

A STUDY OF THE EFFECT OF GREEN CERTIFICATION ON BUSINESS PERFORMANCE IN BUSAN

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ABSTRACT. *The green certification has been introduced since 2010. The green certification was designed to accelerate economic development by introducing green technology to industries. If a company acquires a green certification, various government support will be given to the company. It is known that the government support may lead to a better business performance. Therefore, we investigate the effect of the green certification by the comparison of the business performance indexes (profitability, growth, turnover and stability) of companies before and after the acquisition of the green certification. We also investigate the effect of the green certification companies with leading company certification compared to the green certification companies without leading company certification. The result of this study is valuable as basic data for the improvement of the performance of the green certification support policy of Busan and the regional policies about the green certification are suggested to companies in Busan.*

Keywords: Green certification, Business performance, Leading company, Busan

1. Introduction. In the 21st century, the world is fiercely competing for green technology development in order to cope with climate change and foster new growth in green industry. Green technology can be summarized as ‘hardware and software technologies that can achieve sustainable growth by utilizing environmentally friendly resources in social, environmental and economic fields’. As a result, research and development of innovative and sustainable green technologies are being sought around the world. In addition, a system is being implemented to promote the growth of the national economy through the revitalization of the green industry. The systems are Green Labeling System in Hong Kong (HKGLS), Eco-Labeling system in Europe, Green Seal in USA, Eco-Mark in Japan, etc. In Korea, green certification system is being implemented from April 2010. Green certification in Korea is divided into four categories: green technology certification, green product certification, green business certification, and green company certification. So, the role of leading innovation is given to companies that have obtained the green certification.

From 2010 to 2013, the green certification was given to companies in Busan. The purpose of this study is to investigate the effect of green certification (with leading company certification) on the business performance of the company in Busan. In the previous research, most of studies are focused to the considerations about green certification and green growth, and there are few empirical studies on the business performance to green

certification companies. It is important that this study is the first empirical study which investigates business performance for the green certification companies in Busan. In addition, we identify the effect on the business performance of green certification and leading company certification. The result of this study is valuable as basic data for the improvement of the performance of the green certification support policy of Busan and the regional policies about the green certification are suggested to companies in Busan.

2. Problem Statement and Preliminaries.

2.1. Green certification. In order to promote the commercialization of green technology, the government tried to establish the growth base of green industry by certifying and supporting promising green technology as new technology and green product as new product in five-year plan for green growth (2009-2015) [1]. The green certification was created to determine the details of identification for green technology, green business, green specialized companies and green product.

2.2. Literature survey. In the work [2], this study aims at analyzing the influences of Certification of Green Logistics Company on performance and suggesting the implications. In the work of [3], this study aims to make institutional improvement in eco technology certification system including green certified product and technology classification system for green technology in order to facilitate the green port logistics industry of Korea. So, a ground to enter the global market with leading technologies and contribute to the identification of new future industries will be established. In the work of [4], the aim of this paper is to suggest strategies of fostering green business for Daejeon Metropolitan City after the selection process of green business. In the work of [5], the direction and strategy of low-carbon green growth policy of the local government was sought by analyzing the promotion system of Gangwon-do carbon green growth policy. In the work of [6], the possibility of achieving the long-run economic growth strategy by the green technology R&D investments was examined. The Dynamic Computable General Equilibrium Model in order to analyze the economic effects of the green technology R&D investments was developed. In the work of [7], the green growth policy of Korea was divided into two steps – sustainable developmental strategy and green growth strategy. Through a comparative analysis of those two steps, the task of low-carbon green growth policy in Korea was suggested.

In the work of [8], the empirical effectiveness of the inno-biz certificate system was analyzed by investigating the comparative managerial performance indexes (profitability, growth, turnover and stability) of the companies before and after the acquisition of the certificate. In the work of [9], the purpose of this study is to evaluate the effectiveness of the support program (especially leading company certification) for the SMEs in the local area, Busan.

2.3. Setting a hypothesis. Green certification companies have a considerable advantage compared to general companies by receiving various supports from the government, such as funding, marketing, the establishment of commercialization infrastructure. So, green certification companies are more likely to achieve high business performance compared to those before green certification. The following hypothesis was set up to analyze whether the acquisition of green certification had a significant effect on business performance.

Hypothesis 1. The performance of the green certification company will be higher than the performance before the certification.

In addition, the company selected as a leading company in Busan can receive various benefits such as financial support and technology development support. Therefore, in the case of a green certification company with a leading company certification, there is a

possibility that business performance will be higher than that of a company with only a green certification, so the following hypothesis was set.

Hypothesis 2. In the case of a green certification company with a leading company certification, the business performance will be higher than a company with only a green certification.

2.4. Selection of samples. The sample of this study includes 42 companies that were chosen as members of green certification program in Busan by the green certification program of Busan TechnoPark and satisfy the following conditions.

- 1) Companies whose business addresses are registered in Busan at October 31, 2015.
- 2) Certified as a green certification company from 2010 to 2013.
- 3) Settle accounts at the end of December.
- 4) Manufacturing business.
- 5) Companies with financial data required for this study in Korea Corporate Data Ltd.
- 6) Companies with data from two years before green certification to two years after green certification.

Conditions 1) and 2) are to study the business performance of a company that is selected as a green certification company whose business site is registered in Busan. 3) is to control the difference according to the settlement month. In addition, condition 4) is to focus on manufacturing industry, and 5) to obtain data necessary for the analysis of this study. Finally, condition 6) is to compare the effect before and after the green certification.

2.5. Setting variables. The variables about business performance are financial ratios based on the financial statements of the company for objective analysis. We set an independent variable as the dummy variable about green certification, a dependent variable as business performance, and control variables as company age, number of employees, and ln (total amount of assets). Dependent variables about business performance are shown in Table 1. We selected ROA (Return on Assets) and ROE (Return on Equity) as profitability index, selected net profit growth rate as the growth index. The asset turnover ratio was selected as the activity index and the debt ratio and the current ratio were selected as the stability index.

TABLE 1. Dependent variables about business performance

Division	Variable	Calculation formula
Profitability	ROA	Net Income/Average Total Asset
	ROE	Net Income/Average Owner's Capital
Growth	Net profit growth rate	(Net Income – Prior Period Net Income)/Prior Period Net Income
Activity	Asset turnover ratio	Sales/Average Total Asset
Stability	Debt ratio	Liabilities/Total Asset
	Current ratio	Current Assets/Current Liabilities

2.6. Model for verification. To test Hypothesis 1, we calculate the annual financial ratios for green certification companies from 2 years before certification to 2 years after certification. We conducted a *t*-test to verify whether there is a difference in the performance of the company before and after the green certification. In addition, we conducted a regression analysis about the dummy variable of green certification as an independent variable, and each business performance as a dependent variable. In order to verify Hypothesis 2, the financial ratios of green certification companies were divided into companies with/without leading company certification, and then they were verified by *t*-test. The model is summarized as follows.

Model for Verification of Hypothesis 1/Hypothesis 2

a_0 : regression intercept

a_1 : coefficient of Green certification dummy

a_2 : coefficient of Firm age

a_3 : coefficient of number of employees

a_4 : coefficient of $\ln(\text{total asset})$

· Hypothesis 1 Variable*

$$= a_0 + a_1 \times \text{Green certification dummy} + a_2 \times \text{Firm age} + a_3 \times \text{number of employees} \\ + a_4 \times \ln(\text{total asset}) + \varepsilon$$

· Hypothesis 2 Variable*

$$= a_0 + a_1 \times \text{Leading company dummy} + a_2 \times \text{Firm age} + a_3 \times \text{number of employees} \\ + a_4 \times \ln(\text{total asset}) + \varepsilon$$

*ROA, ROE, Net profit growth rate, Asset turnover ratio, Debt ratio, Current ratio

a_0 : intercept, a_1, a_2, a_3, a_4 : coefficient of independent variable

3. Empirical Analysis.

3.1. Verification of hypothesis 1.

3.1.1. *Verification of differences before and after green certification (t-test analysis).* Table 2 shows the results of the difference test before and after the green certification.

TABLE 2. Verification of differences before and after green certification

Division	Variable	Before	After	Difference	p-value
Profitability	ROA	5.5890	-0.1520	5.7409	0.166
	ROE	12.9112	12.4843	0.4269	0.324
Growth	Net profit growth rate	263.4498	107.0248	156.4250	0.216
Activity	Asset turnover ratio	1.5877	1.3364	0.2512	0.074
Stability	Debt ratio	214.2681	279.4103	-65.1422	0.193
	Current ratio	333.7763	340.0948	-6.3185	0.551

ROA and ROE about profitability, and net profit growth ratio about growth potential were lower after the green certification, but not statistically significant. Assets turnover ratio about activity was statistically significantly lower after the green certification. Debt ratio and liquidity ratio about stability were higher after green certification, but not statistically significant. From the result, Hypothesis 1 that the business performance will be improved due to the green certification is not supported.

3.1.2. *Hypothesis testing: Dummy regression analysis.* We conducted a regression analysis about the dummy variable of green certification as an independent variable, and each business performance as a dependent variable. As a result of analysis, all variance inflation Factor (VIF) is less than 10, which means that there is no multicollinearity problem among the independent variables.

Table 3 shows whether the business performance is improved by the green certification. ROA and debt ratio show statistically significant positive relationship and current ratio shows statistically significant negative relationships about the green certification dummy. Therefore, Hypothesis 1 that the company's business performance will be improved due to green certification is not supported.

TABLE 3. Regression analysis of green certification and business performance

Division	ROA		ROE		Net profit growth rate	
	Regression coefficient	t-value	Regression coefficient	t-value	Regression coefficient	t-value
Green certification dummy	9.651	2.124**	2.632	0.193	199.480	1.106
Company age	-0.026	-0.076	-1.452	-1.424	-11.643	-0.864
Number of employees	-0.057	-1.157	0.065	0.437	-2.201	-1.120
ln(total asset)	6.719	1.816*	2.315	0.208	235.793	1.606
F-value	0.058		0.674		0.255	
Adjusted R-squared	0.018		-0.006		0.005	

Division	Asset turnover ratio		Debt ratio		Current ratio	
	Regression coefficient	t-value	Regression coefficient	t-value	Regression coefficient	t-value
Green certification dummy	0.638	0.955	167.434	2.200**	-181.854	-2.154**
Company age	-0.019	-0.383	-16.843	-2.960***	4.304	0.682
Number of employees	-0.001	-0.125	0.861	1.038	0.403	0.438
ln(total asset)	-0.207	-0.381	-44.660	-0.720	-214.973	-3.126***
F-value	0.741		0.002		0.000	
Adjusted R-squared	-0.007		0.045		0.062	

***: p -value < 0.001, **: p -value < 0.05, *: p -value < 0.1

3.2. Verification of hypothesis 2.

3.2.1. *Verification of differences between green certification companies with/without leading company certification (t-test analysis).* Table 4 shows the results about the difference on the business performance between green certification companies with/without leading company certification.

TABLE 4. Verification of differences on the business performance between green certification companies with/without leading company certification

Division	Variable	Before	After	Difference	p-value
Profitability	ROA	6.418	1.1045	-5.3135	0.053
	ROE	13.3779	19.6992	6.3213	0.033
Growth	Net profit growth rate	357.4600	86.3489	-271.1111	0.004
Activity	Asset turnover ratio	1.9419	1.9139	-0.0280	0.718
Stability	Debt ratio	176.0872	316.0428	139.9556	0.011
	Current ratio	275.3632	370.8783	95.5151	0.003

As a result, the results showed that they are statistically significant in profitability, growth and stability.

3.2.2. *Hypothesis testing: Dummy regression analysis.* We conducted a regression analysis about the leading company dummy (Leading company certification) as independent variable, and each business performance as a dependent variable. As a result of analysis, all Variance Inflation Factor (VIF) is less than 10, which means that there is no multicollinearity problem among the independent variables in the model.

Table 5 shows the results of a regression analysis about differences in business performance between certification. The net profit growth rate was significantly higher than that of green certification company without leading company certification, while the asset turnover ratios turnover was not significant. The debt ratio to company age was significantly negative and the number of employees was not significant. In the case of \ln (total assets), ROA has a significant positive relationship and the current ratio shows a negative relationship. As a result of hypothesis 2, only the growth rate of net profit shows a significantly positive value, which can be explained as supporting some of hypothesis 2. So, green certification companies with leading company certification will achieve better business performance than green certification companies without leading company certification.

TABLE 5. Relationship of business performance between green certification companies with/without leading company certification

Division	ROA		ROE		Net profit growth rate	
	Regression coefficient	<i>t</i> -value	Regression coefficient	<i>t</i> -value	Regression coefficient	<i>t</i> -value
Leading company dummy	3.739	0.660	2.150	0.127	504.358	2.275**
Company age	-0.059	-0.167	-1.479	-1.406	-18.865	-1.367
Number of employees	-0.059	-1.175	0.064	0.429	-2.504	-1.280
\ln (total asset)	7.217	1.912*	2.299	0.204	188.647	1.277
<i>F</i> -value	0.281		0.678		0.055	
Adjusted <i>R</i> -squared	0.004		0.008		0.018	

Division	Asset turnover ratio		Debt ratio		Current ratio	
	Regression coefficient	<i>t</i> -value	Regression coefficient	<i>t</i> -value	Regression coefficient	<i>t</i> -value
Leading company dummy	0.681	0.823	-11.125	-0.117	101.176	0.962
Company age	-0.028	-0.543	-16.251	-2.746***	2.296	0.350
Number of employees	-0.001	-0.176	0.885	1.055	0.319	0.344
\ln (total asset)	-0.233	0.422	-25.784	-0.407	-247.460	-3.530***
<i>F</i> -value	0.784		0.015		0.001	
Adjusted <i>R</i> -squared	-0.008		0.029		0.050	

***: p -value < 0.001, **: p -value < 0.05, *: p -value < 0.1

4. **Conclusions.** Since the existing economic growth paradigm has been shifting to environmentally friendly, we have examined the business performance of environmentally friendly green certification companies and analyzed the business performance of green certification companies with/without leading company certification. The result shows that the company's business performance will be improved due to green certification is not supported. The result is not as expected because the macroeconomic situation does not take into account. The green certification companies with leading company certification will achieve better business performance than green certification companies without leading company certification.

Also, this paper is meaningful that this study is the first empirical study which investigates business performance for the green certification companies in Busan. This study has the following limitations.

1) This study has limitations that the investigation was based on the survey of companies in Busan. The study will be expanded to the whole green certification company.

2) The green certification system has not been implemented for a long time, so the survey period (two years before and after certification) is short in comparing performance before and after certification.

3) Though the focus of green certification is on excellence and greenness of technology, technical characteristics are not considered in this study.

The result of this study is valuable as basic data through the analysis of the performance of the green certification support policy of Busan. The importance of green certification companies in the economy and the effective ways to support them are considered. We will also be interested in the greenhouse gas emission trading system, which has been in operation since 2015, and hope to continue the wide range of follow-up studies in related institutions and academia related to the green industry.

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