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ANALYSING THE EFFECT OF CORPORATE ENVIRONMENTAL PERFORMANCE ON CORPORATE FINANCIAL PERFORMANCE: DOES A NONLINEAR RELATIONSHIP OCCUR?

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Abstract

Climate change as a part of environmental degradation has become a topic widely discussed in recent decades. This study analyses the relationship between corporate environmental performance and corporate financial performance by studying cases at the company level. The company level was chosen to focus the research since companies are the main actors in economic activity as producers of both goods and services. The method used is unbalanced panel data regression with the Random Effects Model with a sample of 175 firms from 2003 to 2021 in 20 countries. This research also captures the influence of the COVID-19 pandemic. Empirical results show that there is no nonlinear relationship between corporate environmental performance and corporate financial performance with the Lind-Mehlum test. It indicates that there is a trade-off between profit and the environment. As such, the effort of businesses to drive investors from the profit-oriented to become green-oriented needs significant effort. A key policy priority should therefore be the long-term reinforcement of businesses in green activities.

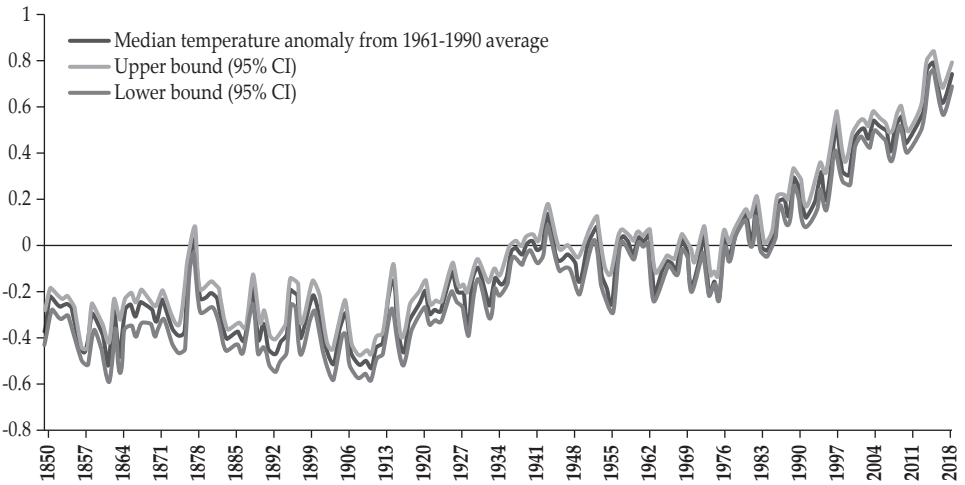
Keywords: *Corporate Financial Performance, Corporate Environmental Performance, Climate Change, Econometrics, Panel Data*

I. INTRODUCTION

Climate change as a part of environmental degradation has become a topic widely discussed in recent decades. This is motivated by the important role of the environment in economics, politics, demography, health, and human welfare.[1] The International Labor Organization (2018) explains that environmental degradation has a negative impact on worldwide employment. This is in line with data that 34 percent of jobs in G20 countries depend directly on ecosystem services. As such, workers in agriculture, fisheries, and forestry, and all those who depend on natural processes will be at risk of losing their jobs.

[1] Dennis. Hamro-Drotz and United Nations Environment Programme., 'Livelihood Security: Climate Change, Conflict and Migration in the Sahel', 2011, 108. https://wedocs.unep.org/xmlui/handle/20.500.11822/8032. [accessed 26 August 2023].

Ritchie et al.[2] explains that climate change is caused by an increase in greenhouse gases including carbon dioxide, methane, and nitrous oxide. These gases are the result of fossil fuels, industrial production, and changes in land use which then cause the greenhouse effect and have an impact on climate change. It can be seen in Figure I.1 below that the global average temperature has increased over time. The blue line represents the trend of the mean annual temperature over time, with the upper and lower confidence intervals shown in light grey. The graph shows that over the past few decades, global temperatures have increased by around 0.7°C higher than the 1961-1990 baseline. It can be interpreted that there is an increase in global average temperature reaching 1.1°C.



Source: Our World in Data (2020)

Figure 1. Global Average Rise in Temperature

Issues related to global warming are complex, so it is necessary to involve all countries. One of the efforts made is the Paris Agreement, which is an international agreement on mitigation, adaptation, and financing related to climate change. The agreement has been joined by 196 parties to limit global temperature increases to less than 2.0 degrees Celsius.[3] Furthermore, climate change mitigation also needs to involve various parties including academics, policymakers, business stakeholders, and communities. However, comprehensive research to addressing complex problems is not easy to do. Therefore, this research takes part in tackling climate change by analysing

[2] Hannah Ritchie and Max Roser, 'CO_2 and Greenhouse Gas Emissions - Our World in Data', *OurWorldInData.Org*, 2020.

[3] *Paris Agreement*, 2015. https://web.archive.org/web/20210705141043/https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=_en.

the role of companies in reducing production emissions through responsible environmental performance. Furthermore, an analysis is carried out whether a business will reduce or increase the corporate financial performance in implementing environmentally conscious practices. If it increases, the company is involved in climate change mitigation actions, which is a good thing. Conversely, if efforts to reduce emissions reduce financial performance, it is necessary to reconsider the efforts that must be made by companies involved in this climate change mitigation efforts.

The company level was chosen to be the focus of this research because companies are the main actors in economic activity as producers of both goods and services. In economics, environmental impacts such as climate change are referred to as negative externalities. According to Pindyck & Rubinfeld[4], negative externalities occur because companies do not calculate production impacts, so they must be borne by other parties. Effective corporate environmental performance can be seen if the resulting negative externalities are low. In other words, the company in question has included environmental impact costs in its production costs. Beckman et al.,[5] stated that combating global climate change results from growing public awareness, thus encouraging companies to take responsibility for the environment.

Many studies have examined the relationship between corporate environmental performance and corporate financial performance Ghardallou and Alessa;[6] Ben Lahouel, et.al.; [7] Manrique and Carmen;[8] Thomas Guenther.[9] However, the previous study employed various approaches, methods, periods, and types of companies examined, so the results obtained between researchers are different. Therefore, there are some contradictions that need to be confirmed.

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[4] Pindyck, R. S., & Rubinfeld, D. L. (2015). *Microeconomic* (Eight). Pearson Education Limited.

[5] Terry Beckman, Alison Colwell, and Peggy H. Cunningham, 'The Emergence of Corporate Social Responsibility in Chile: The Importance of Authenticity and Social Networks', *Journal of Business Ethics*, 86.SUPPL.2 (2009). https://doi.org/10.1007/s10551-009-0190-1.

[6] Wafa Ghardallou and Noha Alessa, 'Corporate Social Responsibility and Firm Performance in GCC Countries: A Panel Smooth Transition Regression Model', *Sustainability (Switzerland)*, 14.13 (2022). https://doi.org/10.3390/su14137908.

[7] Béchir Ben Lahouel, Maria Giuseppina Bruna, and Younes Ben Zaied, 'The Curvilinear Relationship between Environmental Performance and Financial Performance: An Investigation of Listed French Firms Using Panel Smooth Transition Model', *Finance Research Letters*, 35 (2020). https://doi.org/10.1016/j.frl.2020.101455.

[8] Sergio Manrique and Carmen Pilar Martí-Ballester, 'Analyzing the Effect of Corporate Environmental Performance on Corporate Financial Performance in Developed and Developing Countries', *Sustainability (Switzerland)*, 9.11 (2017). https://doi.org/10.3390/su9111957.

[9] Christoph Trumpp and Thomas Guenther, 'Too Little or Too Much? Exploring U-Shaped Relationships between Corporate Environmental Performance and Corporate Financial Performance', *Business Strategy and the Environment*, 26.1 (2017), 49–68. https://doi.org/10.1002/BSE.1900.

Contradictory findings related to research on the impact of corporate environmental performance on corporate financial performance can be summarised as follows. First, research conducted by Lankoski;[10] Lioui & Sharma[11] proves that corporate practices related to social and environmental responsibility hurt corporate financial performance. Trumpp & Guenther's research[12] show that sustainable practices provide a higher expenditure burden than the benefits obtained, moreover the benefits are not received directly by the company. Specifically, the sustainable practices carried out by the company has mitigated its impact on the environment. Second, Haholongan[13]; Widhiastuti et al.[14] show that the company's role has a positive effect on financial performance. Dixon-Fowler et al.,[15] support Porter's hypothesis that a company's ability to operate advanced technology to use resources more efficiently can reduce operating costs so that financial performance increases. Third, previous studies show no correlation between environmental performance and corporate financial performance. Earnhart & Lizal[16] stated that better pollution control neither increases nor reduces corporate financial performance.

Trumpp & Guenther[17] state that a nonlinear model of analysis of environmental performance and financial performance is needed because it can describe more realistic results. Research through nonlinear models can provide more comprehensive analysis or, in other words, not only show the results of the relationship between positive, negative, or neutral variables. For example, when a company incurs a cost to minimise emissions, the impact of increasing costs is like a trade-off hypothesis. Hence, this study intends to

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[10] Leena Lankoski, 'Corporate Responsibility Activities and Economic Performance: A Theory of Why and How They Are Connected', *Business Strategy and the Environment*, 17.8 (2008), 536–47. https://doi.org/10.1002/BSE.582.

[11] Abraham Lioui and Zenu Sharma, 'Environmental Corporate Social Responsibility and Financial Performance: Disentangling Direct and Indirect Effects', *Ecological Economics*, 78 (2012). https://doi.org/10.1016/j.ecolecon.2012.04.004.

[12] Trumpp and Guenther.

[13] Rutinaias Haholongan, 'Kinerja Lingkungan Dan Kinerja Ekonomi Perusahaan Manufaktur Go Public', *Jurnal Ekonomi Dan Bisnis*, 19.3 (2016). https://doi.org/10.24914/jeb.v19i3.477.

[14] Ni Luh Putu Widhiastuti, I D. G. Dharma Suputra, and I G. A. N Budiasih, 'Pengaruh Kinerja Lingkungan Pada Kinerja Keuangan Dengan Corporate Social Responsibility Sebagai Variabel Intervening', *E-Jurnal Ekonomi Dan Bisnis Universitas Udayana 6.2*, 2 (2017).

[15] Heather R. Dixon-Fowler and others, 'Beyond "Does It Pay to Be Green?" A Meta-Analysis of Moderators of the CEP-CFP Relationship', *Journal of Business Ethics*, 2013. https://doi.org/10.1007/s10551-012-1268-8.

[16] Dietrich Earnhart and Lubomir Lizal, 'Effect of Pollution Control on Corporate Financial Performance in a Transition Economy', *European Environment*, 17.4 (2007). https://doi.org/10.1002/eet.447.

[17] Trumpp and Guenther, (2017).

confirm the relationship between corporate environmental performance and corporate financial performance in a nonlinear manner.

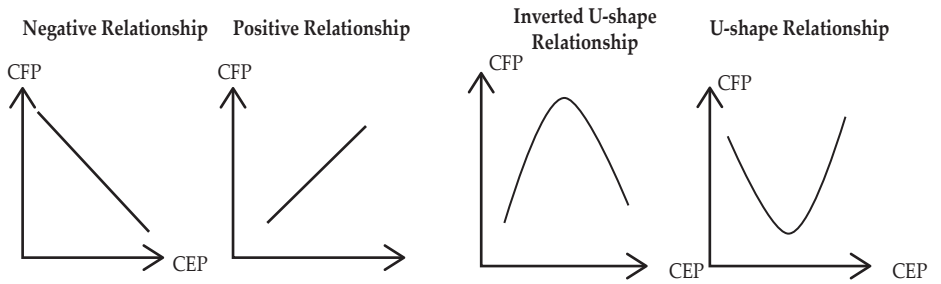
To complete this research idea, the authors have made several contributions as differentiators and have updated previous studies. First, the research used panel data of quadratic environmental performance variables to determine nonlinear relationships. However, we also conducted a test to examine the existence of U-shape correlation using the Lind-Mehlum test. Second, the data used is more recent, namely from 2003 to 2021 with unbalanced panel data. Third, the researchers looked at the effect of the Corona Virus Diseases 19 (Covid-19) pandemic disruption on the corporate financial performance. Fourth, the researchers added the dummy variables of corporate environmental, social, and governance (ESG) transparency to the public.

By using the regression method with the REM unbalanced statistical panel data model (Random Effect Model), the research made two important findings. First, there is no nonlinear relationship between corporate environmental performance and corporate financial performance using the Lind-Mehlum test. Second, there is a relationship between company size, market capitalization, total revenue, transparency of environmental, social, and governance (ESG) performance, and the Covid-19 pandemic on the corporate financial performance.

This research was compiled scientifically, beginning with an introduction to explain the background. The second part reflects on the then-existing literature to provide a theoretical review and the third part is the empirical model. Section four presents the results and discussion. Finally, the fifth section concludes the paper, summarising the main findings and providing the authors' suggestions.

II. LITERATURE REVIEW

The correlation between corporate environmental performance and corporate financial performance is an interesting issue and needs to be studied. Previous research has provided mixed results. Indeed, the authors found that there are four differences in the previous literature. These four differences are illustrated in the following graph which will then be elucidated in the sub-chapters below. CFP stands for *Corporate Financial Performance*, while CEP stands for *Corporate Environmental Performance*.



Sources: Fujii, et.al.;[18] Trumpp and Guenther[19]

Figure 2. Relationship between Environmental Performance and Financial Performance

Environmental performance can have a negative effect on corporate financial performance. This determination is reinforced by the view of traditionalists who approve of the negative effects of environmental performance on corporate financial performance. The traditionalist view of behaviour can be found in the research by Wagner et al.[20]; Lankoski.[21] This view states that improving environmental performance is an investment that increases costs, thus negatively affecting corporate financial performance. A similar finding in Galant & Cadez's[22] research shows Friedman's view which states that a company's goal is to increase economic value and maximise profits for shareholders. Therefore, a company's steps for improving environmental performance will reduce the company's focus on maximising profits, thereby forming a negative relationship between corporate social responsibility and corporate performance.

Almost like the traditionalist view, Trumpp & Guenther[23] uses the term "trade-off hypothesis." The hypothesis states that there is a negative relationship between corporate social responsibility practices and corporate

[18] Hidemichi Fujii and others, 'Corporate Environmental and Economic Performance of Japanese Manufacturing Firms: Empirical Study for Sustainable Development', *Business Strategy and the Environment*, 22.3 (2013), 187–201. https://doi.org/10.1002/BSE.1747.

[19] Trumpp and Guenther, (2017).

[20] Wagner Cezar Lucato, Elpidio Moreira Costa, and Geraldo Cardoso de Oliveira Neto, 'The Environmental Performance of SMEs in the Brazilian Textile Industry and the Relationship with Their Financial Performance', *Journal of Environmental Management*, 203 (2017). https://doi.org/10.1016/j.jenvman.2017.06.028.

[21] Lankoski.

[22] Adriana Galant and Simon Cadez, 'Corporate Social Responsibility and Financial Performance Relationship: A Review of Measurement Approaches', *Economic Research-Ekonomska Istrazivanja* , 30.1 (2017). https://doi.org/10.1080/1331677X.2017.1313122.

[23] Trumpp and Guenther, (2017).

financial performance due to increased costs.[24] Similar results were obtained from research conducted by Lioui & Sharma[25] indicating that focusing on environmental performance has a negative impact on a corporate financial performance.

Other studies have found that environmental performance can have a positive effect on corporate financial performance, exhibiting a positive correlation between environmental performance and corporate financial performance as stated by Porter;[26] Porter & Kramer.[27] These findings are then revealed by Porter's hypothesis that the existence of government regulations related to sustainable practices encourages companies to move forward. This can create more sophisticated technological innovations, making it more environmentally friendly and providing a comparative advantage. Beckmann et al.,[28] added that government regulations can lead to the incorporation of environmental aspects in decision-making, thereby changing the previous trade-offs to a win-win solution. Furthermore, Dixon-Fowler et al.,[29] stated that a company's ability to deploy advanced technology to use resources more efficiently can reduce the company's operational costs, so that financial performance increases.

The third group of studies have found that environmental performance can have a neutral effect on corporate financial performance, meaning that there is no correlation between the two. Earnhart & Lizal[30] stated that better pollution control neither increases nor decreases corporate financial performance. That is, these results do not provide support for the hypothesis that pollution prevention through better production processes can lead to lower costs, thereby increasing company profits. Similar results were also obtained from the study by Lucato et al.[31] that the larger the company size, the worse the environmental performance. However, the researchers found no statistical evidence that corporate environmental performance has a direct effect on corporate financial performance.

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[24] Leonardo Becchetti, Rocco Ciciretti, and Iftekhar Hasan, 'Corporate Social Responsibility and Shareholder's Value: An Event Study Analysis', *SSRN Electronic Journal*, 2009. https://doi.org/10.2139/SSRN.928557.

[25] Lioui and Sharma.

[26] Michael E. Porter reviewed by Steven Pressman, 'Book Review: The Competitive Advantage of Nations', *Https://Doi.Org/10.1177/014920639101700113*, 17.1 (1991), 213–15. https://doi.org/10.1177/014920639101700113.

[27] Michael E. Porter and Mark R. Kramer, 'Strategy & Society: The Link between Competitive Advantage and Corporate Social Responsibility', *Harvard Business Review*, 84.12 (2006). https://doi.org/10.1108/sd.2007.05623ead.006.

[28] Beckman, Colwell, and Cunningham.

[29] Dixon-Fowler and others.

[30] Earnhart and Lizal.

[31] Lucato, Costa, and de Oliveira Neto.

Finally, it has been found that environmental performance has a mixed effect on corporate financial performance. The mixed effect can mean that there is a relationship with more than one model or a combination of positive, negative, and neutral influences between environmental performance and corporate financial performance. Misani & Pogutz[32] examined the effect of carbon emissions as an indicator of environmental performance results with Tobin's Q as an indicator of corporate financial performance. The sample used was 127 companies from various countries from 2007 to 2013. The results of this study indicate that there is a nonlinear relationship; good environmental performance will increase the corporate financial performance to a certain point. However, the increase in environmental performance cannot be offset. The findings are different from Trumpp & Guenther (2017)[33] that the relationship between environmental performance and corporate financial performance is like a "u" (U-shaped). Efforts to improve environmental performance will reduce profitability, but over time positive effects are found. That is, an increase in environmental performance can encourage an increase in company profitability in the future even though initially it can reduce the corporate financial performance.

II. DATA AND METHODOLOGY

II.A. Dataset

This study uses secondary data. The samples used in this study are 175 companies with annual data from 2003 to 2021. The company data is obtained from Rimm Sustainability Pte. Ltd. and Refinitiv. The following is a table of the data points used in this study.

Table 1.
Types and Sources of Research Data

Data type	Definition	Unit
Waste	Total waste generated by the company, both solid and liquid waste	Tons
ESG Score (Environmental, Social, and Government)	The score indicates the performance and level of transparency in reporting a company's ESG data to the public. The index ranges from 1 -100. The closer to 100, the better the ESG performance of companies	Index
ROA	ROA (return on assets) is the ratio of a corporate financial performance to profitability	Ratio
Total Revenue	Total revenues of the company in one year	Million USD
Total assets of the company	Total company assets in one year	Million USD
Company Size	Company size is measured by the natural logarithm of total assets	Million USD

[32] Nicola Misani and Stefano Pogutz, 'Unraveling the Effects of Environmental Outcomes and Processes on Financial Performance: A Non-Linear Approach', *Ecological Economics*, 109 (2015). https://doi.org/10.1016/j.ecolecon.2014.11.010.

[33] Trumpp and Guenther, (2017).

Observations in this study are 175 companies in 20 countries. These companies operate in different sectors, both in the manufacturing and service sectors. At least, there are ten classifications of economic activity based on The International Standard Industrial Classification of All Economic Activities (ISIC). The distribution can be seen in the following table.

Table 2.
Company Classification Based on Country of Origin

Country	Freq.	Percent	Cum.
Austria	53	2.61	2.61
Belgium	82	4.04	6.65
Czech Republic	13	0.64	7.29
Denmark	70	3.45	10.74
Finland	108	5.32	16.06
France	295	14.53	30.59
Germany	250	12.32	42.91
Greece	12	0.59	43.50
Hungary	20	0.99	44.48
Ireland; Republic of	27	1.33	45.81
Italy	92	4.53	50.34
Netherlands	106	5.22	55.57
Norway	46	2.27	57.83
Poland	6	0.30	58.13
Portugal	54	2.66	60.79
Russia	14	0.69	61.48
Spain	177	8.72	70.20
Sweden	151	7.44	77.64
Switzerland	92	4.53	82.17
United Kingdom	362	17.83	100.00
Total	**2030**	**100.00**	

Table 3.
Type of Company Classification Based on Economic Activity

	Freq.	Percent	Cum.
Construction	183	9,01	9,0
Electricity, gas, steam, and air conditioning supply	158	7,78	16,8
Financial and insurance activities	284	13,99	30,8
Human health and social work activities	14	0,69	31,5
Information and communication	289	14,24	45,7
Manufacturing	763	37,6	83,3
Mining and quarrying	115	5,67	89,0
Professional, scientific, and technical activities	29	1,43	90,4
Real estate activities	72	3,55	93,9
Transportation and storage	18	0,89	94,8
Wholesale and retail trade; repair of motor vehicles and motorcycles	105	5,17	100,0
Total	**2030**	**100.00**	

III. METHODOLOGY

This research uses a nonlinear regression method with the panel data model. Regression analysis is used to determine the effect of environmental performance on company performance. To get the best and most efficient model, it is necessary to do a model suitability test and a classic assumption test. Analysis with panel data must avoid cross-sectional data problems (e.g., heteroscedastic problems) and time series (e.g., autocorrelation problems). Therefore, it needs testing to determine the right approach to determine the best model.

The model used by researchers in this study is unbalanced panel data. The main reference for this research is the work of Thomas Guenther.[34] However, the authors also provide differences and comparisons with other similar studies as illustrated in table III.4.

Table 4.
Reference Variables in Forming Research Models

Data		Variable	Formula	Reference
Dependent Variable	Profitability Dimension Corporate Financial Performance	ROA	ROA =	Manrique & Martí-Ballester, (2017); Tzouvanas et al., (2020); Widhiastuti et al., (2017); Trumpp & Guenther (2015)
Independent Variable	Operational Performance of Corporate Environmental Performance	Waste Intensity	Waste Intensity Performance = ln () x (-1)	Trumpp & Guenther (2015)
	Environmental, Social, and Corporate Governance Management Performance	Environmental, Social, and Corporate Governance Performance	The ESG variable is in the form of a dummy where 1 means the company has a score above 76 out of 100, while 0 means the opposite	Ben Lahouel et al., (2020); Misani & Pogutz (2015); Gotschol et al., (2014)
	Control Variable	Company Size	Natural Logarithm of the Company's Total Assets	Trumpp & Guenther (2015)
		Market Capitalization	Natural Logarithm of a Company's Market Capitalization	Ben Lahouel et al., (2020)
		Company's revenue	Natural Logarithm of the Company's Total Revenue	Lucato et al. (2017)
		Economic disruption dummy (Covid-19 pandemic)	Value 1 for 2020 and 2021, while 0 for years before 2020	Huy Bui et al. (2022); Xu & Jin (2022)

[34] C. Trumpp and others, 'Definition, Conceptualization, and Measurement of Corporate Environmental Performance: A Critical Examination of a Multidimensional Construct', *Journal of Business Ethics*, 126.2 (2015). https://doi.org/10.1007/s10551-013-1931-8.

Thomas Guenther[35] classifies environmental indicators based on waste intensity as will be carried out in this study.

$$Y_{it} = \beta_0 + \beta_1 \text{CEP}_{it} + \beta_2 \text{CEP2}_{it} + \beta_3 \text{size}_{it} + \beta_4 \text{lmarket\_cap}_{it} + \beta_5 \text{lrevenue}_{it} + \beta_6 \text{dummy\_covid}_{it} + \beta_7 dummy\_performance^{h}_{it\,it} + e_{\text{it}} \quad (1)$$

Where,

Y_{it}	: natural logarithm from ROA (return on asset)
i	: company
t	: year
β_0	: intercept
$\beta_1 \beta_2 \beta_3 \beta_4 \beta_5 \beta_6 \beta_7$	: coefficient
CEP	: environmental performance as measured by the company's waste output
CEP2	: quadratic of environmental performance as measured by the company's waste output
size	: company size obtained from the natural logarithm of total assets
lmarket_cap	: natural logarithm of market capitalization
lrevenue	: natural logarithm of revenue
dummy_covid	: dummy period of covid-19 where 1 = the period of the covid-19
dummy_performance	: score of corporate transparency on ESG
h	: type of corporate transparency towards responsibility for environmental, social and governance performance

Equation III.1 is built based on the author's goal to analyse the effect of a company's environmental performance on corporate financial performance. In addition, other considerations were the availability of data and references to previous research. Details regarding the development of the model in this study will be presented in the following table.

Environmental performance variables are analysed from two dimensions. First, environmental operational performance is measured quantitatively based on the company's input and output with a particular unit or units.[36] In this study, the number of emissions and waste produced by the company is used as a proxy for the company's output. The intended output are pollutants and other byproducts from the production process such as pollutants released into the air

[35] Trumpp and Guenther.

[36] Shuangyu Xie and Kohji Hayase, 'Corporate Environmental Performance Evaluation: A Measurement Model and a New Concept', *Business Strategy and the Environment*, 16.2 (2007), 148–68. https://doi.org/10.1002/BSE.493.

and all forms of waste. The calculation of environmental performance refers to Trumpp & Guenther's research[37] by calculating the ratio of total pollutants and total assets and then multiplying that figure by a negative number. The formula is used to show the company's efforts to reduce emissions and waste. The higher the value of the company's environmental performance, the better the company is at mitigating the environmental impact of the company's production activities. This measure is carried out quantitatively, so as to avoid subjectivity.[38]

The second dimension is environmental management scores (Environmental Management). Misani & Pogutz[39] used the environmental management score variable as a proxy for environmental performance from a process standpoint. The process in question is company intervention that includes emission reduction policies or the percentage of company locations that are certified as compliant with environmental management systems. Furthermore, Thomson-Reuters[40] explains that an Environmental Performance Score reflects how well the subject company uses management practices to avoid environmental risks and take advantage of environmental opportunities to generate positive value over the long term. However, this study does not use Environmental Performance Scores calculated by Thomson-Reuters in the Asset4 database, but rather looks at ESG (Environmental, Social, and Governance) performance data or in Indonesia, namely Environmental, Social, and Governance (ESG) performance obtained from Refinitiv.

As the name suggests, ESG Performance consists of three pillars which are important criteria regarding the assessment of company sustainability performance.[41] The first pillar is Environmental Practices, which focuses on the influence of company practices on the surrounding environment, for example, pollution. The second pillar, namely social practices, is a pillar related to the company's overall social responsibility. The social responsibility in question is both internal and external human relations. Internal linkages include employees and customers, while external relations include government, investors, suppliers, and other stakeholders. The last pillar is governance. Corporate governance is fundamental to an organisation's control over the

[37] Trumpp and Guenther, (2017).

[38] Kimitaka Nishitani and others, 'Does Corporate Environmental Performance Enhance Financial Performance? An Empirical Study of Indonesian Firms', *Environmental Development*, 23 (2017). https://doi.org/10.1016/j.envdev.2017.06.003.

[39] Misani and Pogutz.

[40] Thomson Reuters, 'Corporate Responsibility & Inclusion Report', 2014, 44.

[41] Haris Ramić, 'Relationship between ESG Performance and Financial of Companies: An Overview of the Issue', *Lausanne Master of Science in Accounting, Control and Finance*, 2019.

company's business operations.[42] Good corporate governance according to Ramic[43] is a principle related to competitive and fair management compensation to attract and retain executives and board members. Therefore, shareholders need to be treated equally and given certain privileges. In addition, visions and strategies are shared with all stakeholders, so as to achieve sound practices and governance transparency.

This study uses ESG Performance value data as a proxy for the subject companies' management performance obtained from Refinitiv. Refinitiv[44] looks at and quantifies more than 12,000 public and private companies globally. The ESG performance indicators are grouped into 10 categories that reflect a company's ESG performance, commitment, and effectiveness based on publicly reported information.

IV. RESULTS

IV.A. Descriptive Statics

Regression analysis with panel data in this study was conducted to determine the factors that influence financial performance and focuses more on examining the effect of environmental performance on corporate financial performance. The test results and parameter estimation of the panel data regression models are the outputs of the statistical software. However, before formulating an estimate, a description of the data used in this study will be shown in Table IV.1. In addition, in Figure IV.1. shows the average of corporate environmental performance of companies from each country. The darker shading indicates the better of the corporate environmental performance, while the lighter colour shows the opposite.

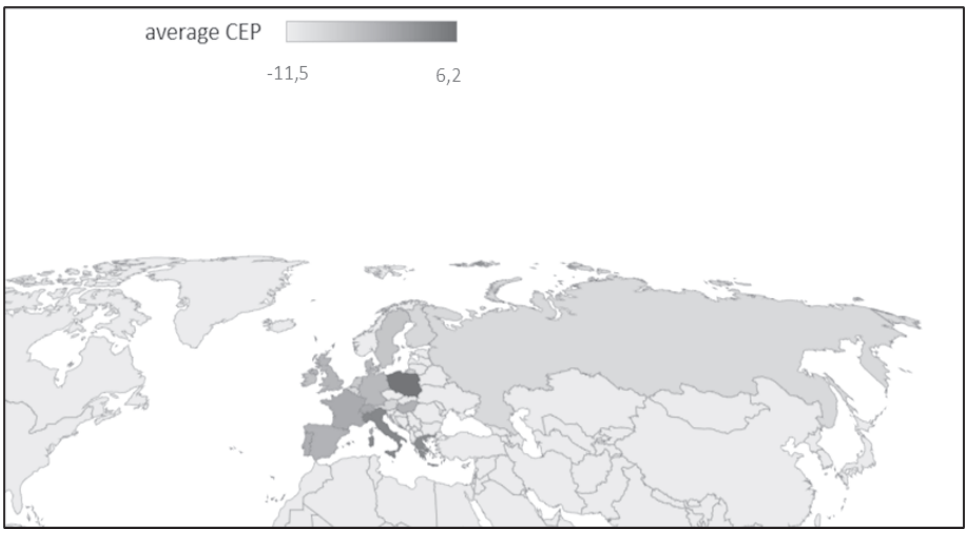
Table 5.
Statistical description

Variable	Obs	Mean	Std. Dev.	Min	Max
roa	2030	.045	.042	-.135	.345
waste	2030	2868796.2	27710538	18.35	4.930e+08
esg score	2030	76.59	11.593	14	96
total assets	2030	139206.7	379476.4	443.865	3077514
total revenue	2030	26768.272	41944.95	-14958.84	379631
market cap	2030	27608.737	36074.369	39.577	247356.05

[42] Roszaini Haniffa and Mohammad Hudaib, 'Corporate Governance Structure and Performance of Malaysian Listed Companies', *Journal of Business Finance & Accounting*, 33.7–8 (2006), 1034–62. https://doi.org/10.1111/J.1468-5957.2006.00594.X.

[43] Ramić.

[44] 'Environmental, Social and Governance (ESG) Scores from Refinitiv - May 2022', 2022.



Source: author's processing

Figure 3. Corporate Environmental Performance of each country

IV.B. The Influence of Environmental Performance on Corporate Financial Performance

Before evaluating the environmental and financial performance relations, the most appropriate and efficient model must be selected. First, the Breusch-Pagan Lagrangian Multiplier Test was done to compare PLS or REM. The resulting probability value is 0.0000, this value is smaller than the 5% significance level so that it rejects H0, and therefore the best model of the Breusch-Pagan Lagrangian Multiplier test is REM. After testing the model above, REM was selected for this study. This is motivated by the problem of heteroscedasticity. According to Wooldridge[45] the heteroscedastic problem in the model can be corrected by GLS estimation. REM accommodates GLS Estimation. In addition, this study uses a dummy variable that cannot be captured using the Fixed Effect Model, so the most efficient model is REM.

Table IV.2. shows the results of the outcome estimates. To show strong (robust) results, this study displays six regression models. The model uses waste as an environmental performance variable, quantitative variables with units of tons which are then transformed into intensity ratios by dividing the figure by the acceptance variable and multiplied by the negative. This formula produces a corporate environmental performance variable as an effort for pollutant efficiency on company revenue.[46] In addition, this study seeks to

[45] J.M Wooldridge, *Introductory Econometrics: A Modern Approach Cengage Learning*, 2015.
[46] Trumpp and others.

capture the influence of company performance on environmental, social, and governance (ESG) responsibility. Simultaneous test results show the results of Prob > F = 0.000. This means that there are at least one or more independent variables that have a significant effect on the dependent variable of this study.

Table 6.
Regression Result

Variable	CFP (ROA)					
CEP	-0.0793***	-0.0805***	-0.0789***	-0.0501***	-0.0488***	-0.0503***
	(0.0238)	(0.0234)	(0.0236)	(0.0162)	(0.0160)	(0.0162)
CEP2	0.00632*	0.00693*	0.00625*			
	(0.00377)	(0.00373)	(0.00376)			
size	-0.593***	-0.583***	-0.593***	-0.610***	-0.601***	-0.608***
	(0.0374)	(0.0368)	(0.0373)	(0.0361)	(0.0356)	(0.0361)
lnmarket_cap	0.274***	0.259***	0.274***	0.280***	0.267***	0.281***
	(0.0403)	(0.0399)	(0.0401)	(0.0401)	(0.0397)	(0.0399)
lnrevenue	0.279***	0.252***	0.279***	0.286***	0.261***	0.286***
	(0.0417)	(0.0420)	(0.0417)	(0.0415)	(0.0418)	(0.0415)
dummy_covid	-1.237*	-1.281*	-1.235*	-1.229*	-1.270*	-1.226*
	(0.690)	(0.690)	(0.690)	(0.691)	(0.690)	(0.691)
dummy_env	-0.0114			0.00227		
	(0.0881)			(0.0878)		
dummy_soc		0.279***			0.269***	
		(0.0916)			(0.0916)	
dummy_gov			-0.0151			-0.0200
			(0.0846)			(0.0845)
Constant	-2.553***	-2.461***	-2.556***	-2.519***	-2.431***	-2.528***
	(0.268)	(0.265)	(0.268)	(0.267)	(0.265)	(0.268)
Observations	2,029	2,029	2,029	2,029	2,029	2,029
Number of companies	175	175	175	175	175	175

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Altuzarra et al.[47] examined the relationship of nonlinear regression with quadratic variables. However, the coefficient of the quadratic environmental performance variable is too small. Therefore, we need to examine this with the Lind-Mehlum test. The Lind and Mehlum[48] test is a test of non-linearity. The result of the test is provided below.

[47] Amaia Altuzarra, Catalina Gálvez-Gálvez, and Ana González-Flores, 'Economic Development and Female Labour Force Participation: The Case of European Union Countries', *Sustainability (Switzerland)*, 11.7 (2019). https://doi.org/10.3390/su11071962.

[48] J.T Lind and H Mehlum, 'With or Without U? – The Appropriate Test for a U-Shaped Relationship.', *Oxford Bulletin of Economics and Statistics 72*, 2010, 109–18.

Table 7.
Tests for a U-shape

Specification: f(x)=x^2 Extreme point: 6.317688 Test: H1: U shape vs. H0: Monotone or Inverse U shape		
	Lower bound	**Upper bound**
Interval	-11.537	6.249
Slope	-0.222	-0.001
Extremum outside interval - trivial failure to reject H0		

The result shows that there is no U-shape in the model. As such, this research analyses the effect of CEP on CFP using linear regression analysis. This finding is different from previous studies which found that the nonlinear relationship between corporate environmental performance and a corporate financial performance by Tzouvanas et al.;[49] Trumpp & Guenther;[50] Fujii et al.;[51] and Wang et al.[52] From the previous findings, it can at the very least be concluded that government regulations for transparency in the impact of company activities on the environment can change the behaviour of consumers and investors. Literally, they tend to avoid products from companies that are known to be heavy polluters and switch to companies that are more friendly to the environment. Therefore, environmental performance can provide distinct benefits for a company through a positive reputation that can bring financial benefits to the company.

Part One shows that when the corporate environmental performance gets better by 1 percent, the financial performance will decrease by 0.08 percent. This shows that environmental control efforts do increase costs, which reduces financial performance.[53] These results are consistent across the three models.

Next is an analysis based on the corporate responsibility score based on environmental, social, and governance (ESG) performance. The regression results in table IV.2 show that there is consistency both in the linear and nonlinear models. This consistency is indicated by the significance of the 99% level of confidence in the social responsibility variable. Conversely, the environmental

[49] Panagiotis Tzouvanas and others, 'Environmental and Financial Performance in the European Manufacturing Sector: An Analysis of Extreme Tail Dependency', *British Accounting Review*, 52.6 (2020). https://doi.org/10.1016/j.bar.2019.100863.

[50] C. Trumpp and others, (2015).

[51] Fujii and others.

[52] Lei Wang, Steven Li, and Simon Gao, 'Do Greenhouse Gas Emissions Affect Financial Performance? – An Empirical Examination of Australian Public Firms', *Business Strategy and the Environment*, 23.8 (2014), 505–19. https://doi.org/10.1002/BSE.1790.

[53] Becchetti, Ciciretti, and Hasan.

and governance variables have a p-value > α having no significant effect on corporate financial performance. Results similar to Haris Ramić [54] also show that governance has no influence on financial performance, while social factors have a positive effect on three accurate financial performance indicators based on ROA (Return on Assets), ROE (Return on Equity), and Tobin's Q. The results of this study indicate that social factors play an important role in the progress of the company. These social factors include employee welfare and safety, equality, and the company's social responsibility to. Rubio-Andrés et al.,[55] explains empirically that there is an influence of well-being and high-performance work systems. That is, employee welfare is an important variable for improving a company's performance leading to an increase in company performance.

From a legal perspective, Zhu et al.,[56] found that environmental regulations significantly increase the motivation for companies to participate in environmental governance and the central environmental protection inspector plays a mediating role in the impact of environmental regulations on corporate environmental governance behaviour. This is in line with Zhang et al.,[57] who examined the effect of regulations related to pollution reduction called the Ambient Air Quality Standard (AAQS) on CEP. Their findings indicated that the new AAQS significantly promotes the improvement in CEP. Therefore, Feriansyah et al.,[58] stated that the government has an important role to play in implementing green growth policies by encouraging economic development that does not put pressure on the environment.

IV.C. Factors Influencing the Corporate Financial Performance

After analysing the influence of the corporate environmental performance on the corporate financial performance, this study then examines the factors that influence corporate financial performance. Table IV.2 shows that the variables of company size, market capitalization, revenue, and the Covid-19 pandemic have a significant effect on the corporate financial performance.

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[54] Ramić.

[55] Mercedes Rubio-Andrés and others, 'Creating Financial and Social Value by Improving Employee Well-Being: A PLS-SEM Application in SMEs', *Mathematics*, 10.23 (2022). https://doi.org/10.3390/math10234456.

[56] Di Zhu and others, 'The Effect of Environmental Regulation on Corporate Environmental Governance Behavior and Its Mechanisms', *Sustainability (Switzerland)*, 14.15 (2022). https://doi.org/10.3390/su14159050.

[57] Weike Zhang, Qian Luo, and Shiyuan Liu, 'Is Government Regulation a Push for Corporate Environmental Performance? Evidence from China', *Economic Analysis and Policy*, 74 (2022). https://doi.org/10.1016/j.eap.2022.01.018.

[58] Feriansyah Feriansyah and others, 'Economic Growth and CO2 Emission in ASEAN: Panel-ARDL Approach', *Economics and Finance in Indonesia*, 68.2 (2022), 4.

Trumpp & Guenther;[59] Manrique & Martí-Ballester[60] calculated company size with the natural logarithm of total assets. With a similar formula, this study shows that a one percent increase in firm size can reduce the corporate financial performance by 0.6 percent. The results are strong because of the 99% confidence level consistent across all models' confidence levels. Similar results were also found by Lioui & Sharma[61] that the logarithm of total assets is negatively related to ROA. Furthermore, Olawale et al.[62] stated that company size as a proxy for total assets has a negative and significant effect on the corporate financial performance, while total sales have a positive effect on financial performance. Therefore, Olawale et al.[63] added that companies are better off focusing on increasing their size by increasing revenues and opening new markets for both existing and new products. This aims to increase sales, thus leading to an increase in corporate financial performance. Not much different from Olawale et al.[64], Cavaco & Crifo[65] also found that total assets tend to reduce company profitability, while revenue from total sales significantly increases profitability.

Another factor affecting corporate financial performance is market capitalisation. When market capitalisation increases by one percent, it will increase financial performance by 0.3 percent with a 99% confidence level. Similar results were also obtained from the research of Ben Lahouel et al.,[66] that increasing market capitalisation can improve corporate financial performance. This is because market capitalisation shows the shares circulating in the community multiplied by their share price, so that a high value indicates that investor interest and confidence in the company is high. This interest is in line with profit expectations of investors on the company's performance. The next factor is the company's acceptance variable. An increase in company revenue of one percent can increase corporate financial performance by 0.3 percent with a 99% confidence level. This is a naturally occurring phenomenon, especially when the financial performance variable is calculated from the ratio between profitability and total assets, while revenue reflects a company's total sales. Thus, increased revenue can improve corporate financial performance.

[59] C. Trumpp and others, (2015).

[60] Manrique and Martí-Ballester.

[61] Lioui and Sharma.

[62] Luqman S. Olawale, Bamidele M. Ilo, and Fatai K. Lawal, 'The Effect of Firm Size on Performance of Firms in Nigeria El Efecto Tamaño En El Rendimiento de Las Empresas Nigerianas', *The Ieb International Journal of Finance*, 15.4 (2017).

[63] Olawale, Ilo, and Lawal.(2017).

[64] Olawale, Ilo, and Lawal.(2017).

[65] Sandra Cavaco and Patricia Crifo, 'CSR and Financial Performance: Complementarity between Environmental, Social and Business Behaviours', *Applied Economics*, 46.27 (2014). https://doi.org/10.1080/00036846.2014.927572.

[66] Ben Lahouel, Bruna, and Ben Zaied.

Corporate financial performance is not only influenced by internal factors, but also unforeseen external factors. One of them is the existence of Covid-19 which was declared a pandemic by the World Health Organization on March 11, 2020. The availability of data from 2003 – 2021 allows this research to capture the influence of the Covid-19 pandemic on corporate financial performance. The results show that in the event of Covid-19, the probability of financial performance (ROA) will decrease by 1.2%. This value is consistent across all models with a 90% confidence interval. Previous research has also captured the negative impact of the Covid-19 pandemic on financial performance. Huy Bui et al.[67] examined 131 companies in Vietnam and provided results that the Covid-19 pandemic had a direct impact on financial performance. This was caused by a decrease in corporate revenues which had a direct impact on the company's profitability. Xu & Jin[68] also provided evidence of the impact of the Covid-19 crisis on the financial performance and cash holdings of companies in the agri-food sector in China.

V. CONCLUDING REMARKS

This study aims to analyse the relationship between corporate environmental performance and corporate financial performance with case studies of 175 companies in 20 countries. There are three important findings in this research. First, corporate environmental performance has a negative effect on corporate financial performance. Second, there is no nonlinear relationship between corporate environmental performance and corporate financial performance with Lind-Mehlum test. Third, this research has empirically confirmed that there is a relationship between company size, market capitalization, total revenue, transparency of environmental, social, and governance (ESG) performance, and the Covid-19 pandemic on corporate financial performance.

Although the objectives of this research have been fulfilled, it cannot be denied that some limitations in this study need to be acknowledged, namely as follows. First, this study has limited data, so it only captures 20 European countries due to limited access to data. Second, researchers have also not considered other financial performance proxies (e.g., Tobin's Q) and company expenditures for research and development (Research and Development) as

[67] Trung Huy Bui and others, 'The Impact of Covid-19 Pandemic on Firm Performance: Empirical Evidence from Vietnam', *Journal of Asian Finance, Economics and Business*, 9.7 (2022).

[68] Jian Xu and Zhenji Jin, 'Exploring the Impact of the COVID-19 Pandemic on Firms' Financial Performance and Cash Holding: New Evidence from China's Agri-Food Sector', *Agronomy*, 12.8 (2022). https://doi.org/10.3390/agronomy12081951.

presented by Trumpp & Guenther[69] and Misani & Pogutz[70]. Therefore, this research is expected to be a first step for further research that is better and more comprehensive.

Through this research, the authors have provided results empirically and are expected to be useful for several related parties. Therefore, in this closing chapter, the author provides the following suggestions.

First, this research indicates that there is a negative effect of CEP on CFP. Therefore, the effort of businesses to drive the investor from the profit-oriented became green-oriented needs high effort. On the other hand, Eccles[71] state that investor awareness of ESG issues has increased since 2018, so the authors suggest that business actors improve corporate environmental performance by being more proactive. This is supported by the findings of this study that better environmental performance can improve corporate financial performance. In addition, companies need to re-evaluate the social impact of business. This can be done with ESG Performance analysis to see how well the company pays attention to the environment, society, and governance (ESG). Currently, many institutions provide consulting and reporting services. Even though profitability is fundamental for a company, social responsibility must also be considered, and this social investment has proven to be able to improve the corporate financial performance. In addition, other factors have a positive effect on the company's finances, namely acceptance and market capitalization to be considered by the company. There are also some factors that have decreased the corporate financial performance, namely company size and economic disruption such as Covid-19 to be a concern of the company so that it can be minimised.

Second, the author provides advice for the government as a policy maker to continue to increase efforts to mitigate climate change. This can be done with the right policies. This is related to the positive correlation between environmental performance and corporate financial performance stated by Porter (1990)[72]; Porter & Kramer[73] This finding became known as A Porter's hypothesis that the existence of government regulations regarding sustainable practices encourages companies to innovate. This can create more sophisticated technological findings, making it more environmentally friendly and providing a comparative advantage. Beckmann et al.[74] added that government regulations

[69] Trumpp and Others, (2015).

[70] Misani and Pogutz.

[71] Robert.G Eccles and Svetlana Klimenko, 'The Investor Revolution'. https://hbr.org/2019/05/the-investor-revolution..

[72] Porter.

[73] Porter and Kramer.

[74] Beckman, Colwell, and Cunningham.

can lead to the incorporation of environmental aspects in decision-making, thereby changing the previous trade-offs and providing a win-win solution. The government can provide incentives for business actors who have good corporate environmental performance. Not only that, but the government also needs to socialise with the public to start being sensitive to the environment. It is undeniable that society is an important agent for the realisation of the country's and the world's big goals for the environment.

Third, the author also provides suggestions for academics on how to become part of climate change mitigation by actively contributing to research related to the environment. This is important because the environment is an important element in human life. The writer feels that the writer still needs to learn and examine more deeply, so this research still has limitations. Therefore, academics can better review the influence of environmental performance on corporate financial performance so that they can present appropriate results and recommendations for business enterprises and the government.

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