The impact of customer pressure and the environmental regulation on green innovation performance

E R Lestari, W A P Dania, C Indriani, and I A Firdausyi

Department of Agro-industrial Technology, Faculty of Agricultural Technology, Universitas Brawijaya, Malang, Indonesia
E-mail: endahlestari24@ub.ac.id

Abstract. In recent years, global climate change and environmental issues have become the serious attention of many parties. This is due to the growing awareness of customers, government and communities as the parties who are related to degradation of natural resources and environmental pollution matters. Firms encounter various external pressures, including consumer pressure and environmental regulation, so that they have to implement some environmentally friendly practices to achieve sustainable development, such as green innovation. The purpose of this study is to examine the impact of consumer pressure on green innovation performance and the role of moderating environmental regulation in this relationship. The conceptual model was verified using partial least square (PLS). Data was obtained from 80 food sector SMEs in Batu, East Java-Indonesia. The results show that customer pressure has a significant positive effect on green innovation performance. Likewise, environmental regulations have a significant positive effect on the relationship between customer pressure and green innovation performance. These results offer important implications on how the companies are more concerned about improving green innovation.

1. Introduction
Environmental issues have become serious matters for many parties, including for academic studies in the recent years. These issues are not only the responsibility of large industries but also small industries which today developing rapidly. Highly industrial growth becomes the major impact of the environmental damage, in addition to its strategic role in providing employment opportunities. Water, air and soil pollution as well as disposal of hazardous and toxic waste are several problems that should be mitigated seriously. As a consequence of various arising environmental issues, the government arranges certain environmental regulations aimed to limit the amount of carbon emissions and control the impact of material and energy use on the environment [1]. Many firms have made several efforts to address the problem and protect the environment. They have implemented environmental management strategies to minimize the firm’s impact on the environment and conduct some measures to reduce energy consumption and waste [2]. The motivation of the firms to promote ‘go green’ initiative is to improve performance and increase
competitiveness [3]. The solution that can be taken is performing environmentally friendly innovation or green innovation, as a strategy to protect the environment, increase economic growth and achieve environmental sustainability [4, 5]. Green innovation has become a popular concept due to global warming and environmental damage which have become serious threats in this global era.

Environmentally friendly innovation, known as green innovation, is undertaken by firms in all aspects and is developed in a sustainable manner [6]. The right environmentally friendly innovation not only has the ultimate goal of reducing negative impacts on the environment, but also increases the advantages of green products [7]. Environmental issues are critical in corporate strategic planning. The demand for green products is both an opportunity and a challenge to meet the environmental market. Therefore, businesses must be environmentally oriented and must adopt green innovation strategies and environmental practices effectively. Besides, the businesses should introduce and use efficient environmental technologies, as well as reduce waste and pollution. This aspect is mainly associated with the issue of "green" concept which marks out the pattern of shifting purchases, although there is no strong empirical evidence that customer demand is influenced by the "green" image of the firm [8].

Research on green innovation is growing rapidly [1, 9]. Many researchers continue to analyze the effect of green innovation on firm performance and competitiveness. Various studies are trying to investigate the driving factors of green innovation, including consumer awareness and corporate responsibility towards the environment, stakeholders’ pressure, ethical concerns, top management initiatives, technological availability, collaboration and networking among stakeholders [10, 11]. Among these factors, the main external driving forces for managing business sustainability are market forces, namely customers and legal drivers related to environmental regulations. Customer pressure and environmental regulations have been identified as essential external drivers of green innovation [12].

Some businesses are facing a shift in customer attitudes that engage more in sustainability-oriented actions and avoid products that they consider damaging the environment [12]. Additionally, Ford et al. [13] argued that green innovation is a consequence of government intervention designed to increase corporate responsibility to the environment. Several studies have shown that environmental regulation is the main motivation for firms to implement green innovations [5, 14]. However, Frondel et al. [15] and Eiadat et al. [16] found empirical evidence that environmental regulation had no significant impact on green innovation. Likewise, Zhu et al. [17] believed that regulatory pressure cannot lead to better performance. These inconsistent results actually indicate that the mechanisms on the effect of customer pressure and environmental regulation are still unclear. The effect of customer pressure on the green innovation and the contingency factor in the context of sustainable innovation is quite interesting to be investigated. Hence, this gap is considered important to be addressed. The aim of this research is to find out the impact of customer pressure on green innovation and the moderating role of environmental regulation on the relationship mentioned.

2. Literature Review and Development Hypotheses

Green innovation is identical with some terms, such as eco-innovation, sustainable innovation and environmental innovation, which covers various kinds of technologies such as solar and wind energy systems, organizational practices such as products redesign and production processes so that waste and pollution can be reduced [18]. Meanwhile, Reid and Miedzinski [19] defined this term more specifically as the creation of new products, processes, systems, services and procedures that have competitive ability to fulfill human needs and in order to improve the quality of life, by using natural resources and eliminating toxic substances. Cainelli et al. [20] underlined the importance of green innovation because it tends to have a higher level of technological novelty compared to conventional products, and builds a balance between economic needs and their impact on the environment.
The theoretical framework of this research referred to the institutional theory which is known as an explanation that strengthens organizational actions caused by external factors, social factors, community expectations and environmental factors. In order to survive and gain legitimacy from public, organizations should try to ensure that they could adapt to the external or social expectations of their environment. This theory identifies 3 different institutional mechanisms, namely coercive isomorphism (pressure from the government regulations), normative isomorphism (pressure from the society) and mimetic isomorphism (pressure that mainly comes from leading firms) [21, 22]. Thus, customer pressure and environmental regulation are two critical points of institutional pressure that will be discussed in this study.

Green innovation is a strategy that widely used to get superior performance. The focus of green product development includes saving water, energy and natural resources, reducing pollution and waste and eliminating hazardous materials [23]. The results of green innovation are able to reduce environmental risks such as pollution, carbon emissions and negative impacts related to the environment, as well as to improve efficiency [24]. The application of green innovation is the right strategy since the environmental regulations are increasingly stringent [25, 26]. This strategy is supported by the increasing customer awareness of environmental sustainability, so that they switch to environmentally friendly products [27]. Green innovation can be a solution to balance corporate responsibility towards the environment, and maintain business operation since the firms will be able to capture new market opportunities, comply with the applicable regulation [28] and meet the increasing demands of the consumers on environmentally friendly products and are willing to pay more than non-environmentally friendly products [27, 29].

The green consumer’s buying behavior has changed to be more ethical, where the consumers are considering whether the product they purchase has a positive or negative impact on the environment. Chiou et al. [30] indicated that from time to time, customers are getting more concerned to the environment matters and tend to demand more on green products. Green innovation creates superior value for the customers. Moreover, firm's decision to adopt green practices stems from its desire to earn more revenue through an improvement on customer satisfaction. Huang et al. [5] indicated that customer pressure affects organizational responses in improving green innovation performance. Customers shift their consumption patterns from conventional products to green products [29]. Some empirical evidence reveals that customer pressure stimulates firms to adopt green innovations and has proven to increase competitiveness due to products differ from competitors and improve product image and firms’ reputation [9, 31, 32].

The implementation of green product innovation is a strategic response as well as cooperative effort towards increasingly stringent environmental regulations to gain legitimacy and achieve a competitive advantage [33, 34, 35]. Consequently, strict environmental regulations force the firms to take the initiative and be responsible on the environmental protection actions, for example, proactively participating in green practices and investing in green innovation [36]. Under the pressure of environmental regulation, firms can build a positive green reputation [37, 38]. Strict environmental regulations and compliance costs have forced the firms to increase resource efficiency and improve productivity [39] rather than paying costs for waste recycling process.

Nevertheless, the government must be careful in enacting the regulations as the firms have a strategic choice that provides greater benefits at the sacrifice of lower environmental performance. Moreover, the strict regulations cause firms feeling reluctant to make innovation for different (specific) market segments [40]. Likewise, Ramanathan et al. [28] emphasized that environmental regulations do not affect green innovation. The relationship between customer pressure and green innovations is moderated by its context. If customer pressure is unable to support the green innovation performance, then the contingency factor may weaken the negative effect, or vice versa. Thus, the following hypotheses:

H1. Customer pressure is positively associated with green innovation
H2. Environmental regulation moderates the relationship between customer pressure and green innovation
3. Methods
The study was conducted on 80 small industries of food sector located in Batu, Indonesia. The data was collected through a structured questionnaire with five-point Likert-type scales ranging from 1 (totally disagree) to 5 (totally agree). The customer pressure was focused on five indicators which adopted from [5]. Environmental regulation consists of five indicators; referring to [5, 16, 28, 41]. While green innovation is classified into two dimensions, namely green product innovation and green process innovation; based on [16, 24, 42, 43]. The data was analyzed using WarpPLS version 5.0.

4. Results and Discussion
The result presented in Table 1 points out that the measurement model indicated through loading factor is > 0.50, which means the convergent validity of indicators was approved. The evaluation of the Goodness of fit model showed that all of the variables obtained a Cronbach-alpha coefficient is > 0.7; those are 0.891, 0.786 and 0.877 respectively. Composite reliability coefficients of the construct are all > 0.6 which means high internal reliability model.

| Constructs/items                  | Loading factor | Cronbach’s alpha | Composite Reliability |
|----------------------------------|----------------|------------------|-----------------------|
| Customer pressure                |                |                  |                       |
| Knowledge of green product       | 0.891          | 0.847            |                       |
| Increasing awareness of the customer | 0.741          |                  |                       |
| Green products image             | 0.811          |                  |                       |
| Preference on green product      | 0.807          |                  |                       |
| The commitment of buying green product continuously | 0.798          |                  |                       |
| Environmental regulation         | 0.811          | 0.658            |                       |
| Enactment of the environmental regulation | 0.703          |                  |                       |
| Environmental regulatory flexibility | 0.542          |                  |                       |
| Easy for implementation          | 0.794          |                  |                       |
| Governmental advocacy            | 0.793          |                  |                       |
| Administrative sanctions         | 0.583          |                  |                       |
| Green innovation                 |                | 0.877            | 0.836                 |
| Green product innovation         | 0.614          |                  |                       |
| Not containing toxic ingredients | 0.741          |                  |                       |
| Harmless for the health          | 0.754          |                  |                       |
| Improving quality                | 0.574          |                  |                       |
| Green process innovation         | 0.810          |                  |                       |
| Using environmentally friendly equipment | 0.674          |                  |                       |
| Updating environmentally friendly process | 0.801          |                  |                       |
| Using recyclable materials       | 0.728          |                  |                       |
| Reusing the waste                | 0.736          |                  |                       |
| Handling the waste effectively   | 0.845          |                  |                       |

GoF = 0.559; SPR = 1.000; RSCR = 1.000; SSR=1.000; NLBCDR = 1.000
The hypotheses testing outcome indicated the effect of customer pressure on green innovation (β = 0.2; p-value = 0.03), thus H₁ was supported. For H₂, the moderating effect of environmental regulation on the relationship between customer pressure and green innovation (β = 0.38; p-value <0.01) indicates that it is accepted. Additionally, the coefficient of determination (R²) revealed that 17 % of green innovation variation is explained by customer pressure and environmental regulation (see Figure 1).

Market considerations and environmental regulation have been identified as an important external driver of green innovation implementation [6, 11]. Based on the institutional theory, this research empirically examined the effect of customer pressure on green innovation directly and moderation of environmental regulation in this relationship. The findings suggested that customer pressure plays an important role in promoting green innovation. It is in line with the finding mentioned in the previous study [5, 11, 30]. This means that the achievement of better green innovation performance depends on firm’s effort and motivation in adopting and practicing green innovation to anticipating market dynamics, such as customer pressure. Firms can improve their products to differentiate from others, so that had an advantage.

Unfortunately, many consumers are unwilling to pay at a premium price or shift another product just for the green attribute of the product [44]. Therefore, D’Souza et al. [45] suggested to inform the advantages or benefits of green products through green advertising to justify higher price. Green marketing recommends that green innovation is not only beneficial for the firms, but also provides environmental benefits to customers thereby increase higher demand. This can be explained by the fact that firm benefits such as costs and energy savings through more efficient equipment, better products quality and durability, and disposal possibilities, and reduction of health impacts [46]. The firms must try to maintain the product image so that the product remains strategic in the market and has a longer life cycle and enhances the firm’s reputation.

Figure 1. Model estimated

(CP = customer pressure; ER = environmental regulation; GI = green innovation)

Table 2. Hypotheses testing.

\[
\begin{align*}
\text{H}_1: 
\beta_{CP} & = 0.2; p\text{-value} = 0.03 \\
\text{H}_2: 
\beta_{ER} & = 0.38; p\text{-value} <0.01
\end{align*}
\]
[26, 42]. Consequently, firms should adopt green innovations effectively in responding customer pressure of green product.

Furthermore, environmental regulation positively moderates the relationship between customer pressure and green innovation. This result is in line with the finding of [33, 34]. Environmental regulatory pressure will encourage firms to promote green innovation to cope customer pressure. The high pressure of customer supported by the enactment of flexible and easy to implement regulation allows the firms to voluntarily comply, which in consequence, improves green innovation performance [5, 41, 47]. The reason may be compliance with environmental regulations will be important to obtain environmental legitimacy at this time [34, 35]. Firms should find some effective ways to deal with pollution as well as stakeholder pressure as the regard in adopting green innovation. Certainly, this method is not merely applicable for short-term goals, but also to get a long-term competitive advantage. Firms that are more consistent in implementing environmental regulations will tend to be proactive in environmental management and contribute in increasing competitiveness.

5. Conclusions
This study contributes to a deeper understanding of the relationship between customer pressure and environmental regulation. Besides, it also gives evidence that green innovation provides useful guidance for improving green innovation performance. Customer pressure has been identified as the determinant factor of green innovations. This means that the higher customer pressure, the greater firms’ efforts to promote green innovation. Moreover, the higher customer pressure and the more flexible environmental regulations allow firms to implement green innovations intensively. This pressure forces firms to adopt environmental management and practices effectively. Firms must increase environmental concern by paying attention to environmental issues and protecting the environment sustainability. The campaign to promote go green activities must be intensified due to the many benefits it may contain.

References
[1] Brunnermeier S B, Cohen M A 2003 Determinants of environmental innovation in US manufacturing industries. J. Environ. Econ. Manag. 45  278-293.
[2] Melville N 2010 Information Systems Innovation for Environmental Sustainability," MIS Quarterly, 34  1 1-21.
[3] Bansal P, Roth K 2000 Why Company go green: A model of ecological responsiveness. Acad. Manag. J.  43 4 717-736.
[4] Dangelico R M 2016 Green product innovation: where we are and where we are going. Bus. Strateg. Environ.  25 8 560-576.
[5] Huang X, Hu Z, Liu, C, Yu D, Yu L 2016 The relationships between regulatory and customer pressure, green organizational responses, and green innovation performance J. Clean. Prod. 112 3423 – 3433
[6] Rennings K 2000 Redefining innovation. Eco-innovation research and the contribution from ecological economics Ecol. Econ.  32 2 319–332.
[7] Porter M E, Van der Linde C 1995 Toward a New Conception of the Environment-Competitiveness Relationship J. Econ. Perspect. 9 4 97-118
[8] Ambec S, Lanoie P 2008. Does it pay to be green? A systematic overview. Acad. Manag. Perspect. 22  45-62.
[9] Chen Y 2008 The driver of green innovation and green image green core competence J. Bus. Ethics  81 531-543.
[10] Kesidou E, Demirel P 2012 On the drivers of eco-innovations: empirical evidence from the UK Res. Policy 41 5 862 - 870.
[11] Tariq A, Badir Y F, Tariq W, Bhutta U S 2017 Drivers and consequences of green product and process innovation: A systematic review, conceptual framework, and future outlook. *Technol. in Society* **51** 8–23.

[12] Yalabik B, Fairchild R J 2011 Customer, regulatory, and competitive pressure as drivers of environmental innovation *Int. J. Prod. Econ.* **131** 519-527.

[13] Ford J A, Steen J, Verreynne M-L 2014 How environmental regulations affect innovation in the Australian oil and gas industry; going beyond the Porter Hypothesis. *J. Clean. Prod.* **84** 204-213.

[14] Rennings K, Rammer C 2010 The Impact of Regulation-driven Environmental Innovation on Innovation Success and Firm Performance *Discussion Paper* 10 – 065.

[15] Frondel M, Horbach J, Rennings K 2008. What triggers environmental management and innovation? Empirical evidence for Germany *Ecol. Econ.* **66** 153-160.

[16] Eiadat Y, Kelly A, Roche F, Eyadat H 2008 Green and competitive? An empirical test of the mediating role of environmental innovation strategy *J. World Bus.* **43** 131-145.

[17] Zhu Q, Geng Y, Sarkis J, Lai K H 2011 Evaluating green supply chain management among Chinese manufacturers from the ecological modernization perspective *Transp. Res. Part E: Logist. Transp. Rev.* **47** 6 808–821.

[18] Karakaya E, Hidalgo A, Nuur C 2014 Diffusion of Green Innovations: A Review. Renewable and Sustainable *Energy Rev.* **33** 392 – 399.

[19] Reid A, Miedzinski M 2008 Eco-innovation, Final Report for Sectoral Innovation Watch. L Brussels. *Technopolis Group*.

[20] Cainelli G, de Marchi V, Grandinetti D 2015. Does the development of environmental innovation require different resources? Evidence from Spanish manufacturing firms *J. Clean. Prod.* **94** 212-2020.

[21] DiMaggio PJ, Powell W W 2000 The Iron Cage Revisited-Institutional Isomorphism and Collective Rationality in Organizational Fields (Reprinted from the American Sociological Association 48 147-160 1983). JAI Press INC, 100 Prospect Street, Stamford, CT 06901-1640 USA, 143 -166.

[22] Liu X, Liu B, Shishime T, Yu Q, Bi J, Fujitsuka T 2010 An empirical study on the driving mechanism of proactive corporate environmental management in China *J. Environ. Manag.* **91** 1707-1717.

[23] Wu S-I, Chen Y-J 2014 The Impact of Green Marketing and Perceived Innovation on Purchase Intention for Green Products Inter. *J. Market. Stud.* **6** 5 81 – 100.

[24] Cheng, CCJ, Yang C, Sheu 2014 The link between eco-innovation and business performance: A Taiwanese industry context. *J. Clean. Prod.* **64** 81-90.

[25] Chen Y S, Chang C H, Wu F S 2012 Origins of green innovations: the differences between proactive and reactive green innovations *Manag. Deci.* **50** 3 368-398.

[26] Lin R-J, Tan K-H, Geng Y 2013 Market Demand, Green Product Innovation, and Firm Performance: Evidence from Vietnam Motorcycle Industry. *J. Clean. Prod.* **40** 101–107.

[27] Chekima B, Wafa SAWSK, Igau O A, Chekima S, Sondoh Jr SL 2016 Examining green consumerism motivational drivers: does premium price and demographics matter to green purchasing? *J. Clean. Prod.* **112** 1436 – 1450.

[28] Ramanathan R, Black A, Nath P, Muylldermans L 2010 Impact of Environmental Regulations on Innovation and Performance in The UK Industrial Sector *Manag. Deci.* **48** 10 1493-1513.

[29] Xie X, Huo J, Zou H 2019 Green process innovation, green product innovation, and corporate financial performance: A content analysis method *J. Bus. Res.* **101** 697 – 706.

[30] Chiou T-Y, Chan K C, Lettice F, Chung S H 2011 The influence of greening the suppliers and green innovation on environmental performance and competitive advantages in Taiwan. *Transport. Res. E- Log.* **55** 55–73.
[31] Horbach J, Rammer J, Rennings K 2012 Determinants of eco-innovations by type of environmental impact the role of regulatory push/pull, technology push and market pull. *Ecol. Econ.* 78 112-122.

[32] Qi G, Zeng S, Tam C, Yin H, Zou H 2013 Stakeholders’ influences on corporate green innovation strategy: A case study of manufacturing firms in China *Corp. Soc. Respons. and Environ. Manag.* 20 1 1–14.

[33] Chan K C, Yee RWY, Dai J, Lim M K 2016 The moderating effect of environmental dynamism on green product innovation and performance *Inter. J. Prod. Econ.* in press.

[34] Li D, Zheng M, Cao C, Chen X, Ren S, Huang M 2017 The impact of legitimacy pressure and corporate profitability on green innovation: Evidence from China top 100 *J. Clean. Prod.* 141 41 – 49.

[35] You D, Zhang Y, Yuan B 2019 Environmental regulation and firm eco-innovation: Evidence of moderating effects of fiscal decentralization and political competition from listed Chinese industrial companies *J. Clean. Prod.* 207 1072 – 1083.

[36] Berrone P, Fosfuri A, Gelabert L, Gomez-Mejia LR 2013 Necessity as the mother of ‘green’ inventions: institutional pressures and environmental innovations *Strateg. Manag. J.* 34 8 891-909.

[37] Klewitz J, Zeyen, A, Hansen E.G 2012 Intermediaries driving eco-innovation in SMEs: a qualitative investigation *Eur. J. Innovation. Manag.* 15 442 - 467.

[38] Triguero A, Moreno-Mondéjar L, Davia M A 2013 Drivers of different types of eco-innovation in European SMEs *Ecol. Econ.* 92 25–33.

[39] Zailani S, Govindan K, Iranmanesh M, Shaharudin M R, Chong Y.S 2015 Green Innovation Adoption in Automotive Supply Chain: The Malaysian Case *J. Clean. Prod.* 108 1115–1122.

[40] Hafezi M, Zolfagharinia H 2018 Green product development and environmental performance: Investigating the role of government regulations *Inter. J. Product. Econ.* 204 395 – 410.

[41] Ramanathan R, He Q, Black A, Ghobadian A, Gallear D. 2017 Environmental regulations, innovation and firm performance: A revisit of the Porter hypothesis *J. Clean. Prod.* 155 2 79 – 92.

[42] El-Kassar A, Singh S K 2019 Green innovation and organizational performance: The influence of big data and the moderating role of management commitment and HR practices *Technol. Forecast. & Soc. Change.* 144 483–498.

[43] Chen, Y S, Lai S B, Wen, C T 2006 The influence of green innovation performance on corporate advantage in Taiwan *J. Bus. Ethic.* 67 4 331–339.

[44] Peattie K 2001 Golden goose or wild goose? The hunt for the green consumer *Bus. Strateg. Environ.* 10 4 187–199.

[45] D'Souza C Taghian M, Lamb P 2006 An empirical study on the influence of environmental labels on consumers. *Corp. Commun. Int. J.* 11 2 162-173.

[46] Kammerer D 2009 The effects of customer benefit and regulation on environmental product innovation. Empirical evidence from appliance manufacturers in Germany *Ecol. Econ.* 26 2285 – 2295.

[47] Nishitani K, Kaneko S, Fujii H, Komatsu S 2012 Are firms’ voluntary environmental management activities beneficial for the environment and business? An empirical study focusing on Japanese manufacturing firms *J. Environ. Manag.* 105 121 130