도시계획학 석사 학위논문

The Effect of the Environmental Performance of Korean Manufacturing Sectors on the Short- and Long-term Corporate Performance:

Comparison before and after the COVID-19 Pandemic

제조업체의 환경성과가 장·단기 기업성과에 미치는 영향:

코로나19 전후 비교를 중심으로

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서울대학교 대학원

환경계획학과 환경관리학 전공

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Abstract

The COVID-19 pandemic has greatly affected the domestic economy and the impacts of the recession are ongoing. There are claims that climate change may have been an important factor in the outbreak of the COVID-19 pandemic. Consumer pressure on companies to take responsibilities of environmental and social issues has increased. Also, climate risk has induced new environmental regulations which act as trade barriers. Therefore, the importance of environmental management has never been more pertinent and it has become almost obligatory rather than choice. Therefore, ESG management that fosters sustainable growth is to be integral to companies.

This thesis aims to analyze the effect of environmental performance on the short and long-term corporate performance in the Korean manufacturing sector. To achieve the objective of this study, the panel data has been collected from the South Korean manufacturing industry over 2012-2021 periods. Introducing regression model for panel data analysis, we firstly select the environmental grade published by KCGS as an independent variable. For short and long-term corporate performance, ROA(Return on Assets) and Tobin's Q are adopted as dependent variables respectively. And also, three hypotheses are developed. First, environmental performance affects the short and long-term corporate performance respectively. Second, environmental performance affects corporate performance differently before and after COVID-19.

Third, depending on whether it is a subsector with high environmental risk or not, environmental performance has a different effect on corporate performance.

Panel regression analysis has been undertaken and the results are as follows. First, the effect of environmental performance on ROA was not significant but on Tobin' s Q was negative and significant. Second, the effect of environmental performance on ROA during COVID-19 was not different from before COVID-19. However, the effect of environmental performance on Tobin' s Q was negative. This result shows that higher environmental performance during COVID-19 does not lead to higher short and long-term financial performance. Third, the higher the environmental performance the subsectors with high environmental risk significantly decreased in ROA relative to subsectors that do not have high environmental risk but relatively increased in Tobin' s Q. This implies that investments in environmental performance by subsectors with high environmental risk will experience decrease in profitability in the short-term aspect but will experience increase in firm value in the long-term aspect. As a result, the persistent investment to enhance environmental performance needs to be placed as a top priority in business management: in particular, as for subsectors with high environmental risk.

Keywords: COVID-19, Environmental performance, Corporate performance, ROA, Tobin' s Q, Panel regression analysis

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Chapter 1. Introduction

1.1. Research background and purpose

The COVID-19 pandemic has greatly affected the global economy, with South Korea currently experiencing a severe economic recession, and the impacts are now being felt. According to Kang et al. (2021), the real GDP of the Korean economy is estimated to have fallen by 3.7 percentage points, private consumption by 7.4 percent, and annual employment by 460,000 over the year since the onset of COVID-19 pandemic. Compared to major crises of the past, this crisis is the second largest recession after the foreign exchange crisis in 1997, based on private consumption and employment shocks.

Climate change is gaining attention as a major variable affecting the occurrence and spread of infectious diseases in the face of the crisis of pandemic. Although the origin of coronavirus has not yet been scientifically proven, Yun (2020) and Beyer et al (2021) conclude that climate change may have been an important factor in the outbreak of coronavirus.

As public awareness of climate change has grown in recent years, consumer pressure on companies to take responsibilities of environmental and social issues is on increase. As shifting quickly from shareholder capitalism to stakeholder capitalism, the firm executives have started to consider more of Environmental, Social and Governance (ESG) risks to better position the

company to manage and mitigate such risks, leading to greater firm value. Currently valuing a company for its sustainability, there has been momentum to start incorporating non-financial information to traditional financial information. The representative indicator of non-financial indicator called ESG has recently become the key factor to consider in setting up overall management and investment strategies. ESG, a non-financial indicator, has emerged as a practical value that will enable sustainable development and survival, including all members of society, not limited to shareholders.

The environmental pillar of ESG has received much attention because it presents both risks and opportunities for companies. According to the Global Risk Report 2022 published by the World Economic Forum, half of the ten risks that humanity will face in the next 10 years were environmental risks. Each country is implementing environmental regulations for a sustainable future and thus, companies that are capable to comply and effectively operate within the regulations will see it as an opportunity. The EU Due Diligence Act which requires companies, that reside within or trade with the EU, to monitor and act and report on environmental issues in the supply chains has already become a concern for domestic companies. The Korea Chamber of Commerce and Industry (2022) has completed a survey with 300 companies that export overseas and the survey results showed that more than half of the companies do not have an adequate response system and only four percent is carrying out the necessary due diligence and feedback in their supply chain. More than half of the companies expressed anxiety

over the possibility of termination of contract. EY (2021) highlights that the total money that have to be paid due to climate regulations amount to USD 1.87 billion. Domestic companies need to set environmental targets and achieve these to prepare due diligence and Carbon Border Adjustment Mechanism. The companies that are well prepared will see it as a new growth engine. It is imperative to prepare for environmental risks.

The climate risks are of three parts: transition risk, physical risk and liability risk (Condon, 2021). Transition risk is the consequence of companies failing to adapt to low-carbon economy. Stranded assets of fossil fuel companies are an example of transition risks. Physical risk includes all kinds of risk caused by the change in climate. Liability risk is the probability of parties that contribute to emissions or gain profit from it and have to compensate to those who are damaged by the climate change. Goldstein et al (2019) reported that bottom-up reporting of financial risk due to climate change was 100 times less than top-down estimation. This implies that companies are underreporting the financial risk caused by climate change. American utility company PG&E is the chosen example. PG&E stipulated wildfire due to climate change to be a significant liability risk and estimated the compensation amount to be USD 25 million. However, the California wildfire in 2019 caused PG&E to face USD 300 million compensation as liability and went bankrupt. Companies can manage environmental risks through environmental management and can expect higher corporate value and sustainable growth.

In order to mitigate the climate crisis, developed nations are leading the way for an increase in carbon neutrality declarations and many countries are enacting carbon neutrality laws. Also, a majority of countries are pursuing carbon neutrality through establishing long-term low greenhouse gas emission development strategies. The world is transitioning towards a carbon neutral economy and during the process of transition the damage of climate change will be lessened, but the high emitting industries will be exposed to transition risk and the corporate value will decline and has the potential to become stranded assets. In South Korea, the economic reliance of the manufacturing industry, which accounts for 28% of total GDP and the nature of high emissions of the manufacturing industry make it vulnerable to the transition risk (Kim, 2021) The domestic finance industry has a heavy reliance on the manufacturing industry thus, presents them with a transition risk that can be transferred to the loss of finance industry and decline in financial stability.

Summarizing the above, environmental management has become imperative for sustainable growth. Research on environmental performance and its relationship with financial performance is necessary to provide data which can serve as the basis for environmental management strategies. The purpose of this study is to investigate the effect of environmental performance on short and long-term corporate financial performance of manufacturing industry. For the purpose, three hypotheses are set up. First, environmental performance has effect on the short and long-term corporate financial performance respectively. Second, there is a difference in the

impact of environmental performance on the short and long-term corporate financial performance before and after the COVID-19 pandemic. Third, there is a difference in the impact of environmental performance on the short and long-term corporate financial performance for subsectors that have high environmental risk and subsectors that do not have high environmental risk.

1.2. Scope of the study

The sample has been selected in the South Korean manufacturing industry which satisfy three conditions.

First, companies are subject to an annual assessment from the Korea Institute of Corporate Governance and Sustainability (KCGS) and have received a ESG combined rating, E rating, S rating, G rating and they are listed on the Korea Composite Stock Price Index(KOSPI).

The other is that companies' financial data are available at the end of the year through KIS-VALUE.

The selected companies in the manufacturing industry are classified into 12 industries according to the industry classification table from the Environmental Assessment Guidelines. These 12 industries are Food/Drink, Textiles, Paper/Pulp, Petroleum, Chemical, Plastic/Pharmaceutical, Glass/Cement, Steel/Non-Steel, Electrical and Electronic ,Machinery and Equipment, Automotive and Other Manufacturing.
The reason for using industry classification from the Environmental Assessment Guidelines is that the Korea Standard

Industry Classification(KSIC) groups different industries according to similarity of industrial activities. There is a limitation in assessing environmental impact. Industry classification from the Environmental Assessment Guidelines group industry according to similarity of industrial activities as well as environmental characteristics and provide sufficient sample numbers for each industry. Data spans from the period of 2012 to 2021 and the 10-year unbalanced panel data is created. The number of observed firms is described in Table 1 and subsectors of manufacturing industry are described in Table 2.

<Table 1> Panel Data: Number of Sample Firms

Year	Frequency	Percent(%)
2012	318	9.09
2013	322	9.21
2014	328	9.38
2015	335	9.58
2016	351	10.03
2017	353	10.09
2018	361	10.32
2019	372	10.63
2020	376	10.75
2021	382	10.92
Total	**3,498**	**100.00**

<Table 2> Subsectors of Manufacturing Industry

Korean Standard Industrial Classification	Frequency	%	New Classification	Frequency	%
Food products	275	6.68	Food/Drink	325	7.89

Beverages	50	1.21			
Textiles, except apparel	60	1.46	Textiles	60	1.46
Tobacco products	10	0.24	Paper/Pulp	185	4.49
Wood and of products of wood and cork; except furniture	30	0.73			
Pulp, paper and paper products	145	3.52			
Coke, briquettes and refined petroleum products	50	1.21	Petroleum	50	1.21
Chemicals and chemical products; except pharmaceuticals and medicinal chemicals	635	15.42	Chemical	635	15.42
Pharmaceuticals, medicinal chemical and botanical products	396	9.62	Plastic/Pharmaceutical	613	14.89
Rubber and plastic products	217	5.27			
Other non-metallic mineral products	179	4.35	Glass/Cement	179	4.35
Basic metals	449	10.90	Steel/Non-Steel	449	10.9
Electronic components, computer; visual, sounding and communication equipment	323	7.84	Electrical Electronic	459	11.14
Electrical equipment	136	3.30			
Fabricated metal products, except machinery and furniture	102	2.48	Machinery and Equipment	415	10.08
Medical, precision and optical instruments, watches and clocks	44	1.07			
Other machinery and equipment	269	6.53			
Motor vehicles, trailers and semitrailers	398	9.66	Automotive	483	11.72
Manufacture of other transport equipment	85	2.06			
Wearing apparel, Clothing accessories and fur articles	144	3.50	Other Manufacturing	265	6.44
Leather, luggage and footwear	39	0.95			
Furniture	52	1.26			
Other manufacturing	30	0.73			
Total	**4,118**	**100.0**	**Total**	**4,118**	**100.0**

The reason for choosing the manufacturing industry as the

research subject is that it is vulnerable to transition risks due to its high-emitting greenhouse gas nature. This nature is likely to act as a risk factor for the Korean financial system, which has a high financial sector exposure (loans, bonds, stocks) to the manufacturing industry (Kim, 2021). Therefore, environmental management of manufacturing industry is important for sustainable growth.

1.3. Methodology

As an empirical analysis tool, panel regression models are employed to analyze the relationship between the environmental performance of Korean manufacturing sector and the short and long-term corporate performance. First, the relationship between short and long-term corporate performance and environmental performance of the entire manufacturing industry is analyzed then the relationship between short and long-term corporate performance and environmental performance by manufacturing sector is analyzed. Second, a dummy variable is created for pre and post COVID-19 and short and long-term corporate performance and environmental performance by manufacturing industry is analyzed. Third, a dummy variable is created for subsectors that have high environment risk and the other subsectors which do not have high environmental risk then short- and long term corporate performance and environmental performance is analyzed. ROA (Return on Assets) and Tobin' s Q are selected as proxies for short and long-term corporate

performance. For independent variable, the Environmental grade published by the Korea Institute of Corporate Governance and Sustainability (KCGS) is chosen. The ESG evaluation model by the KCGS satisfies the international standards such as OECD principles of corporate governance and ISO 26000 and has been developed considering the specific business environment of South Korea which guarantees the validity and fairness of testing (Park, 2021). Also, the wide use of KCGS ESG data is the industry standard by academic researchers, illustrating the common acceptance and adoption. KCGS uses 7-grade system; S, A+, A, B+, B, C, D for ESG scoring. Variables that can affect the corporate financial performance are controlled.

Chapter 2. Literature Review

2.1. Theoretical framework

There are many theories pertaining to the relationship between environmental performance(EP) and financial performance(FP). The theory that believes environmental performance hinders financial performance is shareholder theory. Neoclassical economists believe the sole responsibility of a corporate executive is to maximize profit. They believe if an executive spends more than what is considered optimal for emissions reduction this is taking away the shareholders' share for a social interest which will result in less of a return to shareholders and it is beyond executive's responsibility. On the other hand, the Porter hypothesis claims that environmental regulations will induce innovation because firms will try to increase efficiency and competitiveness. This will lead to reduced cost that is induced by regulation and lead to higher financial performance (Porter and Linde 1995).

2.2. Relationship between EP and FP

There is a mix of results of positive, neutral and negative.

1) Previous studies on the relationship between EP and FP

Kim (2020) analyzed the effect of non-financial information

disclosure on KOSPI-listed firms from 2011 to 2019. The result showed that the relationship between EP and ROA was not significant nor with Tobin's Q.

Lim (2019) examined the effect of Environmental, Social and Governance scores on firm value. The effect of environmental grade on Tobin's Q of the current and the next period was not significant.

Jung and Choi (2022) analyzed the effect of combined ESG score, Environmental score, Social score and Governance score on Tobin's Q of the next period for the listed companies spanning from 2010 to 2016. The effect of environmental score on Tobin's Q of the next period was not significant. The insignificant relationship can be attributed to investors' concerns over environmental management. From the perspective of viewing investment in environment as green-washing environmental management does not lead to increase in firm value and could work in the direction of decreasing the stock price.

Kang and Jung (2020) analyzed the effect of ESG score, Environmental score, Social score and Governance score on Tobin's Q by employing two different ESG score sets from WHO's GOOD (WG) and KCGS rating agencies. In WG sample, the effect of environmental score on Tobin's Q was positive. In KCGS sample, the effect of environmental score on Tobin's Q was also positive. In the common sample which WG and KCGS both rated, the environmental performance on firm value was not significant using WG ESG data but positive in KCGS ESG data. The result could be different even using the same sample due to

the different rating system of different agencies.

2) Previous studies on the relationship between EP and FP during the COVID-19 pandemic

Kaakeh and Gokmenoglu (2022) analyzed the effect of environmental performance on the financial performance of 329 Chinese firms during the COVID-19 pandemic. Refinitiv Environmental score of ESG was used and the data spanned from 2017 to 2020. The effect of environmental performance on the financial performance was significant and positive during COVID-19. The higher the environmental performance higher the financial performance. This study implies that firms that invest in environmental performance would financially perform better in times of economic crisis such as COVID-19.

Khoury et al. (2022) used financial data of 4528 firms from G20 countries and Refinitiv Environmental score of ESG to analyze the impact of environmental pillar on financial performance for the year 2020 during COVID-19. The effect of environmental pillar on financial performance was not significant during COVID-19.

Hwang et al. (2021) analyzed the difference in the effect of firm's ESG activities on its financial performance during and before COVID-19. 1645 KOSPI-listed firms are included in the sample and ESG ratings from KCGS are used. The effect of environmental performance on financial performance was not significant.

3) Previous studies on the effect of EP on FP of industrywide

subsectors facing the environmental risk.

Park (2022) used KCGS ESG data from 2011 to 2019 and financial data for all KOSPI-listed companies and some of the KODAQ-listed companies to analyze the difference in the impact of environmental performance that have high environmental risk and subsectors that do not have high environmental risk. The higher the environmental performance, the subsectors with high environmental risk decreased in ROA relative to those that do not have high environmental risk but relatively increased in Tobin' s Q. This implies that firms with high environmental risk will experience decrease in profitability in the short-term but will experience increase in firm value in the long-term.

2.3. Differentiation of research

There is a growing number of research that investigates the individual pillar of ESG and its relationship with financial performance. However, there is insufficient research that investigates the relationship between environmental performance and financial performance in times of economic crisis such as the COVID-19 recession. The differentiation of this study from others is employing the COVID-19 pandemic as a proxy for economic crisis and investigates the difference in the effect of environmental performance on the financial performance between during the COVID-19 and after the COVID-19. We also investigate the manufacturing industry as a whole and at sub sector level using the classification system by Environmental

Assessment Guidelines which divided the manufacturing sector according to the environmental characteristics. This enhances the accuracy of environmental assessment for each subsector. Lastly, we analyzed the difference between the effect of environmental performance for subsectors with high environmental risk and subsectors with not high environmental risk, within the manufacturing industry.

Chapter 3. Hypothesis and Methodology

3.1. Hypothesis setting

Based on previous studies analyzing the relationship between ESG environmental performance(EP) and financial performance(FP), the relationship is mixed; positive, neutral, or negative. Therefore, the following H_1-1 is set up to verify the corporate effect of EP on FP.

H_1-1: Environmental grade affects the short and long-term corporate performance, respectively.

Based on the previous studies that analyzed the relationship between ESG EP and FP during the COVID-19 recession, the relationship was either positive or neutral. Therefore, the following H_1-2 is set up to verify the impact of EP on FP during the COVID-19 economic crisis.

H_1-2: The effect of Environmental grade on short and long-term corporate performance is different between pre- and post- COVID-19 pandemic

Based on Park (2022) study that examined the impact of environmental grade on the financial performance of industries with high environmental risks and industries without high environmental risks, it was confirmed that there was a difference

between industries with high environmental risks and industries without high environmental risks. Therefore, the hypothesis H_1-3 below is set up to investigate the difference between the effect of environmental grade on the corporate financial performance, such as ROA and Tobin' s Q, of industries with high environmental risk and without high environmental risk, respectively.

H_1-3: The effect of Environmental grade on subsectors with high environmental risk is different to the subsectors that do not have high environmental risk

3.2. Multivariate regression model for panel data

Based on the previous studies, the following panel regression methods is adopted to test the above hypothesis H_1-1, 2, 3 using the panel data specified in section 1.2.

Fist of all, the model for H_1-1 hypothesis testing is as follows;

$$FP_{i,t} = \beta_0 + \beta_1 E_{i,t} + \beta_2 S_{i,t} + \beta_3 G_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 LEV_{i,t} + \beta_6 OCF_{i,t} + \beta_7 BETA_{i,t} + \beta_8 AGE_{i,t} + \beta_9 OWN_{i,t} + \sum YEAR + \sum IND + e_{i,t}$$

And also, the testing model for H_1-2 is as follows;

$$FP_{i,t} = \beta_0 + \beta_1 E_{i,t} + \beta_2 dum\_ind_{i,t} + \beta_3 E_{i,t} \times dum\_ind_{i,t} + \beta_4 S_{i,t} + \beta_5 G_{i,t} + \beta_6 SIZE_{i,t} + \beta_7 LEV_{i,t} + \beta_8 OCF_{i,t} + \beta_9 BETA_{i,t} + \beta_{10} AGE_{i,t} + \beta_{11} OWN_{i,t} + \sum YEAR + \sum IND + e_{i,t}$$

As for H_1-3 hypothesis testing, the following model is employed: that is,

$$FP_{i,t} = \beta_0 + \beta_1 COVID_{i,t} + \beta_2 E_{i,t} + \beta_3 S_{i,t} + \beta_4 G_{i,t} + \beta_5 COVID_{i,t} \times E_{i,t} + \beta_6 COVID_{i,t} \times S_{i,t} + \beta_7 COVID_{i,t} \times G_{i,t} + \beta_8 SIZE_{i,t} + \beta_9 LEV_{i,t} + \beta_{10} OCF_{i,t} + \beta_{11} BETA_{i,t} + \beta_{12} AGE_{i,t} + \beta_{13} OWN_{i,t} + \sum YEAR + \sum IND + e_{i,t}$$

Description of the variables used in the above 3 models is as follows;

- Dependent variables

$FP_{i,t}$ indicates the financial performance of corporation i in year t measured by $ROA_{i,t}$ and $Tobin's\ Q_{i,t}$ where ROA is the return on average total assets and Tobin's Q is measured by $\frac{market\ value\ of\ common \text{ and } preferred\ stocks + book\ value\ of\ debt}{book\ value\ of\ total\ assets}$

- Independent variables

E : environmental grade in ESG score

● Control variables

S : social grade in ESG score

G : governance grade in ESG score

SIZE: natural log(total assets)

LEV: total debt/total assets

OCF: operating cash flow/total assets

BETA: corporate systematic risk

AGE: natural log(corresponding year−foundation year)

OWN: major shareholder's share ratio

● Dummy variables

∑YEAR : corresponding year '1', if not '0'

∑IND : corresponding industry '1' if not '0'

Dum_Ind : representing whether or not manufacturing subsectors with high environmental risk, if corresponding industry '1', if not '0'

COVID : representing the COVID−19 Pandemic, if after 2020 year '1', if not '0'

Tobin's Q which is a proxy for long−term firm performance is used for a dependent variable. In this study, calculation of Tobin's Q follows Chung and Pruitt (1994) method; (Market Value of Common Stock + Market Value of Preferred Stock + Book Value of Debt) / Book Value of Total assets. In this calculation method, the higher the ratio of Tobin's Q implies it is regarded as premium in the stock market. Firms with size, high ROA or earnings per share (EPS) does not correlate with Tobin's Q. For short−term

firm performance, ROA(Return on Assets) is used for a dependent variable. ROA is the ratio of how much revenue is generated (net income/total assets).

Explanatory variable used is environmental grade. KCGS uses 7-grade system; S, A+, A, B+, B, C, D for ESG combined grade, S grade and G grade. For the regression analysis, these are turned into interval scale and given number for calculation S grade is 7, A+ is 6 and so on. Kim (2021) turned grade system into interval scale.

In order to control the variables that affect the corporate performance the control variables used in the study by Kim (2020) in which the relationship between environmental performance and corporate performance is explored are reviewed and selected. Size, Leverage, CFO, Beta, Age and Ownership are controlled. Yuk et al.(2020) showed that the higher largest shareholders' ownership led to increase in firm values of hidden champion firms. Kim and Kim (2022) showed that Tobin' s Q has a positive relationship with BETA and negative relationship with AGE.

Dum_Ind is a dummy variable created to specify subsectors with high environmental risk as '1' and subsector with no high environmental risk as '0', according to the classification of Park and Park (2020).

Chapter 4. Panel Regression Results

4.1. Descriptive Statistics

Variables used in the fixed effects panel regression model are provided in <Table 3> below. The mean ROA was 0.02 and minimum was -0.271 and maximum was 0.024. There was a range of firms in the sample generating negative profitability to positive profitability. The median was 0.024 which was similar to ROA. The mean value of Tobin' s Q was 1.87 and the maximum value was 5.091, the disparity between the two was high. Outliers were observed both in ROA and Tobin' s Q and standard deviation of ROA and Tobin' s Q was high therefore the sample was winsorized at 1% and 99% quantiles. The average environmental score for manufacturing industry was 2.808 which was close to B grade. The median was 3 which was close to the average. The minimum was 1 which was Grade D and the maximum was 6 which was Grade A. The average of COVID was 0.215 which meant that 21.5% of sample firms were from during the COVID-19 pandemic. The average of DUM_IND was 0.398 which meant that 39.8% of manufacturing industry had high environmental risk. The average Leverage was 0.417 which was similar to the median, the minimum was 0.001 and the maximum was 2.010. For Beta considering the effect of the pandemic, the range was wide, the minimum was -3.929 and the maximum was 20.48. For OWN, the average was 44.6% and the maximum was 97.2%

<Table 3> Descriptive Statistics

Variable	Obs.	Mean	Std.Dev	Min	Median	Max
ROA	4118	.0208444	.0704486	-.2716494	.0245345	.2077038
Tobin's Q	4118	1.187086	.7309217	.4322285	.9829263	5.091397
E	4118	2.808159	1.186562	1	3	6
S	4118	2.965517	1.227677	1	3	6
G	4118	2.911608	.9871441	1	3	6
COVID	4118	.2158815	.4114824	0	0	1
DUM_IND	4118	.3987373	.489698	0	0	1
SIZE	4118	26.76284	1.433165	23.02378	26.49909	33.02019
LEV	4118	.4177417	.2144931	.0005999	.4176795	2.010792
OCF	4118	.0473627	.0729071	-.4945426	.0462257	.5931314
BETA	4118	.8594889	.6004537	-3.929404	.827983	20.24803
AGE	4118	3.507986	.7449013	.6931472	3.7612	4.820282
OWN	4118	.4467554	.1618747	0	.4511965	.972485

The <Table 4> below presents the pairwise Pearson correlations between all the variables. E was positively correlated with ROA with value of 0.094 at the 1% significance level. E was negatively correlated with Tobin' s Q with value of -0.034 at the 5% significance level. Opposing correlation was observed. E was positively correlated with SIZE, LEV, OCF, BETA and DUM_IND at the 1% significance level. In contrast, E was negatively correlated with AGE and OWN at the 1% significance level. ROA was positively correlated with OCF at the 1% significance level but negatively correlated with AGE at the

1% significance level. Thus, both ROA which was a measure of short-term corporate performance, and Tobin's Q which was a measure of long-term corporate performance positively correlated with OCF but negatively correlated with AGE. As the correlations between all the variables were identified, a fixed-effects regression analysis would be undertaken to analyze the effect of E on ROA and Tobin's Q.

<Table 4> Correlation Matrix

	ROA	*Tobin's Q*	E	S	G	*COVID*	*DUM_IND*	*SIZE*	*LEV*	*OCF*	*BETA*	*AGE*	*OWN*
ROA	1.000												
Tobin's Q	0.067***	1.000											
E	0.094***	-0.034**	1.000										
S	0.126***	0.106***	0.599***	1.000									
G	0.132***	0.058***	0.372***	0.539***	1.000								
COVID	-0.007	0.038**	-0.180***	0.024	0.086***	1.000							
DUM_IND	0.135***	-0.073***	0.089***	-0.017	-0.003	0.002	1.000						
SIZE	0.143***	-0.044***	0.577***	0.671***	0.427***	0.048***	0.050***	1.000					
LEV	-0.232***	0.021	0.116***	0.069***	-0.046***	0.017	-0.113***	0.051***	1.000				
OCF	0.527***	0.043***	0.184***	0.176***	0.156***	-0.030*	0.100***	0.174***	-0.143***	1.000			
BETA	-0.067***	0.115***	0.112***	0.135***	0.103***	0.075***	-0.011	0.180***	0.121***	-0.036**	1.000		
AGE	-0.066***	-0.107***	-0.112***	-0.159***	-0.161***	0.022	-0.036**	-0.072***	-0.057***	-0.076***	-0.036**	1.000	
OWN	0.180***	-0.147***	-0.070***	-0.045***	-0.043***	-0.003	0.168***	-0.021	-0.115***	0.115***	-0.117***	-0.119***	1.000

1) ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

4.2. Empirical Results

1) Comments on fixed-effects regression

The sample used for analysis is firm-year panel data. The panel data is consisted of cross-sectional and time series data. Therefore, when regression analysis is performed assumptions about error term is likely to be violated. Therefore, in order to control the errors with non-constant variance, fixed effects regression model is used. Fixed effects regression model is selected because the results from F-test, Breusch-Pagan Lagrange Multiplier test and Hausman test prefer fixed effects regression model.

First, this is the results of F-test. When the dependent variable was ROA, F-value was 13.67. when the dependent variable was Tobin' s Q, F-value was 17.47 they both rejected the null hypothesis at the 1% significant level. The null hypothesis of F-test was that the pooled OLS was better than fixed-effects model. Thus, fixed-effects model was more suitable than pooled OLS. Also in the Breusch-Pagan Lagrange Multiplier test, when the dependent variable was ROA, chibar2 was 0.00 and when the dependent variable was Tobin' s Q, chibar2 was 0.00. They both rejected null hypothesis at 1% significance level. The null hypothesis of Breusch-Pagan Lagrange Multiplier test was that pooled OLS was more suitable than fixed-effects model. fixed-effects model was more suitable than pooled OLS. Then Hausman test was performed to choose between fixed-effects model and random effect model. When the dependent variable was ROA, chi2 was 131.45. When the dependent variable was Tobin' s Q, chi2 was 163.94. They both rejected the null hypothesis at the 1% significance level. The null hypothesis for Hausman test was that random-effect model was more suitable than fixed-effects model. Fixed-effects model was more suitable than random-effect model. Through three different tests fixed-effects model was the most suitable for analysis.

2) H_1-1 testing and comments

Fixed-effects regression was conducted to analyze the effect of environmental performance on financial performance. The following <Table 5> presents the results of the effect of environmental performance on manufacturing industry as a whole. The effect of environmental performance on ROA was insignificant but on Tobin' s Q was negative and significant at 1% levels. This result supported H_1-1 that environmental performance affected short and long-term corporate performance respectively. This result was in line with the result from Kim(2020) that environmental performance had no significant impact on ROA. This result implies that the improvement in environmental performance of manufacturing sector may not lead to improved profitability and lead to decrease in firm value. This result supports the neoclassical economists' view that resources spent to improve environmental performance hinders financial performance. Multicollinearity between independent variables were investigated. In general, when variance inflation factor(VIF) is greater 10, it is considered that there is a multicollinearity problem. The maximum VIF in this research was 2.37 and it could be assumed that there was no multicollinearity problem.

<Table 5> Relationship between EP and FP

	ROA	Tobin's Q
INTERCEPT	-0.059***	4.216***
	(-2.67)	(15.65)
E	-0.001	-0.067***
	(-1.25)	(-5.15)
S	0.001	0.150***
	(1.29)	(10.87)
G	0.006***	0.028**
	(5.17)	(1.97)
SIZE	0.002*	-0.107***
	(1.87)	(-9.64)
LEV	-0.050***	0.003
	(-11.49)	(0.07)
OCF	0.464***	0.705***
	(36.09)	(4.53)

BETA	-0.003**	0.124***
	(-1.99)	(6.45)
AGE	-0.001	-0.098***
	(-0.70)	(-6.55)
OWN	0.047***	-0.694***
	(8.33)	(-10.09)
Obs.	4118	4118
fixed effect	included	included
mean VIF(Max VIF)	1.45(2.37)	1.45(2.37)
R-sq	0.335	0.089

1) This table presents results from Panel Fixed Effects Model.

2) ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively. All t-values are based on two-tailed tests using firm and year clustered standard errors.

Mixed results have been observed in the relationship between environmental performance and financial performance in the manufacturing subsectors. Tables <6-1> and <6-2> below present the results of the effect of environmental performance on ROA. In most of subsectors the effect of environmental performance on ROA was not positive. 8 out of 12 subsectors showed no significant relationship between environmental performance and ROA. Two subsectors show a significant negative relationship between environmental performance and ROA: that is, Plastic/Pharmaceutical in <Table 6-1> and Steel/Non-Steel in <Table 6-2>. On the other hands, Food/Drink in <Table 6-1> and Other Manufacturing in <Table 6-2> each show a positive relationship between environmental performance and ROA in which the result for Food/Drink industry is consistent with Baek and Choi (2021).

<Table 6-1> Relationship between EP and ROA

	ROA					
	Food/Drink	Textiles	Paper/pulp	Petroleum	Chemical	Plastic/Pharmaceutical
INTERCEPT	-0.026	0.984**	-0.023	0.747**	0.038	-0.140**
	(-0.36)	(2.12)	(-0.19)	(2.66)	(0.57)	(-1.98)
E	0.005**	-0.014	-0.000	0.009	0.000	-0.006**

	(2.01)	(-1.09)	(-0.06)	(0.75)	(0.15)	(-2.09)
S	-0.004	0.040**	-0.000	0.013	0.003	0.004
	(-1.46)	(2.17)	(-0.10)	(1.41)	(0.92)	(1.37)
G	0.002	-0.005	0.003	0.003	0.001	0.002
	(0.73)	(-0.41)	(0.56)	(0.39)	(0.36)	(0.54)
SIZE	0.000	-0.066***	0.003	-0.028**	0.001	0.005
	(0.13)	(-2.72)	(0.58)	(-2.71)	(0.27)	(1.63)
LEV	-0.041***	-0.306***	-0.081***	-0.063	-0.012	-0.049***
	(-3.20)	(-3.82)	(-5.10)	(-1.29)	(-0.94)	(-3.84)
OCF	0.432***	-0.095	0.551***	0.458***	0.440***	0.613***
	(10.36)	(-0.50)	(8.55)	(4.25)	(13.19)	(16.61)
BETA	0.017**	-0.000	0.015	0.008	-0.027***	-0.005
	(2.30)	(-0.00)	(1.54)	(0.35)	(-4.27)	(-1.52)
AGE	-0.004	0.217**	-0.011	-0.010	-0.009***	0.003
	(-1.36)	(2.41)	(-1.41)	(-0.45)	(-2.98)	(0.95)
OWN	0.071***	-0.178*	0.005	0.029	0.003	0.058***
	(3.98)	(-1.70)	(0.25)	(0.24)	(0.19)	(4.23)
N	325	60	185	50	635	613
R-sq	0.379	0.459	0.541	0.863	0.331	0.411

1) This table presents results from Panel Fixed Effects Model.

2) ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively. All t-values are based on two-tailed tests using firm and year clustered standard errors.

<Table 6-2> Relationship between EP and ROA

	ROA					
	Glass/Cement	Steel/Non-Steel	Electrical &Electronic	Machinery &Equipment	Automotive	Other Manufacturing
INTERCEPT	-0.337***	0.051	-0.091	0.085	0.097**	-0.674***
	(-3.42)	(0.92)	(-1.45)	(0.81)	(1.99)	(-4.32)
E	-0.002	-0.006**	-0.001	0.000	-0.000	0.019***
	(-0.38)	(-2.14)	(-0.28)	(0.07)	(-0.03)	(3.06)
S	-0.004	0.008**	0.005	-0.003	0.004	-0.011
	(-0.89)	(2.56)	(1.23)	(-0.59)	(1.61)	(-1.47)
G	0.012**	0.005*	0.005	0.022***	-0.002	0.009
	(2.51)	(1.80)	(1.23)	(4.70)	(-0.73)	(1.46)
SIZE	0.011***	-0.003	0.001	-0.006	-0.001	0.024***

	(2.67)	(-1.19)	(0.52)	(-1.34)	(-0.66)	(3.81)
LEV	-0.035*	-0.049***	-0.067***	-0.058***	-0.097***	0.026
	(-1.67)	(-3.93)	(-5.00)	(-3.78)	(-11.21)	(1.28)
OCF	0.230***	0.241***	0.465***	0.480***	0.354***	0.330***
	(3.08)	(6.06)	(14.18)	(11.44)	(10.77)	(4.86)
BETA	0.016	0.000	-0.007	0.008	0.005**	-0.025**
	(1.63)	(0.03)	(-1.02)	(1.02)	(2.22)	(-2.33)
AGE	-0.005	0.004	0.009*	-0.002	-0.005	0.001
	(-0.70)	(0.87)	(1.76)	(-0.44)	(-1.59)	(0.22)
OWN	0.123***	0.036**	0.044**	0.081***	-0.017	0.043
	(4.54)	(2.35)	(2.00)	(3.82)	(-1.06)	(1.59)
N	179	449	459	415	483	265
R-sq	0.279	0.205	0.455	0.381	0.391	0.291

1) This table presents results from Panel Fixed Effects Model.

2) ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively. All t-values are based on two-tailed tests using firm and year clustered standard errors.

The following Tables <7-1> and <7-2> present the results of the effect of environmental performance on Tobin's Q of manufacturing subsectors. Similarly, 8 subsectors showed no significant relationship between environmental performance and Tobin's Q. 3 showed there was a negative relationship and only 'Food/Drink' showed a positive relationship. Actually, this is consistent with Jung and Choi (2022) that environmental performance had no significant relationship with Tobin's Q. Analyzing the relationship between environmental performance and financial performance, Food/Drink is the only subsector that environmental performance had positive impact on both ROA and Tobin's Q. This means that the financial performance of Food/Drink could increase with better environmental performance and also this result could act as a driver for Food/Drink firms that are to set up the environmental management practices in order to strengthen environmental management.

<Table 7-1> Relationship between EP and Tobin's Q

	Tobin's Q					
	Food/Drink	Textiles	Paper/pulp	Petroleum	Chemical	Plastic/Pharmaceutical
INTERCEPT	2.448**	3.841***	3.422***	29.552***	7.433***	-0.184
	(2.48)	(3.94)	(2.93)	(4.97)	(7.94)	(-0.15)
E	0.090**	-0.017	-0.001	0.105	-0.076*	-0.207***
	(2.40)	(-0.66)	(-0.02)	(0.44)	(-1.87)	(-4.16)
S	0.041	-0.094**	0.078	0.553***	0.263***	0.107**
	(0.97)	(-2.44)	(1.62)	(2.75)	(6.50)	(2.04)
G	0.018	0.019	0.073	0.266	-0.003	0.014
	(0.46)	(0.65)	(1.57)	(1.43)	(-0.06)	(0.25)
SIZE	-0.076**	-0.109**	-0.113**	-1.080***	-0.198***	0.102**
	(-2.07)	(-2.15)	(-2.44)	(-4.96)	(-5.41)	(2.03)
LEV	0.412**	-0.049	0.087	-4.342***	-0.360*	-0.102
	(2.35)	(-0.29)	(0.55)	(-4.25)	(-1.92)	(-0.45)
OCF	2.452***	-0.237	1.979***	0.293	0.765	-1.159*
	(4.28)	(-0.59)	(3.07)	(0.13)	(1.61)	(-1.75)
BETA	0.155	-0.057	0.151	-0.305	0.268***	0.122**
	(1.48)	(-0.72)	(1.58)	(-0.62)	(3.02)	(2.29)
AGE	-0.034	0.066	0.017	-1.969***	-0.296***	-0.036
	(-0.86)	(0.35)	(0.21)	(-4.40)	(-7.30)	(-0.70)
OWN	0.006	-0.677***	-0.425**	14.548***	-1.150***	-1.459***
	(0.02)	(-3.09)	(-2.00)	(5.59)	(-4.67)	(-5.97)
N	325	60	185	50	635	613
R-sq	0.146	0.502	0.183	0.836	0.196	0.109

1) This table presents results from Panel Fixed Effects Model.

2) ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively. All t-values are based on two-tailed tests using firm and year clustered standard errors.

<Table 7-2> Relationship between EP and Tobin's Q

	Tobin's Q					
	Glass/Cement	Steel/Non-Steel	Electrical& Electronic	Machinery &Equipment	Automotive	Other Manufacturing
INTERCEPT	5.403***	1.281***	3.387***	1.824**	0.970***	6.616***
	(4.09)	(4.04)	(6.34)	(2.31)	(2.98)	(6.03)
E	0.021	0.013	0.038	0.021	-0.038**	0.069

	(0.32)	(0.90)	(0.87)	(0.56)	(-2.12)	(1.57)
S	0.088	-0.016	0.063*	-0.049	0.028	-0.025
	(1.45)	(-0.97)	(1.73)	(-1.28)	(1.63)	(-0.51)
G	-0.073	-0.075***	-0.075**	0.013	0.017	0.146***
	(-1.16)	(-4.42)	(-2.05)	(0.39)	(0.97)	(3.41)
SIZE	-0.225***	-0.003	-0.076***	-0.020	0.005	-0.219***
	(-4.10)	(-0.25)	(-3.33)	(-0.59)	(0.41)	(-4.98)
LEV	0.358	0.307***	-0.018	0.251**	0.432***	0.249*
	(1.27)	(4.34)	(-0.16)	(2.16)	(7.47)	(1.75)
OCF	-0.915	0.410*	0.723***	-0.326	0.220	-0.156
	(-0.91)	(1.82)	(2.59)	(-1.03)	(1.00)	(-0.33)
BETA	0.477***	0.058	0.209***	0.130**	0.015	0.112
	(3.72)	(1.62)	(3.76)	(2.14)	(1.04)	(1.47)
AGE	0.138	-0.033	-0.054	-0.042	-0.067***	-0.202***
	(1.50)	(-1.45)	(-1.30)	(-1.21)	(-3.11)	(-4.46)
OWN	1.035***	-0.462***	-0.661***	-0.455***	-0.381***	0.715***
	(2.86)	(-5.30)	(-3.56)	(-2.84)	(-3.62)	(3.78)
N	179	449	459	415	483	265
R-sq	0.246	0.214	0.108	0.076	0.183	0.279

1) This table presents results from Panel Fixed Effects Model.

2) ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively. All t-values are based on two-tailed tests using firm and year clustered standard errors.

2) H_1-2 testing and comments

The following <Table 8> presents the difference in results in the effect of environmental performance on financial performance of manufacturing industry between pre and post COVID-19. The effect of environmental performance on ROA during the COVID was not different to before COVID. However, the effect of environmental performance on Tobin' s Q during the COVID was negative and significantly different at 10% levels to before COVID. Therefore this result partially support H_1-2 that the effect of environmental performance on financial performance is different pre-COVID and post-COVID. This result showed that higher environmental

performance during COVID did not lead to higher short and long-term financial performance than before COVID. Investment to better environmental performance during COVID may not lead to better financial reward than before COVID. This result was in line with Hwang et al. (2021) which showed that environmental performance during COVID did not lead to increase in ROA than before COVID.

<Table 8> Relationship between EP and FP of Pre and Post COVID-19

	E		S		G	
	ROA	Tobin's Q	ROA	Tobin's Q	ROA	Tobin's Q
INTERCEPT	-0.093***	3.322***	-0.090***	3.402***	-0.084***	3.341***
	(-3.79)	(11.23)	(-3.68)	(11.37)	(-3.45)	(11.25)
COVID	0.001	0.172**	0.005	0.262***	0.026***	0.283***
	(0.23)	(2.52)	(0.85)	(3.81)	(3.68)	(3.64)
E	-0.002*	-0.013	-0.002*	-0.017	-0.002	-0.019
	(-1.85)	(-0.99)	(-1.91)	(-1.29)	(-1.48)	(-1.46)
S	0.001	0.098***	0.001	0.118***	0.001	0.096***
	(0.52)	(5.65)	(0.96)	(5.95)	(0.95)	(5.64)
G	0.001	-0.024*	0.001	-0.023*	0.004***	-0.001
	(1.10)	(-1.83)	(1.15)	(-1.84)	(3.26)	(-0.07)
COVID*E	-0.001	-0.047*				
	(-0.37)	(-1.87)				
COVID*S			-0.002	-0.068***		
			(-1.14)	(-3.05)		
COVID*G					-0.009***	-0.075***
					(-4.30)	(-3.04)
SIZE	0.004***	-0.076***	0.004***	-0.081***	0.003***	-0.079***
	(4.17)	(-6.38)	(4.00)	(-6.63)	(3.39)	(-6.51)
LEV	-0.044***	0.157***	-0.044***	0.157***	-0.044***	0.157***
	(-8.32)	(3.00)	(-8.33)	(3.01)	(-8.34)	(3.01)
OCF	0.448***	0.608***	0.448***	0.609***	0.450***	0.614***
	(23.93)	(2.75)	(23.96)	(2.75)	(24.12)	(2.76)
BETA	-0.003	0.118***	-0.003	0.118***	-0.003	0.118***
	(-1.26)	(2.89)	(-1.26)	(2.91)	(-1.29)	(2.88)
AGE	-0.002*	-0.107***	-0.002*	-0.108***	-0.002	-0.107***
	(-1.65)	(-6.16)	(-1.67)	(-6.21)	(-1.63)	(-6.16)
OWN	0.044***	-0.327***	0.045***	-0.320***	0.045***	-0.326***

	(6.22)	(-3.87)	(6.26)	(-3.76)	(6.34)	(-3.84)
N	4118	4118	4118	4118	4118	4118
R-sq	0.340	0.210	0.341	0.212	0.344	0.212

1) This table presents results from Panel Fixed Effects Model.

2) ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively. All t-values are based on two-tailed tests using firm and year clustered standard errors.

3) H_1-3 testing and comments

The <Table 9> below presents the difference in results in the effect of environmental performance on financial performance between manufacturing subsectors that have high environmental risk and subsectors that do not have high environmental risk. The higher the environmental performance the subsectors with high environmental risk significantly decreased in ROA relative to subsectors that do not have high environmental risk but relatively increased in Tobin' s Q. These results support H_1-3 that the effect of environmental performance on financial performance differs between subsectors with high environmental risk and subsectors with no high environmental risk. This implies that when the firms with high environmental risk invest in improving the environmental performance they would likely to face the decrease in short-term financial performance but the increase in long-term financial performance, compared to those with no high environmental risk. This implication is similar to the result of Park and Park (2022). As a result, the investment to enhance the environmental performance should be continued without interruption.

<Table 9> Relationship between EP and FP relating to Environmental Risk

	ROA	**Tobin's Q**
INTERCEPT	-0.063***	4.264***
	(-2.83)	(15.81)
E	-0.000	-0.083***
	(-0.27)	(-5.63)
DUM_IND	0.021***	-0.209***
	(4.32)	(-3.55)
E*DUM_IND	-0.005***	0.055***

	(-2.90)	(2.92)
S	0.002*	0.145***
	(1.82)	(10.49)
G	0.006***	0.027*
	(5.27)	(1.93)
SIZE	0.002*	-0.106***
	(1.76)	(-9.61)
LEV	-0.047***	-0.014
	(-10.92)	(-0.26)
OCF	0.460***	0.731***
	(35.86)	(4.70)
BETA	-0.003**	0.125***
	(-2.06)	(6.51)
AGE	-0.001	-0.097***
	(-0.73)	(-6.47)
OWN	0.042***	-0.653***
	(7.33)	(-9.36)
N	4118	4118
R-sq	0.339	0.092

1) This table presents results from Panel Fixed Effects Model.

2) ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively. All t-values are based on two-tailed tests using firm and year clustered standard errors.

Chapter 5. Conclusion

5.1. Summary and Implications of Research

The objective of this study is to analyze the effect of environmental performance on the short and long-term corporate financial performance. The sample has been selected from the South Korean manufacturing industry and the data spans from the period of 2012 to 2021. Three hypotheses are developed. First, environmental performance affects the short and long-term corporate performance. Second, environmental performance affects financial performance differently before COVID-19 and after COVID-19. Third, environmental performance affects financial performance differently to the subsectors that have high environmental risk and subsectors that do not have high environmental risk.

A fixed effects regression analysis has been undertaken to test the above hypotheses. ROA and Tobin' s Q were selected as measures for the short and long-term corporate performance, respectively. For the independent variable, the environmental grade published by KCGS was chosen. Variables that could affect the corporate performance were controlled.

The results are as follows. First, the effect of environmental performance on ROA was not significant but its effect on Tobin' s Q was found to be negative and significant. As for manufacturing industry, investment in better environmental performance can generate no profit in the short-term and will decrease firm value in the long-term. Further, mixed results were observed in the relationship between environmental and financial performance in the manufacturing sector. In most of subsectors, the most frequent relationship was neutral followed by negative, then positive. Second, the effect of environmental performance on ROA during COVID was not different from before COVID. However, the effect of environmental performance on Tobin' s Q was negative. This result shows that higher environmental performance during COVID does not lead to

higher short and long-term financial performance. Third, the higher the environmental performance the subsectors with high environmental risk significantly decreased in ROA relative to subsectors that did not have high environmental risk but relatively increased in Tobin' s Q. This suggests that as for subsectors with high environmental risk, investing for better environmental performance would lead to decline in profitability in the short-term aspect but growth in firm value in the long-term aspect. Companies, especially with high environmental risk are required to invest continually for sustainable environmental performance,

Many studies which investigate environmental performance and financial performance do not divide sectors but analyze as a whole. We divided the industry into subsectors according to the industry classification table from Environmental Assessment Guideline, which virtually improved the accuracy of assessment of environmental performance rather than the previous studies.

On the other hand, there have been limited literatures that investigate the relationship between environmental performance and financial performance in times of economic crisis. This study revealed that the exogeneous shock of COVID-19 outweigh the benefits of corporate environmental performance and during the COVID-19 pandemic investment in environmental performance may not be financially rewarding. Also, this study highlights that manufacturing subsectors with high environmental risk would be likely to experience decrease in financial performance in the short-term aspect. However, the financial performance would increase in the long term aspect. And thus, the persistent investment to enhance environmental performance needs to be placed as a top priority in business management.

5.2. Limitations and Future Research Projects

Limitations of this study are as follows. First, the data spans from 2012 to 2021. The result reflects only this period and is not an accurate indicator of predicting future environmental impacts as the importance of

environmental management is increasing and there are more environmental regulations scheduled to be implemented.

Second, The whole environment grade is used but this grade is subdivided into more than one. Thus, it is hard to examine the details of environmental assessment.

Third, the results of analysis might differ even if using the same sample because ESG assessment model is different amongst rating agencies. Different results could signal the market differently. Hence, it is recommended to use different rating model for the same sample for integrity.

I would like to finish the thesis by outlining some useful subjects for future research as a possible extension to this thesis. The current environmental grade from KCGS is assessed on four categories: Leadership and Governance, Risk Management, Management and Performance and Communication with Stakeholders. So, some detailed impacts of the environmental subcategories within E-category in ESG factor on financial performance can be explored using the panel regression analysis conducted in this study. This approach would provide a practical information on which subcategory to focus for each manufacturing subsector. This could be developed in a direction to establishing an environmental management strategy sustainable and relevant to business characteristics. The other is an international comparative study on the effect of EP on FP of manufacturing sector across different countries such as China, the US, Japan, focusing largely on pre- and post-COVID-19 pandemic.

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국문초록

코로나19로 인한 국내 경제는 극심한 경기 침체를 경험하고 있으며 그 영향은 현재도 진행 중이다. 기후변화가 코로나19 발생의 중요한 요인 중 하나라는 주장이 제기되었으며 기업의 사회 환경적 책임에 대한 요구 또한 증가하고 있다. 한편 기후리스크는 새로운 환경규제를 만들어 무역장벽으로서 작용하고 있다. 환경경영의 중요성은 어느 때보다 중요하며 선택이 아닌 필수로 볼 수 있다. 따라서 지속가능한 경영과 ESG경영은 분리될 수 없는 하나의 글로벌 경영원칙으로 자리매김하고 있다.

이 연구는 제조업의 환경성과가 장·단기 기업성과에 미치는 영향을 확인하고자 한다. 코스피(KOSPI)에 상장된 제조업체를 대상으로 2012년부터 2021년까지의 패널데이터를 구성하였다. 독립변수로 환경성과를 측정하기 위해 한국기업지배구조원(KCGS)의 환경등급을 사용하였다. 종속변수로 장기 기업성과의 대리변수인 토빈큐(Tobin’s Q)를 선정하였고 단기 기업성과의 대리변수로 총자산수익률(ROA)를 선정하였다. 이 연구에서 우리는 다음과 같은 세가지 가설을 설정하였다. 첫째, 환경성과가 장·단기 기업성과에 각각 영향을 미친다. 둘째, 환경성과가 코로나 전후 장·단기 기업성과에 미치는 영향이 다르다. 셋째, 환경성과가 환경리스크가 높은 업종과 그렇지 않은 업종의 장·단기 기업성과에 미치는 영향이 다르다.

패널회귀분석을 통한 주요 결과 및 시사점은 아래와 같이 요약할 수 있다. 첫째, 환경성과는 장·단기 기업성과에 영향을 미치는 것으로 확인되었다. 환경성과가 높을수록 단기 기업성과에는 영향이 없었지만 장기 기업성과는 감소하였다. 둘째, 환경성과는 코로나 전후 장·단기 기업성과에 미치는 영향이 다른 것으로 확인되었다. 코로나 이후는 코로나 이전에 비해 환경성과가 높아지면 단기 기업성과에는 영향이 없었지만 장기성과는 감소하였다. 마지막으로 환경성과가 환경리스크가 높은 업종과 그렇지 않은 업종의 장·단기 기업성과에 미치는 영향이 다른 것으로 확인되었다. 환경리스크가 높은 업종은 그렇지 않은 업종에 비해 환경성과가 높아지면 단기 기업성과는 감소하지만 장기 기업성과는 증가하였다. 이러한 연구결과는 코로나와 같은 외생적 충격이 있을 때 환경성과가 높아지더라도 기업성과로 이어지지 못할 수 있음을 시사한다. 또한 환경리스크가 높은 업종들은 높지 않은 업종들에 비해 환경에 대한 투자가 단기적으로 기업성과의 감소로 나타나는 반면에, 장기적으로는 기업성과로 이어지는 것으로 분석되었다. 이는 지속가능한 성장을 도모하는 기업은 무엇보다 환경에 대한 투자가 지속되어야 함을 시사한다.

주요어: 코로나19, 환경성과, 기업성과, 총자산수익률, 토빈 큐, 패널회귀분석