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# The Effects of Government Support on Corporate Performance Hedging against International Environmental Regulation

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**Abstract:** Government support systems are crucial for export SMEs (Small to Medium Enterprises) to cope with growing international environmental regulations. However, empirical studies show a limited research area to explore the performance of export SMEs with the help of government support systems to meet international environmental regulations. This study draws implications on the relationship between government support and corporate performance on export SMEs between two countries: Korea and China. Based on 350 samples from Korea and 320 from China, we diagnosed government supports most positively affects corporate performances in the area of eco-innovation. While education, certificate, and tax supports were less pressing areas to support, no significance was found in information support. Furthermore, we found that eco-innovation is the strongest motive to accelerate corporate performance. Finally, the support of Chinese government on firms seems to be more affective when compared to Korean government support.

**Keywords:** international environmental regulations; government support systems; eco-innovation; corporate performance; Korea and China

## 1. Introduction

Competition in global trade between Korea and China are increasingly intensified these days. According to Trade Specification Index (TSI) data, the eight major Korean trade items, petrochemistry, steel, steel products, machinery, IT, automobiles, shipbuilding, and precision instruments, are competitively falling behind China in Japanese, US, and EU markets [1]. Indeed, the Chinese trade enhancement has becoming a serious threat to Korea.

Recently, global trade regulations have been reinforced not only from the environmental regulation triggered from the Climatic Change Convention, but also from the environment-friendly paradigm initiated by EU and other advanced Western countries by means of preventive environmental regulation [2]. These environment-friendly acts are wielding a strong influence on trading companies as a nontariff barrier. Therefore, it is inevitable for trading companies around the world to prepare for the effective counterplans when they live on foreign trade businesses.

Korea, we have high dependency on foreign trade and extremely low sustainability on our natural resources and raw energy. This makes our foreign trade business structurally more vulnerable under such worldwide regulatory practices. The situation can get even worse on small- and medium-sized enterprises (SMEs). Government Support on SMEs to hedge against this nontariff barrier is apodictically one of the key factors for successful global trade practice [3].

The studies on the environmental regulations and government support policies are a boost as their significance in global business environment is on the rise. Most of the studies concentrated on the political aspects of the effects on the national or industry level but not on the supporting details [4–9]. More precisely, the studies on the details of government support areas to counteract on the upgraded global trade regulations and their effects on the company's trade performances are quite limited.

Understanding the insufficiency of research in this area, this study attempts to explore the relationship between the details of government support areas and corporate performance by scrutinizing the empirical data from Korean and Chinese SMEs. By doing this, we anticipate providing more of a hands-on implications in this field.

The contribution of the study is twofold. First, we classify the government supports into six newly distinguished sub-areas, whereas most previous studies only view them as a whole. In addition, each of these dimensions is subject to be validated to provide empirical framework for our proposition. Next, we examine the effect of eco-innovation on corporate performance, especially companies between the two countries Korea and China, to suggest pros and cons to each country for their different government support programs.

## 2. Literature Review and Hypotheses Development

### *2.1. Market Failure and Government Intervention*

According to neoclassical economics, market failure occurs in the process of creation, transfer, diffusion, and application of knowledge, and government intervention is the key remedy for this. Generally speaking, market failure refers to the condition where the market economy system cannot supply particular goods and services to consumers in optimum level or at all [10]. For this reason, the government intervention needs to enter into the broad range of market process to straighten the market failures and promote the welfare of individuals.

The market failure can further provide a base for the analytical framework to evaluate the economic feasibility when government poured in the public resources into market process, along with the guidelines for proper allocation of the government spending [11]. However, it is limited in explaining how successful or effective the support is from a cost–benefit analytical view point [12].

SMEs, in general, are vulnerable in counteracting the changing external environment, and also in raising funds to prepare for organizational innovation [13]. This makes them harbor more suspicions when they are faced with heavy charges in investment for new facilities and equipment to meet the international environmental regulations. Thus, SMEs are constrained to manufacture what the market requested in an environment-friendly way. As a means to overcome this situation, the government needs intervene to dissolve their suspicions in early stage, so they can focus and be equipped with technological competitiveness in the market process.

According to Porter (1991) [14], environmental regulation will incur a cost for firm's compliance practices, which can adversely affect on the improvement of competitive edge in early days. However, for the medium and long term, the achievement of technological development and innovation due to the cost charged in early stage will contribute in strengthening the competitiveness of the enterprise [14]. In this process, the support of the government on SMEs to easily overcome the adverse affect occurred during the investment at initial stage, and for them to more smoothly connected to the long run technological innovations, is essentially important.

### *2.2. The Government Support on the International Environmental Regulation*

In an effort to meet the global environmental regulation, companies need a great deal of investment in all of their activities, from purchasing of raw materials to developing new technologies [15]. The situation implies that, if companies fail to meet the global regulatory requirements, they can end up penalized and even be deported from the global trade market. For this reason, the companies involved in exporting business, especially SMEs whose resources are relatively limited and deficient

as compared to larger ones, have to go through extra burden. Therefore, the government support for SMEs on this matter is comparatively more pressing than the larger ones.

The government supports their domestic businesses with various workable policies to overcome these regulatory barriers. In the case of Korea, the ministry of trade, industry and energy (MOTIE), which is the major government department for exports, provides such services as "analysis on the international environmental regulation", and "plan for the counteraction and subsequent actions". In addition to that, the department also supports academic–industry joint research on developing green energy and technology. Table 1 summarizes the support of Korean government.

**Table 1.** The support of Korean government on international environmental regulation.

| Managing Dept. | Name of Business | Major Business Contents |
|---|---|---|
| Ministry of Trade | International Environmental Regulation/Establishment of Proactive Base | Analysis of data on International Environmental regulation and Provide Consulting Services.<br>Managing and Developing a Transfer System for Chemical Materials within Products<br>Investigation of Present Conditions for Environmental regulation and Development of Influence Indexes |
| | Development of Global Professional Technology | Development of Countermeasure Technologies for Environmental regulation to Strengthen Business Competitive Power |
| | Informatization of Industry Technology and Support Policy | Integration of Trade Information and Build Database |
| | Management of Chemical Materials in SMEs | Management of Chemical Materials to counteract the International Policy for Regulating Chemical Materials |
| | Development of Green Transportation Systems and R&D Industry Core Technology | Development of Core Technology to Counteract the Environmental regulation of Importing Countries |
| Small and Medium Business Administration | Preparation and Developing Bases for Standards in Foreign Countries | Support for Acquiring Certificates for Overseas Standards |
| Ministry of Environment | Support of Environmental Industry and Exports | Establishment of Information Network for Foreign Environmental regulation<br>Provision of Information on Foreign Environmental regulation<br>Education and Training for Foreign Environmental regulation<br>On-line Consulting for Foreign Environmental regulation |
| | Advancement of Countermeasures for Trade and Environment | Education and Training of Policy Experts for International Environmental regulation |

The government office of small and medium business administration provides services, such as "the collective training on environmental regulation for hands-on worker and staff" and "the program for acquiring certification necessary to enter the global market" [16]. Additionally, the government initiated tax reduction on SMEs in relation to the innovation of environmental technology. Namely, those start-up businesses in domains of new energy technology are benefitted with tax reduction and exemption. Research on SMEs and their development of human resources is the target for the tax exemption as well as the investment on the facilities for environment and energy conservations [17]. Table 2 summarizes the support of Chinese government.

**Table 2.** The support of Chinese government on international environmental regulation.

| Managing Dept. | Name of Business | Major Business Contents |
| --- | --- | --- |
| (General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ) | Blue Sea | - Platform to counteract REACH (education plan for effective counterplan)<br>- Consulting for REACH and provision of one-stop service |
| | The instructions to cope with RoHS/Inspection and supervision on the substances used in electronic devices | - Promotion of standards announced from Chinese RoHS to companies<br>- Compilation of budget for inspection cost on the electronic devices exporting to Europe<br>- Building database for exports to Europe (for ease of tracking) |
| Ministry of Commerce of the People's Republic of China | Guidelines for exports | - Investigation on international regulations and provision of these results to companies<br>- Investigation on international regulations on individual items |
| SAC, Standardization Administration of the People's Republic of China | Environment Standardization on electronic devices and systems | - Establishment of Chinese environment standards based on the international environmental regulation<br>- Support for Chinese businesses manufacturing the electronic devices to meet the international environmental regulation<br>- Research on the conservation of environment, recycling standardization, RoHS, WEEE, EuP, ELV, etc. |
| Ministry of Industry and Information Technology of the People's Republic of China | The plans for development and promotion of SMEs (2016–2020) | - Promotion of green products for SMEs<br>- The financial and tax reduction supports for SMEs |

Note: REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals), RoHS (Restriction of Hazardous Substances), WEEE (Waste Electrical and Electronic Equipment), EuP (Adminitration Division), ELV (Emission Limit Value).

In the case of China, the four departments AQSIC, Inspection and Quarantine of the People's Republic of China, Ministry of Commerce of the People's Republic of China, SAC, and Ministry of Industry and Information Technology of the People's Republic of China all play a key role in provision of support policies for domestic companies to meet international environmental regulations [18–22].

It is meaningful to explore the effectiveness of the government support policies on domestic exporting SMEs on their performances. Doing this will give us a chance to reexamine the direction of policies for future betterment of their performances. Thus, this study will look into the details of government support policies and contents for both China and Korea to draw and compare the effectiveness of outcomes on each country. This study incorporates four types of government support categories suggested by Joo and Koo (2016) as a starting point of classification of sub-dimensions on support areas [16]. They are the provision of information on international regulations, provision of education to cope with the regulations, support companies to acquire necessary certificates, and support companies on developing technologies to counteract on these regulations.

Moreover, we added two more supportive policy models in which both countries currently undergo: the tax support for SMEs, and the support for the infrastructure on technology development. In the case of Korea, two programs, the 21st Century Frontier R&D program and Eco-Technopia 21 project, are initiated

as part of the environment-friendly programs which link between industry and academia [23]. In the case of China, the National Key Laboratories Programme connects between industry and academia to enhance environment innovation [24]. This study incorporates and investigates all six support policy areas: the provision of information, provision of education to deal with certain situations, aid companies to get necessary certificates in the field, support companies to develop technologies to counteract on possible restrictions, the tax support for SMEs, and the support for the infrastructure on technology development.

### *2.3. Corporate Performance*

#### 2.3.1. Eco-Innovation

Eco-innovation has come into the spotlight recently from scholars and experts in the field. Eco-innovation is defined as new ideas, actions, products, services, and processes that can reduce the adverse environmental effects [25]. Eco-innovation produces positive environmental performance while reducing hazards. Among definitions by many researchers on the term, the common ideas are the reduction of hazards and effective utilization of resources [26].

Eco-innovation is an idea that actively responds to the climatic changes in global marketplace. Advanced countries with relevant technologies on this field have realized that eco-innovation is the crucial element to achieve competitive advantages in global marketplace that will lead to the growth of their country [26–30].

Therefore, governments nowadays strongly support their companies with the development of environment-friendly technologies and infrastructures to acquire dominant position in the export market. From this standpoint, "eco-innovation" can also be performed as dependent measure that is positively influenced by the institutional support of government.

#### 2.3.2. Market Performance

The current study investigates firm's performance data as indices to the effect of government support. Such performance data as company sales and market share are contemplated as the direct outcome measure of the government support. These two indices are widely utilized as performance indicators in relevant prior research [31–33].

#### 2.3.3. Environmental Performance

Environmental performance is examined as widely used performance data in the fields of econ-environment studies [33–35]. Environmental performance is the ability of firms to provide environment-friendly products and services to their customers, which fit to the government regulations and customer's request. Therefore, it is significant part of controlling the quality of products that firms must achieve [36]. Usually, a firm's operational success is assessed on their ability to produce environment-friendly products as well as the amount of toxic substance eliminated. Therefore, companies with product and services that meet the criteria of government set standards and regulations will end up spending less cost by recalling those unqualified products. In addition, the positive company image is imprinted to their customers which further connects to the economic profits [31,33,37].

#### 2.3.4. Export Performance

Export performance is measured by the profit earned by a company when customers in foreign countries purchase relatively more expensive, and environment-friendly products exported by that company, over the ones that are not purchase. This scenario is realized when foreign customers highly value environment-friendly products [38]. Currently, for EU countries and US, the government directly regulates the reinforced environment policies on every imported product. Therefore, if products do not meet guidelines and requirements, they lose the opportunity to export into these colossal markets.

Such practice is putting more pressure on countries whose dependency on exports is huge, such as Korea. Ninety percent of Korean export products such as smart phones and other electronic devices are targets for such international environmental regulation [3].

Therefore, the investigation of government support policies that can potentially upgrade firm's exportability by developing matured exporting strategies is a crucial area to uncover.

### *2.4. Study Hypotheses*

Eco-innovation is defined as developing products, services, and processes with minimum consumption of natural resources [39]. To effectuate, the traditional production process needs to be switched to environment-friendly production process. The conversion to the new production lines requires extensive changes to facilities and employee knowledge and skills, which require large investments. Normally, most companies, especially SMEs with limited resources, experience difficulties for their transformation. Therefore, government support on this matter becomes very important [3]. Peng and Liu (2016) claimed from their empirical data that government support exerts positive influences on eco-innovation for companies [40].

When firms could not properly anticipate demands or perceived too much cost to accomplish eco-innovation in global market, the government needs to help minimize the adverse effects via its support policies [41]. In the same line, this study proposes the government support exercises positive effects on eco-innovation of firms and to their export processes.

The case examples show that government support for exporting companies triggers their eco-innovation efforts. For instance, government runs information center regarding international environmental regulation to provide useful information on companies as well as to support them on the fee for acquiring the accreditation in relevant field. These supports have proven to be efficacious in their export performance. According to Lee et al. (2016), the most influential factor to precipitate companies to initiate voluntary environment programs (VEPs) is the government support in the areas of management and subsidies [8]. In addition, the government support on tax to properly react to the environmental regulations is expected to accelerate firm's performance. Our proposition is attributed to many of the previous studies in which tax support is one of the key motives for companies to invest in R&D [42–44]. Obviously, the degree and range of tax support can vary in its effect on the firm's performance. However, the exemption of income tax and corporate tax will mitigate firm's financial burden, and, alternatively, give them a chance to reinforce investment on the areas of innovation. Consequently, the government support on tax payment will positively influence on firm's performance [45].

Generally speaking, the government support on SMEs for them to properly counteract to upgraded international environmental regulation by driving them to invest in facilities and equipment that are suitable for achievement of green technologies. This, in turn, will bring firm's enhanced export performance, which is expected to accelerate overall market performance.

A study from the Ministry of Trade and Industry and Energy also claimed that government support is the crucial part of the performance of exporting companies [3].

**Hypothesis 1.** *Government support of company to counteract international environmental regulation positively influences the performance of exporting companies.*

**Hypothesis 1-1.** *Government Support of information for international environmental regulation positively influences the performance of exporting companies.*

**Hypothesis 1-2.** *Government Support of education for international environmental regulation positively influences the performance of exporting companies.*

**Hypothesis 1-3.** *Government Support of expense to acquire certificates for international environmental regulation positively influences the performance of exporting companies.*

**Hypothesis 1-4.** *Government Support of companies to develop counteract technology for international environmental regulation positively influences the performance of exporting companies.*

**Hypothesis 1-5.** *Government Support of tax exemption on companies developing green technologies for international environmental regulation positively influences the performance of exporting companies.*

**Hypothesis 1-6.** *Government Support of infrastructure on companies developing green technologies for international environmental regulation positively influences the performance of exporting companies.*

Eco-innovation is claimed to bring the most effective economical efficacy without reducing the scale of industry [46]. The Korean government has spent 76.58 billion won (Korean currency equivalent to 67.7 million US dollars) for green transportation system such as green car, and 20.57 billion won for developing green technology in regarding to international environmental regulation (as of 2015). The logic behind these heavy government investments on the areas of eco-innovation is to build corporate capability to successfully face international environmental regulation.

Eco-innovation changed the major competitive factor in global market from "technology" to the "environment". Per the trend, eco-innovation became inevitable trait for companies to reinforce their capability. When companies improve their environmental performance, it leads to develop their ability to overcome global regulations and restrictions. Wisely reacting to global regulations will bring about accelerated exporting performance on companies. Chung at al. (2014) studied the causal relationship between eco-innovation and company performance among Taiwanese firms [47]. The result indicated that the eco-innovation significantly influenced on firm's accelerated performance. Comprehensively, eco-innovation can help companies enhance their ability to properly react to ever-changing environmental regulations and thereby boost their market performance and profit [48].

**Hypothesis 2.** *Eco-innovation of a company positively influences the company performance.*

**Hypothesis 2-1.** *Eco-innovation of a company positively influences the market performance of the company.*

**Hypothesis 2-2.** *Eco-innovation of a company positively influences the environmental performance of the company.*

**Hypothesis 2-3.** *Eco-innovation of a company positively influences the exporting performance of the company.*

Different performance outcomes are expected among firms between Korea and China when government supports are accompanied. This is because the disparity of government supports in each country will facilitate firms' practices differently. Moreover, firms with different abilities have dissimilar performances. In summary, the disparity in government policies and firm's capabilitieswill bring about different performance outcomes.

**Hypothesis 3.** *In the causal relationship between government support and company performance, the disparity of the policies of different countries will bring different performance outcomes.*

**Hypothesis 3-1.** *In the causal relationship between government support and eco-innovation of the company, the disparity of the policies of Korean and Chinese government will bring different performance outcomes.*

**Hypothesis 3-2.** *In the causal relationship between government support and market performance, the disparity of the policies of Korean and Chinese government will bring different performance outcomes.*

**Hypothesis 3-3.** *In the causal relationship between government support and environmental performance of the company, the disparity of the policies of Korean and Chinese government will bring different performance outcomes.*

**Hypothesis 3-4.** *In the causal relationship between government support and export performance of the company, the disparity of the policies of Korean and Chinese government will bring different performance outcomes.*

Recently, the enhancement of firm's capability via eco-innovation has gained significant traction, especially in exporting companies [30,40]. We assume that, in the causal pathway between the eco-innovation to firm's performance, the disparity of the policies in two countries will lead to dissimilar performance outcomes. Overall, in the relationship between eco-innovation and company, environment, and export performances, the industry conditions and company's capability in two countries will produce dissimilar effects. Thus, this research postulates "the differences in countries" as a mediator to investigate performance differences on firms between Korea and China.

**Hypothesis 4.** *In the causal pathway from eco-innovation to market performance, environmental performance, and export performance of the company, the disparity of the policies of different countries will bring different performance outcomes.*

**Hypothesis 4-1.** *In the causal pathway from eco-innovation to market performance, the disparity of the policies of Korean and Chinese government will bring different performance outcomes.*

**Hypothesis 4-2.** *In the causal pathway from eco-innovation to environmental performance, the disparity of the policies of Korean and Chinese government will bring different performance outcomes.*

**Hypothesis 4-3.** *In the causal pathway from eco-innovation to export performance, the disparity of the policies of Korean and Chinese government will bring different performance outcomes.*

### *2.5. Control Variables*

Control variables are extraneous variables that can influence the dependent variable, and thus need to be controlled. By doing this, the genuine relationship between cause and effect variables can be scrutinized [49]. This study controls the corporate size and industry types. This is because different corporate size can bring deviations in their performance measures [50]. In addition, our study looks into manufacturing businesses only to prevent deviations in performance caused from the industry effect [51].

## 3. Study Design

### *3.1. Conceptual Study Model*

This study investigates the government support policies to counteract on the international environmental regulations for exporting SMEs. Furthermore, it serves to see if these supports do have effects on the eco-innovations as well as the performance outcomes of SMEs.

From the previous studies, we extracted the following six dimensions of government supports: the provision of information on international regulations, provision of education to cope with the regulations, supporting companies to acquire necessary certificates, supporting companies on developing technologies to counteract on these regulations, the tax support, and the support of the infrastructure on green technology development.

Moreover, we investigate how differences in government supports can produce different performance outcome for Korea and China. Figure 1 summarizes the study model.

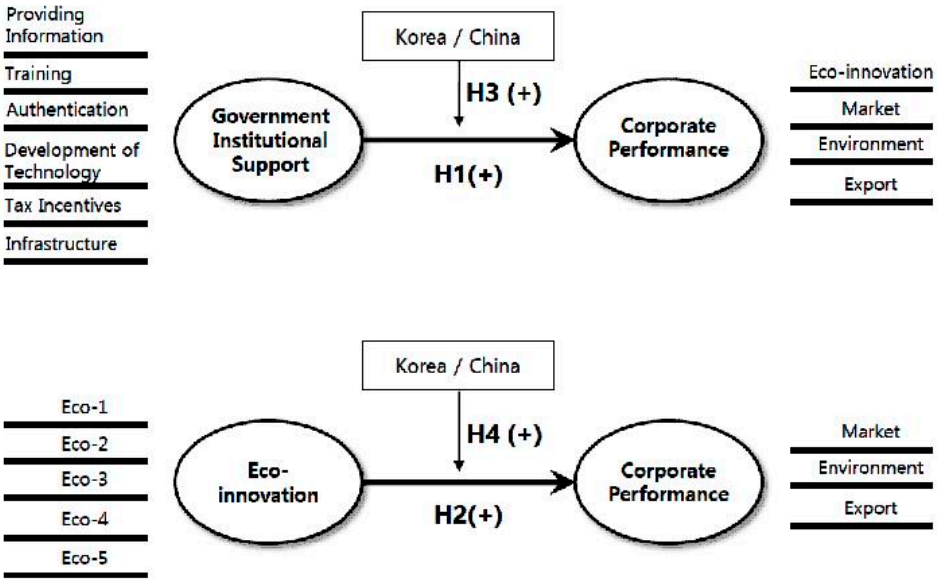


**Figure 1.** Conceptual study model.

### *3.2. Measurement of Variables*

The scales used in the study have the following references. The scales for the provision of information on international regulations, provision of education to cope with the regulations, and supporting companies to acquire necessary certificates came from Joo and Koo (2016) [16]. The scales for the tax support, and the support of the infrastructure on green technology development are from the studies of OECD (2008, 2009) [23,24]. The scale of eco-innovation is extracted from Peng and Liu (2016) [40]. The scale for market performance is taken from the study of Kim (2004) [52], scales of environmental performance is from Zhu et al. (2005, 2007) [35,53]. The scale for export performance is from Knight and Cavusgil (2004) [54].

The operational definitions of the study variables are as follows. "Provision of information on international regulation" is defined as the dissemination of information related to international regulation via government offered website. "Provision of education to cope with such regulations" is defined as the education to properly counteract on such international regulations and further enlarged to the provision of consulting services on the related issues. "Supporting companies to acquire necessary certificates" is defined as the government provided certificate related information as well as the support of the expense to acquire those certificates. "Supporting companies on developing technologies to counteract on these regulations" is defined as literally supporting companies to develop necessary technologies to actively cope with those international regulations. "Tax support" is defined as reduction or exemption of tax on companies when developing green technologies. "Support of the infrastructure on green technology development" is defined as dissemination of the government provided infrastructure and cooperation to exchange green information.

Eco-innovation refers to "any product, technology, service, manufacturing process, and business model which can benefit our environment and its sustainable contribution" [55]. Corporate performance has three parts: market performance, environmental performance, and export performance [35,41,53,54]. The scales used in this study is a seven-point Likert type interval scale, where 1 is not very much, and 7 is very much.

### *3.3. Pilot Test*

The pilot study was conducted on 15 SMEs in Seoul, Korea, and 10 exporting SMEs in Shanghai, China during the month of August 2016. The purpose of this process is to minimize unclear expressions and sentences in the survey questionnaire. In accordance to the result of the

pilot study, revisions were made to questions as well as scales. Statistical analysis on reliability of the indicators was conducted and the result came out to be acceptable. Companies that participated in our pilot study were exempted from the main survey to avoid any learning effects.

The descriptive statistics on our survey is presented in Tables 3 and 4. The reliability analysis revealed that all domains are well above 0.7 except for "provision of education to cope with such regulations", which reached to close to 0.7 (0.693).

**Table 3.** Items for independent variables and descriptive statistics.

| | **Def. of Construct. Mean and Std.** | **Cronbach's Alpha** |
|---|---|---|
| | **Provision of Information. Mean = 4.544, Std. = 1.248** | |
| IFM 1 | The government is properly supporting information on international environmental regulations. | 0.891 |
| IFM 2 | The government is properly supporting counteract guide and current trend on international environmental regulations via website. | |
| IFM 3 | With the help of the government, we can easily acquire information on international environmental regulations. | |
| | **Provision of Education. Mean = 4.690, Std. = 1.106** | |
| EDU 1 | The government is properly providing education regarding to counteract those environmental regulations. | 0.808 |
| EDU 2 | The government is properly providing consulting services to counteract those environmental regulations. | |
| EDU 3 | The government is properly providing education to hands-on-workers on those environmental regulations. | |
| | **Provision of Expense for Certificates. Mean = 4.491, Std. = 1.190** | |
| CER 1 | The government constructed the database for integrated trade information to properly provide information of any necessary certificates. | 0.693 |
| CER 2 | The government is properly supporting with certificate, registration, and test fees for companies to better counteract those environmental regulations. | |
| | **Support Companies to Develop Counteract Tech. Mean = 4.443, Std. = 1.341** | |
| TEC 1 | The government is properly supporting for developing technologies on raising firm's competency to better counteract those environmental regulations. | 0.859 |
| TEC 2 | The government is properly supporting for developing new technologies to better counteract those environmental regulations. | |
| TEC 3 | The government is properly supporting for developing core technologies to preoccupy new markets. | |
| | **Tax Incentive. Mean = 4.996, Std. = 1.070** | |
| TAX 1 | The government support on tax exemption on companies that research and develop green technologies is proper. | 0.866 |
| TAX 2 | The government support with tax exemption on companies that invest facilities and equipment for green technologies is proper. | |
| TAX 3 | The government support on income tax and corporate tax reductions on green companies is proper. | |
| | **Support of Infrastructure on Green Tech Development. Mean = 5.042, Std. = 0.989** | |
| IFA 1 | The government is properly supporting for joint research between academies and industries on green technology. | 0.757 |
| IFA 2 | The government is properly supporting for technology transfer. | |
| IFA 3 | The government is properly supporting the network to adequately exchange green information. | |

**Table 4.** Items for dependent variables and descriptive statistics.

| | Def. of Construct. Mean and Std. | Cronbach's Alpha |
|---|---|---|
| | **Eco-Innovation. Mean = 4.923, Std. = 1.152** | |
| Eco- 1 | The environment-friendly resources are utilized in production process. | 0.847 |
| Eco- 2 | The recycling technology is either being developed or attempted. | |
| Eco-3 | The new methods to reduce the pollutant or waste in production process is discovered. | |
| Eco-4 | The eco- friendly technological innovation is realized. | |
| Eco-5 | From the eco-friend stand point, our product is useful for the customers. | |
| | **Market Performance. Mean = 4.988, Std. = 1.199** | |
| MKP 1 | Overall, our profit is on the increase. | 0.828 |
| MKP 2 | Overall, our market share is on the increase. | |
| | **Environmental Performance. Mean = 5.039, Std. = 1.044** | |
| ENP 1 | The waste and water pollution is on the decrease. | 0.866 |
| ENP 2 | The toxic materials are on the decrease. | |
| ENP 3 | The environmental accident is on the decrease. | |
| ENP 4 | Overall, the environmental conditions in our company is being upgraded. | |
| | **Export Performance. Mean = 4.630, Std. = 1.170** | |
| EXP 1 | The market share of overseas export is on the increase. | 0.843 |
| EXP 2 | The profit from the overseas export is on the increase. | |
| EXP 3 | The overseas export growth is on the increase. | |
| EXP 4 | Overall satisfaction on the export performance is rising. | |

### *3.4. Data Collection and Analyses*

The information on Korean SMEs is extracted from the comprehensive bibliography on the national industry CD ver. 1.0, which is published by the Korean Chamber of Commerce and Industry (2013) [56]. From this resource, we were able to secure the list of export-oriented manufacturing companies, with their addresses, telephone numbers, websites, and their major line of trade. We searched a total of 27,086 export-oriented manufacturing companies from the CD. Among them, the companies included in our study had to be qualified as having past experience volunteering for government supported international environmental regulation, as well as those with employees who are currently in charge of environment management or relevant areas with job positions of executives and staff members. Prior to sending our survey materials to these pre-selected companies, we made phone calls ahead to verify the person in charge and to see whether they have positive intentions to participate in our study. For those who agreed to participate, our survey materials were sent via post. Our survey was conducted from 2 September to 30 December 2016. A total of 1000 surveys were distributed with 350 valid returned.

During this time, we also secured information on export-oriented companies in China. To do this, we received assistance from the Chinese research company Loop Information Technology, which is located in Shanghai. We explained our study background to them to properly select Chinese companies that best fit our research purpose. Through the process, we acquired 320 valid samples from Chinese exporting SMEs in the areas of Shanghai and Beijing.

To test our study hypotheses, we conducted multiple regression analyses. To test for the mediating relationship in the mode to see the performance differences between Korean and Chinese companies in the causal relationship, we used bootstrap analysis method [57].

## 4. Analyses of Data

### *4.1. Sample Population*

The characteristics of our sample population are described in Table 5. Looking into Korean samples, the automobiles and transportation equipment industry took largest portion of the sample (88 companies, 25.2%), followed by the electronic-electric industry (54 companies, 15.4%). For Chinese samples, the textile, clothes, fur, bags, leather, and shoes manufacturers took the largest portion of the sample (68 companies, 21.3%), followed by the electronic component, computers, image, sound and communications (52 companies, 15.2%). Both Korean and Chinese companies are primarily composed of industries and companies that are quite sensitive to international environmental regulations.

Both Korean (106 companies, 30.3%) and Chinese (140 companies, 34.8%) companies included those established within recent 6–10 years.

**Table 5.** Descriptive statistics for sample population.

| Industry | Korea | | China | |
|---|---|---|---|---|
| | **Freq.** | **Ratio (%)** | **Freq.** | **Ratio (%)** |
| Textile, Clothes, Fur, Bags, Leather, and Shoes manufacturers | 54 | 15.4 | 68 | 21.3 |
| Petrochemistry, Paper Products, Rubbers, Plastics, and Minerals | 41 | 11.7 | 27 | 8.4 |
| Automobiles, and other Transportation equipment | 88 | 25.2 | 14 | 4.4 |
| Wood Pulp, Paper and Paper Product manufacturers | 8 | 2.3 | 13 | 4.1 |
| Fabricated Metal, Primary Metal manufacturer | 32 | 9.2 | 8 | 2.5 |
| Electric and Electronic | 54 | 15.4 | 27 | 8.4 |
| Machinery and Equipment manufacturer | 11 | 3.1 | 25 | 7.8 |
| Nonmetallic Mineral manufacturer | 4 | 1.1 | 4 | 1.3 |
| Food manufacturer: except Beverage and Cigarette manufacture | 45 | 12.9 | 20 | 6.3 |
| Medical and Precision Optical instrument, Watch | 5 | 1.4 | 9 | 2.7 |
| Medical Substance and Medicine manufacture | 7 | 2 | 16 | 5 |
| Electronic component, Computers, Image, Sound and Communications | 1 | 0.3 | 52 | 16.2 |
| Transportation equipment manufacturer | - | - | 13 | 4.1 |
| Other industries | - | - | 24 | 7.5 |
| Total | 350 | 100.0 | 320 | 100.0 |
| **Year Established** | **Korea** | | **China** | |
| | **Freq.** | **Ratio (%)** | **Freq.** | **Ratio (%)** |
| Less than 1 year | 16 | 4.6 | 27 | 8.4 |
| 1–3 years | 51 | 14.6 | 42 | 13.1 |
| 4–5 years | 103 | 29.4 | 48 | 15 |
| 6–10 years | 106 | 30.3 | 140 | 43.8 |
| 11 years or more | 74 | 21.1 | 63 | 19.7 |
| Total | 350 | 100.0 | 320 | 100.0 |

### *4.2. Normality Test*

We conducted diagnostic test for normality of our study variables by checking kurtosis and skewness indices. The results indicated that skewness index is within 0.005–0.585 and kurtosis within 0.006–0.620. These values are well below 2 ($|\theta| < 2$), which represents all variables are well-modeled by normal distribution. We also conducted homogeneity of variance test to test for heteroscedasticity in regression model via Breusch–Pagan test. This is to test whether the variance of the errors from

a regression is dependent on the values of the independent variables. The regression models on all four dependent measures are well above 0.05 ($p > 0.05$), thereby validated our regression model.

### *4.3. Common Method Bias Test*

If more than two responses are taken from the same respondent, the common method bias can occur. One of the best ways to test if common method bias is of concern of the study, is to use the Harman's single factor test, in which all items are loaded into one common factor [58]. If the total variance for a single dominant factor is less than 50%, it is suggested that common method bias does not affect your data. For our case, the total variance explained by a single dominant factor is 36.381%, which is less than the 50% suggested Haman's single factor test suggested above. Therefore, our data are not affected with common method bias.

### *4.4. Exploratory Factor Analysis*

We conducted exploratory factor analysis to see whether government support policies on environmental regulation can be bound into six composite dimensions as proposed. We chose principal component analysis for factor extraction with Varimax Rotation method being used to maximize the variance of the factor loadings. The value for Kaiser–Meyer–Olkin is 0.905 and the Chi-square value for Barlett's Test of Sphericity is 6407.565 (significant at alpha level 0.01), which represents that all items are favorable. Six factor solutions resulted with Eigen values greater than 1 to show significance. Total variance explained is 77.188%. Table 6 summarizes the result of exploratory factor analysis.

**Table 6.** Exploratory factor analysis on government support policies on environmental regulation.

| Construct | Items | Varimax-Rotated Loadings | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Factor 1** | **Factor 2** | **Factor 3** | **Factor 4** | **Factor 5** | **Factor 6** |
| Tax Support | TAX 2 | 0.880 | 0.128 | 0.135 | 0.137 | 0.109 | 0.093 |
| | TAX 1 | 0.840 | 0.126 | 0.140 | 0.159 | 0.155 | 0.084 |
| | TAX 3 | 0.779 | 0.036 | 0.159 | 0.127 | 0.223 | 0.100 |
| Provision of Information | IFM 1 | 0.091 | 0.840 | 0.191 | 0.190 | 0.090 | 0.164 |
| | IFM 3 | 0.068 | 0.836 | 0.186 | 0.184 | 0.147 | 0.135 |
| | IFM 2 | 0.147 | 0.825 | 0.182 | 0.208 | 0.106 | 0.198 |
| Provision of Education | EDU 1 | 0.161 | 0.128 | 0.820 | 0.144 | 0.160 | 0.114 |
| | EDU 2 | 0.177 | 0.280 | 0.760 | 0.226 | 0.099 | 0.139 |
| | EDU 3 | 0.181 | 0.203 | 0.674 | 0.197 | 0.156 | 0.236 |
| Development of Counteract Tech. | TEC 2 | 0.170 | 0.234 | 0.199 | 0.837 | 0.090 | 0.125 |
| | TEC 3 | 0.140 | 0.194 | 0.280 | 0.800 | 0.125 | 0.146 |
| | TEC 1 | 0.274 | 0.294 | 0.113 | 0.650 | 0.050 | 0.397 |
| Support of Infra. | IFA 2 | 0.141 | 0.093 | 0.131 | −0.011 | 0.814 | 0.248 |
| | IFA 3 | 0.236 | 0.187 | 0.134 | 0.194 | 0.756 | −0.049 |
| | IFA 1 | 0.539 | 0.068 | 0.204 | 0.110 | 0.584 | 0.121 |
| Provision of Expense for Certificate | CER 2 | 0.088 | 0.231 | 0.171 | 0.265 | 0.158 | 0.773 |
| | CER 1 | 0.200 | 0.272 | 0.325 | 0.175 | 0.115 | 0.676 |

Next, we conducted exploratory factor analysis on corporate performance. The value for Kaiser–Meyer–Olkin is 0.894 and the Chi-square value for Barlett's Test of Sphericity is 5942.562 (significant at alpha level 0.01) which also represents that all items are favorable. Four factor solutions resulted with Eigen values greater than 1 to show significance. Total variance explained is 71.815% (see Table 7).

**Table 7.** Exploratory factor analysis on corporate performance.

| Construct | Items | Varimax-Rotated Loadings | | | |
|---|---|---|---|---|---|
| | | **Factor 1** | **Factor 2** | **Factor 3** | **Factor 4** |
| Eco-Innovation | ECO 4 | 0.794 | 0.274 | 0.087 | −0.207 |
| | ECO 3 | 0.782 | 0.175 | 0.181 | 0.108 |
| | ECO 5 | 0.774 | 0.154 | 0.085 | 0.105 |
| | ECO 2 | 0.774 | 0.047 | 0.164 | 0.209 |
| | ECO 1 | 0.574 | −0.035 | 0.204 | 0.459 |
| Environmental Performance | ENP 3 | 0.181 | 0.825 | 0.264 | 0.132 |
| | ENP 2 | 0.171 | 0.760 | 0.236 | 0.177 |
| | ENP 4 | 0.186 | 0.717 | 0.165 | 0.386 |
| | ENP 1 | 0.234 | 0.584 | 0.136 | 0.490 |
| Export Performance | EXP 3 | 0.183 | 0.230 | 0.874 | 0.185 |
| | EXP 4 | 0.181 | 0.267 | 0.844 | 0.183 |
| | EXP 2 | 0.170 | 0.180 | 0.837 | 0.199 |
| | EXP 1 | 0.113 | 0.230 | 0.675 | 0.204 |
| Market Performance | MKP 1 | 0.147 | 0.480 | 0.165 | 0.653 |
| | MKP 2 | 0.040 | 0.487 | 0.239 | 0.621 |

### *4.5. Confirmatory Factor Analysis*

We conducted confirmatory factor analysis to see how well our theoretical specification of the factors matches the actual data, and to determine the goodness of fit.

From the initial extraction the overall model fit measures, chi-square test $\chi^2 = 1680.832$ ($p = 0.000$), df = 450, CFI = 0.908, TLI = 0.892, RMR = 0.104, and RMSEA = 0.064. The $\chi^2$ statistic was not satisfactory, nor was the goodness of fit index. Therefore, the model was re-estimated. During this process, the variable "EXP 1" as part of export performance was eliminated because it deteriorated the goodness of model fit. Our final mode fit measures $\chi^2 = 1186.600$ ($p = 0.000$), df = 388, CFI = 0.938, TLI = 0.926, RMR = 0.068 and RMSEA = 0.055. Since the goodness of fit indices are well within the acceptable range with our new estimated model, we test for convergent and discriminant validity.

To test for convergent validity, the size of factor loading is one important consideration. High loadings on a factor would indicate that they converge on a common point, the latent construct. A rule of thumb is that the standardized loading estimates should be greater than 0.5, ideally 0.7 or higher [59]. In addition, an AVE of 0.5 or higher is a good rule of thumb suggesting adequate convergence. CR of 0.7 or higher is considered as adequate convergence [59].

Table 8 indicates all 31 items in our study model, except for items ECO 4 = 0.660 and ECO 5 = 0.627, the factor loadings are well above 0.7. Furthermore, CR and AVE values are well above the acceptable ranges suggested by Hair et al. (2006) [59]. Therefore, our estimated model ensures convergent validity (see Table 8).

**Table 8.** Assessment of estimated model.

| Construct | Items | Stand. Factor Loading | *t*-Value | (C. R) | (AVE) |
|---|---|---|---|---|---|
| Provision of Information | IFM 1 | 0.856 *** | 25.860 | 0.812 | 0.590 |
| | IFM 2 | 0.879 *** | 26.660 | | |
| | IFM 3 | 0.831 *** | - | | |
| Provision of Education | EDU 1 | 0.745 *** | 17.860 | 0.810 | 0.588 |
| | EDU 2 | 0.815 *** | 19.259 | | |
| | EDU 3 | 0.738 *** | - | | |
| Provision of Expense for Certificate | CER 1 | 0.757 *** | 16.499 | 0.696 | 0.534 |
| | CER 2 | 0.703 *** | - | | |
| Development of Counteract Tech. | TEC 1 | 0.801 *** | 22.520 | 0.861 | 0.674 |
| | TEC 2 | 0.848 *** | 24.060 | | |
| | TEC 3 | 0.813 *** | - | | |
| Tax Support | TAX 1 | 0.874 *** | 22.016 | 0.875 | 0.701 |
| | TAX 2 | 0.895 *** | 22.379 | | |
| | TAX 3 | 0.733 *** | - | | |
| Support of Infra. | IFA 1 | 0.826 *** | 16.076 | 0.753 | 0.508 |
| | IFA 2 | 0.639 *** | 13.731 | | |
| | IFA 3 | 0.658 *** | - | | |
| Eco-Innovation | ECO 1 | 0.664 *** | 13.909 | 0.838 | 0.512 |
| | ECO 2 | 0.796 *** | 15.724 | | |
| | ECO 3 | 0.810 *** | 15.870 | | |
| | ECO 4 | 0.660 *** | 18.707 | | |
| | ECO 5 | 0.627 *** | - | | |
| Market Performance | MKP 1 | 0.849 *** | 23.372 | 0.830 | 0.710 |
| | MKP 2 | 0.836 *** | - | | |
| Environmental Performance | ENP 1 | 0.747 *** | 21.193 | 0.866 | 0.619 |
| | ENP 2 | 0.757 *** | 21.568 | | |
| | ENP 3 | 0.818 *** | 23.880 | | |
| | ENP 4 | 0.822 *** | - | | |
| Export Performance | EXP 2 | 0.809 *** | 27.707 | 0.912 | 0.775 |
| | EXP 3 | 0.930 *** | 35.042 | | |
| | EXP 4 | 0.898 *** | - | | |

Note: *** $p < 0.01$.

Since convergence validity is ensured, discriminant validity is tested. This study applies a method (AVE > $ø^2$) suggested by Fornell and Lacker (1981) [60], which is considered as one of the most strict method. Table 9 summarizes the result of correlation analysis.

In Table 6, the correlation coefficient of market performance and environmental performance is 0.692, which squared makes 0.479 ($0.692^2$ = 0.479). The AVE value for market performance is 0.710, while the environmental performance is 0.619. Therefore, the AVE values for both market and environmental performances are well above the square value of the correlation coefficient for both, which is 0.479. Thus, the discriminant validity is ensured by the criteria "AVE > $ø^2$", as suggested by Fornell and Lacker (1981) [60].

**Table 9.** Correlation analyses.

| Constructs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Information | 0.590 | | | | | | | | | |
| 2. Education | 0.528 | 0.588 | | | | | | | | |
| 3. Certificate | 0.562 | 0.581 | 0.534 | | | | | | | |
| 4. Technology | 0.565 | 0.566 | 0.603 | 0.674 | | | | | | |
| 5. Tax Support | 0.315 | 0.446 | 0.386 | 0.450 | 0.701 | | | | | |
| 6. Infrastructure | 0.369 | 0.472 | 0.428 | 0.387 | 0.581 | 0.508 | | | | |
| 7. Eco-Innov. | 0.337 | 0.386 | 0.398 | 0.414 | 0.326 | 0.342 | 0.512 | | | |
| 8. Market Perf | 0.315 | 0.468 | 0.386 | 0.517 | 0.565 | 0.429 | 0.387 | 0.710 | | |
| 9. Env. Perf. | 0.342 | 0.490 | 0.426 | 0.537 | 0.570 | 0.491 | 0.477 | 0.692 | 0.619 | |
| 10. Export Perf | 0.373 | 0.367 | 0.424 | 0.520 | 0.349 | 0.347 | 0.438 | 0.497 | 0.543 | 0.775 |

Note: The Values in diagonal line represent AVE.

## 5. Hypotheses Testing

### *5.1. The Relationship between Government Support and Company Performance (Hypothesis 1)*

To test hypothesis on the relationship between the government support and company performance, we controlled corporate size and industry types [61]. To test for multicollinearity, we need to assess the variance inflation factor (VIF) whose threshold is set at 10. Our values were in between 1.686 and 2.001, which are far less than the threshold, thus inconsequential multicollinearity is indicated [59].

Hypothesis 1 is to test the effect of various government supports on company's market, environment, and export performances. We have developed six sub-hypotheses to test those effects.

Hypothesis 1-1 deals with the relationship of the government support on information for international environmental regulation to eco-innovation of the company. The result indicated as not significant at alpha level of 0.05 ($\beta = 0.042$, $p > 0.05$). This explains that, although the government support on information provision is inevitably part of firm's performance, the information itself is not directly linked to the firm's eco-innovation. On the other hand, the government support on information provision is not significantly impacted on market performance ($\beta = -0.063$, $p > 0.05$), environmental performance ($\beta = -0.057$, $p > 0.05$), or export performance ($\beta = 0.046$, $p > 0.05$) at alpha level of 0.05. Thus, Hypothesis 1 is not supported.

Hypothesis 1-2 deals with the relationship of the government support on education for international environmental regulation to eco-innovation of the company. The result indicated as significant at alpha level of 0.05 ($\beta = 0.101$, $p < 0.05$). This explains that the government support on education is indeed directly linked to the firm's eco-innovation. Meanwhile, the government support on education is significantly impacted on market performance ($\beta = 0.153$, $p < 0.01$), environmental performance ($\beta = 0.140$, $p < 0.01$), but not on export performance ($\beta = -0.007$, $p > 0.05$) at alpha level of 0.01. Thus, Hypothesis 1-2 is partly supported.

Hypothesis 1-3 deals with the relationship of the government support of expense to acquire certificates necessary to counteract international environmental regulations to eco-innovation of the company. The result indicated as significant at alpha level of 0.01 ($\beta = 0.130$, $p < 0.01$). However, the expense for certificates support is not significant on market performance ($\beta = -0.005$, $p > 0.05$) or environmental performance ($\beta = 0.025$, $p > 0.05$), but only on export performance ($\beta = 0.109$, $p < 0.05$) at alpha level of 0.05. This explains that the expense for certificates support is having a direct impact on export performance only. Thus, Hypothesis 1-3 is partly supported.

Hypothesis 1-4 describes the relationship between the government support of companies to develop counteract technology for international environmental regulation to eco-innovation of the company. The result indicated as significant at alpha level of 0.01 ($\beta = 0.174$, $p < 0.01$). In corresponding to the result, the support of companies to develop counteract technology is significantly impacting on market performance ($\beta = 0.280$, $p < 0.01$), environmental performance ($\beta = 0.279$, $p < 0.01$), and export

performance (β = 0.352, $p < 0.01$) at alpha level of 0.01. This explains that the government support of companies to develop counteract technology for international environmental regulation has a direct impact on all areas of firm's performances. Thus, Hypothesis 1-4 is supported.

Hypothesis 1-5 describes the relationship between the government support of tax exemption on companies developing green technologies for international environmental regulation to eco-innovation of the company. The result indicated as not significant (β = 0.067, $p > 0.05$). Meanwhile, the support of tax exemption is significantly impacting on market performance (β = 0.349, $p < 0.01$), environmental performance (β = 0.301, $p < 0.01$), but not on export performance (β = 0.065, $p > 0.05$) at alpha level of 0.01. It appears to be that the support of tax exemption is especially beneficial and effective on Korean firms. Thus, Hypothesis 1-5 is partly supported.

Hypothesis 1-6 illustrates the causal relationship between government support for infrastructure on companies developing green technologies for international environmental regulation to eco-innovation of the company. The result indicated as significant (β = 0.122, $p < 0.01$). Our results coincide with the claims of Triguero et al. (2013), in which [30] the collaborative network between academy and industry can positively lead to impactful eco-innovation on companies. Meanwhile, the government support of infrastructure is not significantly impacting on market performance (β = 0.070, $p > 0.05$), but significant on environmental performance (β = 0.154, $p < 0.01$), and export performance (β = 0.121, $p < 0.01$) at alpha level of 0.01. Thus, Hypothesis 1-6 is partly supported.

As a summary, only the government support of companies to develop counteract technology for international environmental regulation appears to be significantly influencing on all areas of the outcomes: the eco-innovation, market performance, environmental performance, and export performance. Government Support of education appears to be significant on eco-innovation, market performance, and environmental performance, but not on export performance. Government Support of expense to acquire certificates for international environmental regulation positively influences eco-innovation and export performance, while tax exemption positively influences market performance and environmental performance. Finally, government support of infrastructure on companies developing green technologies for international environmental regulation has significant impact on eco-innovation, environmental performance, and export performance. Table 10 summarizes the result of regression analysis.

**Table 10.** Regression analyses on the government support and firm's performance.

| | **Dependent Variables** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Eco-Innovation** | | **Market Performance** | | **Environmental Performance** | | **Export Performance** | |
| **Variable** | **Step 1** | **Step 2** | **Step 1** | **Step 2** | **Step 1** | **Step 2** | **Step 1** | **Step 2** |
| **Control Variables** | | | | | | | | |
| Corporate Size | 0.195 *** | 0.144 *** | 0.111 ** | 0.057 | 0.080 | 0.033 | 0.257 *** | 0.199 *** |
| Industry Types | −0.025 | 0.067 | −0.112 | −0.017 | −0.086 | 0.005 | −0.001 | 0.098 |
| Information | | 0.042 | | −0.063 | | −0.057 | | 0.046 |
| Education | | 0.101 ** | | 0.153 *** | | 0.140 *** | | −0.007 |
| Certification | | 0.130 *** | | −0.005 | | 0.025 | | 0.109 ** |
| Counteract Tech | | 0.174 *** | | 0.280 *** | | 0.279 *** | | 0.352 *** |
| Tax Incentive | | 0.067 | | 0.349 *** | | 0.301 *** | | 0.065 |
| Infrastructure | | 0.122 *** | | 0.070 | | 0.154 *** | | 0.121 *** |
| $R^2$ | 0.025 | 0.259 | 0.012 | 0.426 | 0.009 | 0.458 | 0.046 | 0.346 |
| $R^2$ | 0.025 *** | 0.234 *** | 0.012 ** | 0.414 *** | 0.009 | 0.449 *** | 0.046 *** | 0.300 *** |

Note: ** $p < 0.05$, *** $p < 0.01$.

### *5.2. The Relationship between Eco-Innovation and Company Performance (Hypothesis 2)*

Hypothesis 2 is to test the effect of eco-innovation on the company performance. Eco-innovation is an outcome measure of the government support, but, at same time, influences other areas company performances as well. The analyses revealed that the eco-innovation is significantly impacting on market performance (β = 0.383, $p < 0.01$), environmental performance (β = 0.478, $p < 0.01$), and export

performance ($\beta = 0.415$, $p < 0.01$) at alpha level of 0.01 (see Table 11). From the result, the implications are two folds. First, companies without reducing their total number of productions have to depend on the eco-innovation to fulfill the international environmental regulation. The investment on the eco-innovation can enhance company performance by reducing those harmful wastes coming from the production processes.

Another issue raised in the global market is "environment-friendliness". The market requires companies to bring up with new technology through eco-innovation [48]. In reality, most companies around the world fiercely compete with each other to develop new environment-friendly technologies through eco-innovation to ultimately upgrade their position in the market. Countries such as Korea and China are no exception. Eco-innovation in our study empirically proves to have a significant impact on all areas of performances: market, environment, and export performances.

**Table 11.** Regression analyses on the government support and firm's performance.

| | **Dependent Variables** | | | | | |
|---|---|---|---|---|---|---|
| | **Market Performance** | | **Environment Performance** | | **Export Performance** | |
| **Variable** | **Step 1** | **Step 2** | **Step 1** | **Step 2** | **Step 1** | **Step 2** |
| **Control Variables** | | | | | | |
| Comp. Size | 0.111 ** | 0.036 | 0.080 | −0.002 | 0.257 *** | 0.177 *** |
| Ind. Type | −0.112 ** | −0.102 ** | −0.086 | −0.075 | −0.001 | 0.009 |
| Eco-innovation | | 0.383 *** | | 0.478 *** | | 0.415 *** |
| $R^2$ | 0.012 | 0.155 | 0.009 | 0.231 | 0.046 | 0.214 |
| $R^2$ | 0.012 | 0.143 *** | 0.009 | 0.223 *** | 0.046 ** | 0.168 *** |

Note: ** $p < 0.05$, *** $p < 0.01$.

### *5.3. The Mediating Effect of Different Countries in the Relationship between Government Support and Company Performances (Hypothesis 3)*

Hypothesis 3 investigates the disparity of the policies between Korea and China as a mediator to see the differences in outcome in the causal impact between government support and company performance. To do this, Korea and China are treated as dummy coded variables (Korea = 0, China = 1). The six types of government support are multiplied to dummy variables to see the interaction effects (see Table 12).

Hypothesis 3-1 is stated to see the relationship between government support and eco-innovation of the company with expected differences in firm's performance between two countries: Korea and China. The result indicated no zero values found between LLCI and ULCI. Thus, the significance in mediating effect is found [57]. The Chinese government support is found out to be more effective over Korean in Eco-innovation.

Hypothesis 3-2 deals with government support and market performance on the mediating effect of the disparity of the policies between Korean and Chinese government. The results indicated that the information support is more effective for China, while the education and tax exemption are more effective for Korean companies. For other areas, support expense for certificates, development of counteract technologies, and infrastructure on green technology development are found not to be significant.

Hypothesis 3-3 concerns government support and environmental performance of the company on the mediating effect of the disparity of the policies between Korean and Chinese government. The results indicated that the information support is more effective for China and all other areas of supports are not significant. Thus, Hypothesis 3-3 is partly supported.

Finally, the Hypothesis 3-4 concerns with government support and export performance of the company on the mediating effect of the disparity of the policies between Korean and Chinese government. The results indicated that the information support is more effective for China and all other areas of supports are not significant. Thus, Hypothesis 3-4 is also partly supported.

Overall, the effects of Chinese government supports are more able to help companies achieve eco-innovation compared to that of Korea. Corresponding to the result, other areas of company performances, such as market, environment, and export, are more effective under the support of Chinese government as compared to Korean.

**Table 12.** The mediating effect of Korea and China in the pathway of the government support to company performance.

| Pathway/Interaction Effect | Coefficient | se | *t* | *p* | LLCI | ULCI | Result |
|---|---|---|---|---|---|---|---|
| **Government Support → Eco-innovation** | | | | | | | |
| Info × Country (DUM) | 0.289 | 0.063 | 4.580 | 0.000 | 0.165 | 0.413 | ○ |
| Edu × Country (DUM) | 0.153 | 0.067 | 2.230 | 0.026 | 0.018 | 0.282 | ○ |
| Certif × Country (DUM) | 0.315 | 0.062 | 5.072 | 0.000 | 0.193 | 0.437 | ○ |
| Tech × Country (DUM) | 0.376 | 0.061 | 6.078 | 0.000 | 0.254 | 0.497 | ○ |
| Tax × Country (DUM) | 0.339 | 0.068 | 4.935 | 0.000 | 0.204 | 0.474 | ○ |
| Infra × Country (DUM) | 0.298 | 0.071 | 4.193 | 0.000 | 0.158 | 0.438 | ○ |
| **Government Support → Market performance** | | | | | | | |
| Info × Country (DUM) | 0.193 | 0.074 | 2.586 | 0.009 | 0.046 | 0.339 | ○ |
| Edu × Country (DUM) | −0.175 | 0.075 | −2.328 | 0.020 | −0.328 | −0.027 | ○ |
| Certif × Country (DUM) | 0.071 | 0.073 | 0.963 | 0.335 | −0.073 | 0.216 | × |
| Tech × Country (DUM) | −0.096 | 0.068 | −1.410 | 0.158 | −0.231 | 0.037 | × |
| Tax × Country (DUM) | −0.154 | 0.071 | −2.148 | 0.032 | −0.295 | −0.013 | ○ |
| Infra × Country (DUM) | −0.072 | 0.082 | −0.876 | 0.380 | −0.233 | 0.089 | × |
| **Government Support → Environmental performance** | | | | | | | |
| Info × Country (DUM) | 0.259 | 0.063 | 4.060 | 0.000 | 0.134 | 0.384 | ○ |
| Edu × Country (DUM) | −0.044 | 0.065 | −0.687 | 0.491 | −0.172 | 0.083 | × |
| Certif × Country (DUM) | 0.078 | 0.063 | 1.237 | 0.216 | −0.045 | 0.201 | × |
| Tech × Country (DUM) | 0.045 | 0.059 | 0.776 | 0.438 | −0.077 | 0.161 | × |
| Tax × Country (DUM) | −0.102 | 0.062 | −1.646 | 0.100 | −0.224 | 0.019 | × |
| Infra × Country (DUM) | 0.035 | 0.068 | 0.520 | 0.603 | −0.099 | 0.171 | × |
| **Government Support → Export performance** | | | | | | | |
| Info × Country (DUM) | 0.204 | 0.065 | 3.126 | 0.001 | 0.076 | 0.332 | ○ |
| Edu × Country (DUM) | 0.012 | 0.070 | 0.170 | 0.865 | −0.127 | 0.151 | × |
| Certif × Country (DUM) | 0.044 | 0.065 | 0.672 | 0.501 | −0.084 | 0.171 | × |
| Tech × Country (DUM) | 0.102 | 0.062 | 1.644 | 0.100 | −0.019 | 0.225 | × |
| Tax × Country (DUM) | 0.083 | 0.072 | 1.151 | 0.252 | −0.058 | 0.225 | × |
| Infra × Country (DUM) | 0.094 | 072 | 1.253 | 0.210 | −0.053 | 0.241 | × |

Note: The symbol "○" indicates interaction effect is supported, and "×" for not supported.

### *5.4. The Mediating Effect of Different Countries in the Relationship between Eco-Innovation and Company Performances (Hypothesis 4)*

The mediating effects of different countries in the relationship between eco-innovation and company performance are found to be significant in all areas of company performances: on market performance (Coeff = 0.293, LLCI = 0.126, ULCI = 0.470), environmental performance (Coeff. = 0.420, LLCI = 0.279, ULCI = 0.526), and export performance (Coeff. = 0.399, LLCI = 0.246, ULCI = 0.552) (see Table 13). Similar to the results of the government support, the eco-innovation more effectively influences in all areas of company performances for Chinese cases when compared to Korean.

More specifically, we investigated the differences in causal pathway of eco-innovation to company performance between Korea and China by using the graph of interaction effect (see Figure 2). Examining the left-hand side graph (eco-innovation to environmental performance), the slope of the graph for China (dotted line) is steeper than that of Korea (solid line). This implies that the impact of eco-innovation to company performance is greater for the case of China (steeper green slope) than

Korea. Looking at the right-hand side graph (eco-innovation to export performance), the slope of the graph for China (dotted line) is also steeper than that of Korea (solid red line).

**Table 13.** The mediating effect of Korea and China in the pathway of eco-innovation to company performance.

| Pathway/Interaction Effect | Coefficient | se | *t* | *p* | LLCI | ULCI | Result |
|---|---|---|---|---|---|---|---|
| **Eco-innovation → Market performance** | | | | | | | |
| Eco-innov × Country (DUM) | 0.293 | 0.087 | 3.398 | 0.000 | 0.126 | 0.470 | ○ |
| **Eco-innovation → Environmental performance** | | | | | | | |
| Eco-innov × Country (DUM) | 0.420 | 0.072 | 5.839 | 0.000 | 0.279 | 0.562 | ○ |
| **Eco-innovation → Export performance** | | | | | | | |
| Eco-inov × Country (DUM) | 0.399 | 0.078 | 5.109 | 0.000 | 0.246 | 0.552 | ○ |

Note: The symbol "○" indicates interaction effect is supported.

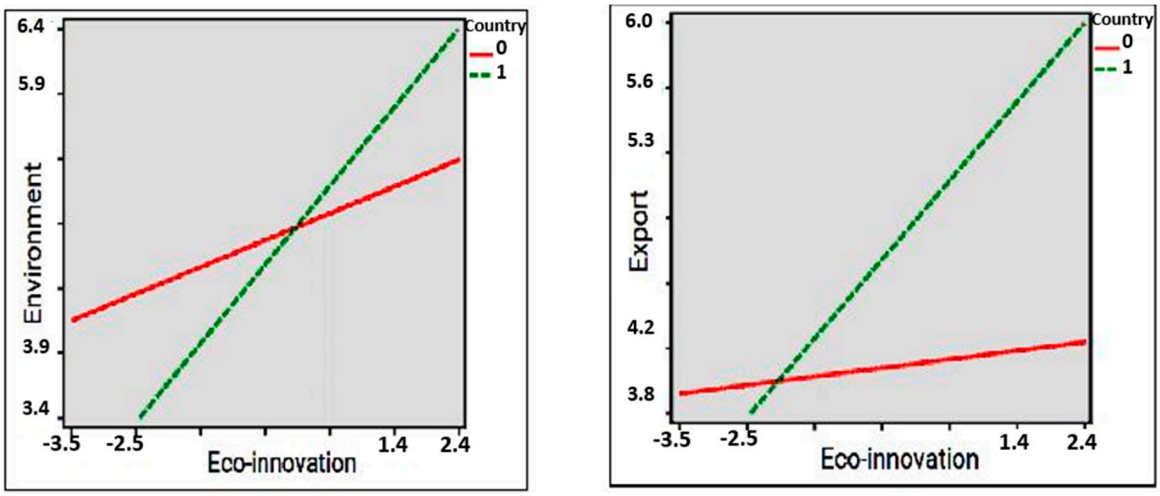


**Figure 2.** Dummy coding (0 = Korea, 1 = China).

Indeed, eco-innovation is an inevitable functional part for companies to uphold performance in today's highly competitive market environment [23,24,28,40,48]. In accordance with the trend, governments from all over the globe are exerting vast efforts to strengthening the capability in eco-innovation. Overall, comparing the two countries, the support of Chinese government outperforms the Korean government.

Examining this result, the Korean government needs to understand the fundamentals of how and why these differences in performance have resulted. The development of new support policies which can possibly compensate defective gaps for Korean must be followed.

In the following Table 14, we summarized the results of all hypothesis testing in this research.

**Table 14.** Summarization of all hypothesis testing.

| Direction | Hypothesis | β Coefficient | *t*-Value | Decision |
|---|---|---|---|---|
| H1 (+) | Government Support → Company Performance | | | |
| H1-1 (+) | Info → Eco-innovation | 0.042 | 0.935 | × |
| | Info → Market performance | −0.063 | −1.604 | |
| | Info → Environmental performance | −0.057 | −1.503 | |
| | Info → Export performance | 0.046 | 1.092 | |
| H1-2 (+) | Edu → Eco-innovation | 0.101 ** | 2.177 | Δ |
| | Edu → Market performance | 0.153 *** | 3.751 | |
| | Edu → Environmental performance | 0.140 *** | 3.521 | |
| | Edu → Export performance | −0.007 | −0.167 | |
| H1-3 (+) | Certificates → Eco-innovation | 0.130 *** | 2.757 | Δ |
| | Certificates → Market performance | −0.005 | −0.116 | |
| | Certificates → Environmental performance | 0.025 | 0.626 | |
| | Certificates → Export performance | 0.109 ** | 2.466 | |
| H1-4 (+) | Technology → Eco-innovation | 0.174 *** | 3.673 | ○ |
| | Technology → Market performance | 0.280 *** | 6.703 | |
| | Technology→ Environmental performance | 0.279 *** | 6.878 | |
| | Technology → Export performance | 0.352 *** | 7.907 | |
| H1-5 (+) | Tax → Eco-innovation | 0.067 | 1.534 | Δ |
| | Tax → Market performance | 0.349 *** | 9.116 | |
| | Tax → Environmental performance | 0.301 *** | 8.082 | |
| | Tax → Export performance | 0.065 | 1.582 | |
| H1-6 (+) | Infra → Eco-innovation | 0.122 *** | 2.799 | Δ |
| | Infra → Market performance | 0.070 | 1.826 | |
| | Infra → Environmental performance | 0.154 *** | 4.111 | |
| | Infra → Export performance | 0.121 *** | 2.950 | |
| H2 (+) | Eco-innov → Company performance | | | |
| H2-1 (+) | Eco-innov → Market performance | 0.383 *** | 10.630 | ○ |
| H2-2 (+) | Eco-innov → Environmental performance | 0.478 *** | 13.892 | ○ |
| H2-3 (+) | Eco-innov → Export performance | 0.415 *** | 11.925 | ○ |
| H3 | Moderating Effect (Government support → Company performance) | | | |
| H3-1 | Gov support → Eco-innovation | China surpass Korea | | ○ |
| H3-2 | Gov support → Market performance | Significant for 3 | | Δ |
| H3-3 | Gov support → Environmental performance | Significant for 1 | | Δ |
| H3-4 | Gov support → Export performance | Significant for 1 | | Δ |
| H4 | Moderating Effect (Eco-innovation → Company performance) | | | |
| H4-1 | Eco-innov → Market performance | China surpass Korea | | ○ |
| H4-2 | Eco-innov → Environmental performance | China surpass Korea | | ○ |
| H4-3 | Eco-innov → Export performance | China surpass Korea | | ○ |

Note: ** $p < 0.05$, *** $p < 0.01$; The symbol "○" indicates all contents in the hypothesis are supported, "Δ" for supported part of them, and "×" for supported none.

## 6. Conclusions

Considering the rapid spread of international environmental regulation from EU and US to many other countries in the world, the proper counterplan or counteraction preparation for this trend is critical for the sustainable growth of any firm. The traditionally adhered "technological capability" alone, now falls short for the current wave, thus embedding "environmental capability" is imperative. SMEs, striving to survive with innate limited resources, are naturally having a harder time to be equipped with environmental capability. Thus, government supports on SMEs is indispensable for their sustainable survival and growth [7,8,62].

From this standpoint, this research attempted to explore if SMEs in different countries resulted with different performance outcomes knowing the fact that the government support in each

country can vary. Findings from the study indicated that the government support only partly influences eco-innovation of the company. Government Support on education, acquiring any necessary certificates, developing new technologies, and infrastructure are significantly affective, while information, and tax exemption have insignificant influences.

Government Support also partly influences company performance. Eco-innovation significantly influences all areas of company performance: market, environment, and export performances. The support on information has no effect, while education, and tax exemption affect both market and environmental performances. The support of expenses for acquiring any necessary certificates is positively related to export performance.

The support of expenses for acquiring any necessary certificates, being it directly influences export performance of the firm, implies that obtaining such certificates requires time, effort, and much cost, which is no longer simple. In 2015, the Korean Small and Medium Business Administration officially supported the expenses related to securing any relevant certificates that are necessary to enter into global market. The support of infrastructure via academy–industry cooperation resulted significant on eco-innovation of the company, environmental performance, and export performance. The collaboration between universities and industries produced synergy effect, leading companies to achieve eco-innovation. Eco-innovation, in turn, accelerated company's environment performance as well as export performance.

Eco-innovation is conceived as the core value to enhance firm's competitiveness in today's environment-friendly paradigm [28,31,40]. From this standpoint, eco-innovation is proven to have significance in all areas of company's performance: market, environment, and export. The result ensures the significance of eco-innovation is robust.

The pathway from government support to company performance is compared between Korea and China. The result indicated that China surpasses Korea in companies achieving eco-innovation. In addition, the effect of government support of information on export performance also favored China. On the other hand, the effect of government support of education and tax for Korea surpassed China.

Lastly, the government support of eco-innovation in China surpassed Korea over all areas of company performance: market, environment, and export.

Overall, from the result of analyses, the support of Chinese government seems to be more effective than Korean government. The question of how and why Chinese government supports surpass Korean, especially in the areas of companies reaching eco-innovation, needs to be researched further. In the case the Korean government support is insufficient, compensatory support areas need to be developed. The contribution of this study lies not only in examining the diverse aspects of government supports and their causal pathway to the fields of company performance, but also in the performance comparison among two countries: Korea and China. Furthermore, by establishing the pros and cons for both countries in this setting, we have a good starting point for further research.

Through this research, we raised the following additional edges. First, this study is conducted to establish the propriety of government intervention on SMEs to properly counteract the international environmental regulations. As a result, the government support on firms, as an extension of the government intervention preventing the market failure scenario, to conform the environmental regulations in global markets, is likely to accomplish favorable outcomes in both countries.

Second, the study model expands the original four dimensions of government supports into six dimensions by adding two more practical government support areas: tax exemption and infrastructure. The results of confirmatory factor analysis on all six dimensions are well within the acceptable range to approve our assumptions. The dimensions we posit can be used for further studies in the field.

Finally, data collection in the study was conducted in large metropolitan areas in the two countries, where all types of small and medium trade firms currently conduct their businesses. This gave us a chance to control the extrinsic factors, while focusing on the intrinsic factor of firm's different size and nationality. In addition, since Korea and China are major economic centers in East Asia, the sample representativeness is robust to generalize our findings.

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