's total GDP and 65 of its population (SAMA, 2015). Saudi Arabia also faces serious environmental issues in the region. This is to be expected because empirical evidence from elsewhere around the world suggests that, up to a point, environmental pollution is positively correlated with the level of economic activity or industrial development. According to the Arab News (report from 17 May, 2014), all of the country's industries are burning oil and heavy fuel. This reflects the needs and opportunities for green economy transition. This study aims to understand the effects of adapting of green product innovation by Saudi firms, especially those in the chemicals industry. It is clear that great care needs to be taken when extending the findings of studies conducted in developed countries like the USA to countries such as Saudi, as "the research findings from more developed countries are not necessarily applicable to organizations in less developed countries" (Albarq, 2014)

2. Literature Review

2.1 Firms' Performance

Any organization has goals to achieve, whether they are financial or non-financial. For determining the level of goal achievement, marketers use performance management practices that are common in all industry sectors as well as the public sector. In addition to increased interest in performance measurement at all levels for organizations, I have reviewed numbers regarding performance measurement, performance comparisons, and benchmarking. In parallel to these theoretical developments, it has seen increased in performance compared with benchmarking practices and services in an early review some of these benchmarking services (Govindan et al., 2015).

The literature identifies a number of leading indicators that predict organizational performance, including customer-oriented operational indicators such as delivery performance, lead times, flexibility, and quality performance (Govindan et al., 2015), as well as human-resource-oriented indicators such as employee satisfaction and morale (Hasan &

Ali, 2015). Furthermore, many studies have measured and compared the performances of different firms from different perspectives (such as marketing, operations, finance, and human resource management) for different purposes. However, there has been little or no informed scientific debate about the appropriateness of measurement methods and how they should be combined in order to compare business performances for different operating firms in different sectors (Dangelico, 2015; Hasan & Ali, 2015; Govindan et al., 2015).

The main issues associated with traditional performance measurement are summarised as follows: lackness of alignment between performance measurement and strategy; failure to include non-financial and less tangible factors such as quality, customer satisfaction, and employee morale for predictors of future performance; and insular or inwards-looking measures that give misleading signals for improvement and innovation (Ghalayini & Noble, 1996). In contrast, the contemporary performance measurement approaches include intangible dimensions, such as public image perception, customer satisfaction, employee satisfaction, attrition and skills levels, innovations in products and services, and investments into training of new value streams (McAdam et al., 2008; Fullerton & Wempe, 2009).

By comparison, the benchmarking approach mainly refers to quantitative comparisons of performance variables such as costs, quality, customer satisfaction, and productivity for identifying performance gaps to identify improvement opportunities. The benchmarking performance measurement tool considers a global approach, but has limitations because, by mainly focusing on financial results, it aims to determine which organization performs better according to its financial objectives like return on investment. While the benchmarking approach works well for identifying and comparing the firms' performances in a specific industry or sector, it does not work well for comparing across industries that becomes meaningless due to contextual factors (Hasan & Ali, 2015). Innovation is considered to be a key competitive advantage that enables firms to create and deploy their capabilities that support long-term business performance (Teece, 2007). In terms of firms' performance improvements, many studies consider green innovation as one of the key factors for improving firms' environmental, social, and financial outcomes (Dangelico, 2015).

Furthermore, according to Krammerer (2009), green products have many public and private environmental benefits for the customer that will generate stronger consumer demand. A study conducted by Carrion and Innes (2010), based on a panel data of 127 US manufacturing industries, and looked at the relationship between environmental innovation and performance. They found that innovation can lower firms' costs to meet tighter government regulations or consumer demands, which tightened pollution targets and elevate the potential cost-saving benefits of environmental research and development, thereby spurring more innovation. Moreover, a study of the Swedish construction industry indicates that organizations could affect green innovations capacity absorption by improvement their business performance (Gluch et al., 2009).

A survey conducted by Pujari (2006) on new environmentally product for development projects in North America reports that green innovation activities have a positive impact on market performance. The production and commercialization of environmentally friendly products may generate important commercial advantages for proactive firms. Marshall and Mayer (1992) found that a product labeled as environmentally responsible can generate potential benefits for a firm as a result of positive public image. This image can enable firms to enter new markets and increase sales, consumer loyalty, and satisfaction by strengthening the application of environmental marketing programs that transmit an ethical organization's environmental orientation behavior. For these purposes, many firms have already started to establish associations with brands with certain environmental sponsorship programs and to support nonprofit organizations (Menon et al., 1999).

2.2 Green Products

According to Zailani et al. (2015), a green product is one that functions with processes of material retrieval, production, sales, utilization, and waste treatment like recycling, in addition to pollution reduction and energy saving. For Albino et al. (2009), a green product is designed to minimize its environmental impact throughout its life-cycle. In particular, such products minimize nonrenewable resource use, avoid toxic material, and use renewable resources in accordance with their rate of replenishment (Albino et al., 2009). Moreover, the definition of green product according to the industrial perception states that such products must respect the “Three Rs” – reduce, reuse, and recycle. Therefore, green products are defined as those that are made and packaged from recyclable or re-usable material, are energy-efficient or use renewable sources of energy, are non-toxic in nature, minimize their greenhouse gas emissions, have received green certification, require less water for manufacturing or using, are manufactured and marketed by a socially responsible firm, and are manufactured locally (Albino et al., 2009).

Chamorro and Banegil (2006) divided levels of green products for basic green products. The manufacturer takes the characteristics of the product into consideration during the use and consumption and post-consumption stages. An extended green product occurs when ecological attributes are considered in the manufacturing process, such as energy, water, natural resource consumption, waste generation with water, and air pollution contribution. A total green product or offer occurs when ecological variables have been incorporated into all internal activities of a firm (financial, purchasing, human, resources, etc.) and the environmental behavior of the organizations is interrelated with the firm (suppliers, distributors, financial entities) but does not contradict its environmental principles policy. The design of less harmful products is considered a complex and integrated process that requires innovative designs. Some of these eco-changes are relatively minor (Chuang & Yang, 2014), such as changes to packaging, while others require substantial engineering changes. Moreover, marketers must always keep in mind that consumers are unlikely to compromise on traditional product attributes, such as convenience, availability, price, quality and performance. In other words, green products must match up with those attributes against non-green products in order to earn consideration of the vast majority of consumers (Ginsberg & Bloom, 2004).

2.3 Green Product Innovation

Green product innovation refers to the application of innovative ideas, leading to the design, manufacturing, and marketing on new products whose newness and greenness significantly outperform conventional or competing products (Soylu & Dumville, 2011). Green innovative products are characterized by taking into account the recyclability and disposal issues throughout their life cycle; usage of materials that are recycled and less polluting, non-polluting, or non-toxic; due consideration to energy use, human toxicity, ecological impact, and sustainability issues at every stage of their life cycle; and incorporate a continual impact assessment and improvement mechanism in the product development cycle (Chiou et al., 2011). The “greenness” of a product is a relative concept that may change over time and be subject to the influences of context and expectations, similar to any other perceptual or evaluative phenomena.

Over the years, many authorities at both national and international agencies have attempted to establish standards or specification for product “greenness” through treaties,

regulations, practices, and guidelines. Although the standards may vary, they are generally concerned with ecological and human health, as well as the social, cultural, and economic impacts of a product. A product is considered to outperform a conventional or competing product in “greenness” if it imposes fewer burdens on the environment in terms of energy and raw materials requirements, air emissions, waterborne effluents, solid waste and other environmental releases incurred throughout its product life cycle (Chuang & Yang, 2014).

The results of the empirical study by Horbach (2008) show the importance of technological capacity (capital knowledge), enhanced by research and developments, in the process of environmental innovation.

Green product innovation represents 76.8 percent of green innovation (Fronzel et al., 2007). The multinomial logistic indicates that the strengthening of environmental policies and regulatory measures are positively correlated with “end-of-pipe” innovation, while the reduction of costs, the managerial system, and some environmental management tools tend to foster innovative products. Indeed, ISO 14001 certification is effective for creating technological change within those firms that are invested in the IPPC directive (Horbach, 2008).

According to Turpitz (2004), case analysis suggests that environmentally innovative product is primarily driven by four important factors: technology, market, environmental policies, and internal firm factors. Additionally, there are many indicators about innovation importance, which seems more important in countries such as Sweden and Denmark, where more active substitution policy in chemical industry is pursued. For instance, a study done by Nogareda (2007) in the chemistry and pharmacy sector showed that demand, regulatory stringency, and the distance from the end consumer in the supply chain all have a positive influence on the amount of product innovations. Consequently, regulation, market change, commercial, and technological aspects are the main factors that have influenced the development of more environmentally friendly products in the chemical sector (Soylu & Dumville, 2011). Furthermore, green product innovation encourages the use of efficient raw materials by lowering their costs, which leads to finding new ways of converting waste into saleable products that provide additional revenues (Hasan & Ali, 2015), in addition to enhancing cash flow and reputation, which became a source of market advantage (Chuang & Yang, 2014).

As a result, enterprises embody the concept of green products in designing and packaging of their products to increase their product differentiation (Chen et al., 2006). Green innovation is used for environmental management performance to satisfy the environmental protection requirements. Chen et al. (2006) divided green innovation performance into green product innovation performance and green process innovation performance and argued that green innovation firms should take advantage by charging relatively high prices for their green products and further obtain a competitive advantage. Consequently, the environmentally oriented firm reputation will be reinforced by affecting consumers’ perception as credibility, reliability, responsibility, and honesty (Miles & Covin, 2000).

In 2011, Eri Nakamura investigated the effect of environmental investment on firm performance, showing that a firm can increase its economic performance by strengthening the trust of consumers and shareholders through environmental investment by making the following contributions. Firstly, Nakamura considered extant firm environmental protection efforts rather than ex post environmental performance. Secondly, he examined the effects of environmental investment for short- and long-term investment. For estimating equations, Nakamura used a data set of 3237 Japanese listed firms collected, regardless of industry classification. The researcher found that, for the short run, the environmental investment does not affect firm performance significantly; as for the long run, environmental investment does increase firm performance significantly and there is a time lag between investment and firm valuation according to consumers and shareholders.

Meanwhile, Ilker (2012) studied the gap between green product innovations and firm performance and firms' ability to enhance their competitive capability under moderating effect of managerial environmental concern in this relation. Ilker constructed a model to link the aforementioned constructs, and data collected through a questionnaire based survey across 140 Turkish manufacturing firms from various sectors, which were then analyzed using structural equation modeling. That study showed that green product innovation generally has a positive effect on firm performance. This result demonstrated the strongest and significant influence of green product innovation on firm performance and competitive capability, with a strong effect of moderates.

Furthermore, Stanley (2012) investigated the influence that green product innovation and product process innovation have on two constructs of green innovation casual chain: green product competitive advantage and green new product success. The impacts of green product competitive advantage as a partial mediator in the link between green innovations (product and process) and green new product success were also examined. A model with four constructs was presented and tested on a sample of 203 research and development project leaders of electronics firms operating in China using quantitative methods. That study found that green innovations (product and process) are positively associated with green product competitive advantage and green new product success, and that green product competitive advantage partially mediates the relationships between green innovations (product and process) leading to new green product success. Stanley (2012) also found that green product innovation exerts a stronger influence on the consequential constructs than green process innovation.

In fact, I found few studies that deal with green product adoption for Saudi chemical industrial sector. On the other hand, many foreign studies have taken into account the impact of green product innovation as main factors in determining the strategic competitive advantage and firms' efficiency and the role of the firm's resources for accelerating it. I noticed that local studies have not dealt with green product innovation in the Saudi industrial sector in general and the chemical industry specifically. For this, I sought to examine the impact of green product innovation on firms' performance for Saudi chemical industrial firms.

3. Method

3.1 Sampling and data collection method

The present research is focused on green product innovation and business performance among related Saudi chemical industrial firms. The data were collected using a questionnaire. Due to the absence of any governmental classification for green product innovation and green firms in general, and in order to get the right number of firms that deal with green product innovation, I included all 19 Saudi chemical industrial firms. Seventy-six questionnaires were personally submitted to the population as follows: four questionnaires for each firm targeting top and middle management, which represents the unit of analysis in this research; two questionnaires were directed to top management and two to middle management. The returned questionnaires were screened and filtered for any unanswered questions and, after screening, 68 questionnaires were processed for analysis, a response rate of 89.4 percent.

A five-point Likert scale, ranging from strongly disagree to strongly agree, was used, taking weight from 1–5 to measure items reflecting the variables of the study. This study consists of one independent variable and one dependent variable. The questionnaire was designed to reflect the study objectives and questions, which consists of (23) questions based on the literature review. I formulated and personally submitted the questionnaire in Arabic. Before using the Arabic version of the questionnaire in the main survey, the questionnaire

was sent to six bilingual Arabic (Arabic/English) lecturers at Al Imam University Collage of Management to ensure the two versions of the questionnaire matched as closely as possible.

Green product innovation was measured using three dimensions (the use of less or non-polluting/toxic materials or using environmentally friendly material; the use of environmentally friendly packaging for existing or new products; and recycling in general) through 15 questions. *Firms' Performance* was measured using three dimensions (sales growth, market share, and general profitability) through eight questions.

Face validity of questionnaire was obtained from a five-member academic panel of management experts from Saudi universities. According to their valuable recommendation, necessary modifications were made. After preparing the final copy of the questionnaire, I distributed a pilot questionnaire to selected firm managers and discussed each component of the questionnaire with them to ensure that each statement measured what it was supposed to measure.

4. Results

4.1 Demographic Characteristics of Respondents

Five demographic variables are included in this study (educational level, current position, gender, age, and work experience). Table (4-1) shows the demographic variables of the respondents.

Table 1. Demographic Characteristics of Managers (N=68)

Variables	Class	Number	(%)
Education level	Diploma or less	18	26.47
	Bachelor	44	51.31
	Higher education	6	22.22
	Total	68	100
Current position	Top level management	40	58.82
	Middle level management	27	39.71
	Others	1	1.47
	Total	68	100
Gender	Male	51	75.00
	Female	17	25.0
	Total	68	100
Age (In years)	Below 25	3	4.41
	25- below 35	22	32.35
	35- below 45	40	58.82
	45- below 55	3	4.41
	55 and more	0	0.00

	<i>Total</i>	<i>68</i>	<i>100</i>
Experiences (In years)	Below 5	5	7.35
	5- below 10	19	27.94
	10- below 15	34	50.00
	15- below 20	7	10.29
	20 and more	3	4.41
	<i>Total</i>	<i>68</i>	<i>100</i>

Tables 2 and 3 show the descriptive statistics for the main study dimensions and their construct (mean and standard deviation); they also show some measurements for each item (rank and the level of importance).

Table 2. Descriptive statistics for the main study dimensions

No.	Items	Mean	SD	Level	Rank
Using environmentally friendly material in production process					
1	Your firm uses less harmful raw materials in the production process.	3.43	1.07	Moderate	13
2	Your firm uses less toxic materials in the production process.	3.83	0.85	High	5
3	Your firm uses environmentally friendly materials in the production process.	3.88	0.83	High	2
4	When designing new products, your firm focuses on environmental concerns.	3.76	0.79	High	7
5	Your firm uses low power consumption procedures (methods) in the production process.	3.39	0.86	Moderate	15
6	Your firm uses low power consumption instruments (machine).	3.87	0.70	High	4
Using environmentally friendly packaging material					
7	Your firm uses biodegradable material for packaging.	3.79	0.97	High	6
8	Your firm avoids using environmentally harmful material for packaging.	3.88	0.85	High	2
9	When modifying current products, your firm takes into consideration the environmental issues.	3.66	0.92	Moderate	9
10	Your firm focuses on producing biodegradable products.	3.93	0.84	High	1
Recycling in general					
11	Your firm recycles its byproducts.	3.71	0.80	High	8
12	Your firm recycles its expired products.	3.52	1.13	Moderate	10
13	Your firm recycles returned products.	3.47	1.04	Moderate	12
14	Your firm recycles the unfinished products that might get damaged during any stage of	3.5	0.94	Moderate	11

15	production. Your firm offer to collect the product's waste from end-users for recycling.	3.4	1.12	Moderate	14
Green product innovation		3.67	0.50	Moderate	
<i>Less than 2.6 is considered Low, 2.6 to less than 3.4 is considered Moderate, and 3.4 to 5 is considered High.</i>					

The results obtained from Table 2 indicate that item no. 10, which states “*your firm focuses on producing biodegradable products*”, has a high degree of importance (mean 3.93), while item no. 5, which states “*your firm uses low power consumption procedures (methods) in the production process*”, has moderate importance (mean 3.39). The overall green product innovation variable is recognized by a mean of (3.67), which reflects a moderate importance level as addressed by the study sample. The most important items for green product innovation are: focusing on producing a biodegradable product, using environmentally friendly materials in the production process, and avoiding the use of environmentally harmful material for packaging.

Table 3. Means, Standard Deviations of Firms` Performance items

No.	items	Mean	SD	level	Rank
Sales growth					
1	The use of green product innovation increased your sales directly (form environmental friendly products).	3.57	0.89	Moderate	7
2	The use of green product innovation increased your overall sales (from other types of products as well).	3.93	0.79	High	2
Market share					
3	The use of green product innovation preserved your current customers.	3.94	0.85	High	1
4	The use of green product innovation attracted new customers.	3.75	0.83	High	3
5	The use of green product innovation increased your market share.	3.64	0.91	Moderate	4
General profitability					
6	The use of green product innovation increased your overall profitability.	3.63	0.78	Moderate	6
7	The use of green product innovation enhanced the financial position of the firm.	3.41	0.80	Moderate	8
8	The use of green product innovation enhanced the firm's mental image among customers.	3.64	0.81	Moderate	4
Firms` performance		3.69	0.52	High	
<i>Less than 2.6 is considered Low, 2.6 to less than 3.4 is considered Moderate, and 3.4 to 5 is considered High.</i>					

The results from Table 3 indicate that item no. 3, which states “*The use of green product innovation preserved your current customers*”, has the highest importance (mean 3.94), while item no. 7, which states “*The use of green product innovation enhanced the financial position of the firm*”, has moderate importance (mean 3.41). The overall firm performance variable is recognized by a mean of (3.69), which reflects a high importance level as addressed by the

study sample. The most important items recognized as firms' performance indicators for firms are: preserving current customers, increasing the overall sales, and attracting new customers. To test this hypothesis, I used simple linear regressions to analyze the impact of green product innovation on firms' performance. The results are shown in Table 4.

Table 4. Simple Linear Regression Analysis of Green Product Innovation on Firms' Performance

Domain	(R)	(R ²)	F	Sig F	β Coefficient	Sig**
Green product innovation on firms' performance	0.694	0.481	91.7	0.000*	0.694	0.000*

* Tabulated F value = 3.94 with degrees of freedom (1, 99), **The impact is significant at level ($\alpha \leq 0.05$)

The results from Table 4 show that green product innovation has a statistically significant impact on firms' performance (calculated F was 91.7); the probability value of F (sig level) was (0.000), which ensures the results are within acceptable limit. The value of R² reflects the proportion percentage of the variation in the dependent variable that could be accounted for in the independent variable. This percentage is 48.1 percent and the beta (β) coefficient reflects the magnitude of how much the green product innovation can affect a firm's performance; this equals 0.694, which is significant (0.000) at the 0.05 percent level. As a result, the null hypothesis is rejected and consequently concluding the presence of the impact of the independent variable (green product innovation) on the dependent variable (firm performance). The contribution of green product innovation on firms' performance is 48.1 percent, which is considered a moderate effect (Salkin, 2007).

5. Discussion

The results indicate a moderate effect of green product innovation on firms' performance. The mean value of green product innovation measurement tool is 3.67, which reflects a high importance level. The most important items are producing biodegradable products and avoiding harmful packaging material. The firm performance measurement tool is recognized by a mean of 3.69, which reflects a high importance level, and the most important items are preserving current customer, increasing overall sales, and attracting new customers. The result obtained from testing this hypothesis is coherent with the survey conducted by Cainelli et al. (2015), which claimed that green innovation activities have a positive impact on the performance. Furthermore, a study by Chuang and Yang (2014) concluded that green innovation is considered as one of the key factors for improving firms' environmental, social, and financial outcomes. Additionally, when firms have commitments to environmental management with active green innovation, this can enhance the overall productivity and performance (Chen et al., 2011).

Although the results of this study are coherent with previous studies, the effect of green product innovation on firms' performance in the present research is weaker than the above mentioned studies. This could be due to the fact that the utilization of green product innovation is still relatively new for chemical industrial firms. As mentioned previously, green innovation investments in general are long-term investments that, over time, will have a greater effect on firms' performance. Also, firms that deal with green product innovation normally start by taking "baby steps" and ease their way into green innovation gradually to avoid any shocks and major changes in their operation.

6. Conclusion

In order to meet great environmental challenges such as pollution, climate change, and ozone depletion, a lot of attention has been paid to innovation as a way of developing sustainable solutions. Green innovation is positively associated with firm performance. In the past, a lot of innovation research was undertaken for these constructs. However, limited studies have focused on the relationship between green product innovation and firm performance. In this context, the evidence presented in this research shows that green product innovation positively affects firm performance. Companies that pioneer in green innovation will enjoy the “first-mover advantage,” which allows them to ask for a higher price for green products, improve their corporate image, develop new markets, and gain competitive advantages (Chen et al., 2011). According to Hasan and Ali (2015), green product innovation refers to the application of innovative ideas leading to the design, manufacturing and marketing of new products whose newness and greenness significantly outperforms conventional or competing products. Companies engaging in environmental management and green innovation actively can not only minimize production waste and increase productivity, but also improve their overall productivity, increase their corporate reputation, and thereby, enhance corporate competitiveness under the trends of popular environmentalism consciousness of consumers and severe international regulations of environmental protection (Chen et al., 2011).

These results demonstrate the significant influence of green product innovation on firm performance, matching previous studies found in the literature. The advantages enjoyed by firms that implement green product innovation (through the use of environmentally friendly material, less and non-polluting/toxic materials, environmentally friendly packaging materials, and recycling in general) include higher performance demonstrated through sales growth, greater market share, and general profitability and competitive advantage demonstrated through product-based advantage as a result of higher product quality, packaging design and style, and value-based advantage drafted from the dimension of value and quality. Those benefits can be labeled as product-based and value-based advantages.

Firms can benefit from applying green product innovation on many levels, such as attracting new customers and preserve current ones, improving product attributes that lead to superior product offerings, and embracing social responsibility that enhance the firm’s image and reputation. Also, green product innovation is considered to be a source for building a competitive advantage and desirable positioning. Green transformation does not require very large investment; even small- and medium-sized firms can start implementing green product innovation. Firms should try to make use of such incentives and increase their cooperation with the government and its agencies to benefit from all green transformation incentive programs. In addition, firms should start implementing the ISO 14001 system, which can facilitate green transformation since it is centered on creating environmental management system. ISO 14001 does not state requirements for environmental performance, but does map out a framework that a firm or organization can follow in order to set up an effective environmental management system; it can be used by any firm to improve resource efficiency, reduce waste, and drive costs down (Cainelli et al., 2015).

I recommend that future studies examine the green product innovation effect on other dependent variables (such as return on investments, return on equity, brand equity, reputation, and customer loyalty, etc.). Examining other moderator variables (such as environmental regulation, environmental policy, and managerial environmental concern) or considering some of those variables as mediators will provide a better understating of the variables that affect the relationship between green product innovation and firms’ performance and competitive advantage. Moreover, applying that same study model to other industrial sectors and comparing the results is a good future research area.

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