Jurnal Manajemen Bisnis Vol. 11, No.2 (2024) September, Page. 1553-1569
e-ISSN: 2621-1971 | p-ISSN: 2088-7086

Environmental Protection Tax and Green Investment on Green Innovation: Digitalization, ESG, CSR as Mediation

Putri Az Zahra Nodhiva[1*], Sofi Salfira Anjharsari[2], Farah Margaretha Leon[3]
[1, 2, 3] Universitas Trisakti, Jl. Letjen S. Parman No.1 Campus A, RT.6/RW.16, Grogol, Grogol Petamburan District, West Jakarta City, Special Capital Region of Jakarta 11440*

ARTICLE INFO

Correspondence Email:
nodhiva@gmail.com

Keywords:
Green Innovation; Environmental Tax Protection; Green Investment; Digitalization; ESG; CSR.

DOI:
https:doi.org/10.33096/jmb.v11i2.861

ABSTRACT

This study aims to identify variables that influence environmental tax protection, digitalization, ESG, CSR and green investment variables on green innovation. The research conducted is quantitative and the data obtained is secondary data. Data were obtained from companies that publish their financial statements and annual reports. The unit of analysis used in this study is manufacturing companies listed on the Indonesia Stock Exchange. Managerial implications for company management with operational efficiency and long-term sustainability of the company. Companies can develop new products that are more environmentally friendly, more energy efficient production processes, or new technologies to recycle waste. Management can consider strengthening and expanding CSR practices including environmental commitments as an integral part of their business strategy. Stakeholders need to see transparency in communication about green investment and green innovation so that they can improve financial performance and company value.

ABSTRAK

Penelitian ini bertujuan untuk mengidentifikasi variabel-variabel yang mempengaruhi variabel perlindungan pajak lingkungan, digitalisasi, ESG, CSR dan investasi hijau terhadap inovasi hijau. Penelitian yang dilakukan bersifat kuantitatif dan data yang diperoleh merupakan data sekunder. Data diperoleh dari perusahaan-perusahaan yang menerbitkan laporan keuangan dan laporan tahunannya. Unit analisis yang digunakan dalam penelitian ini adalah perusahaan manufaktur yang terdaftar di Bursa Efek Indonesia. Implikasi manajerial bagi manajemen perusahaan dengan efisiensi operasional dan keberlanjutan jangka panjang perusahaan. Perusahaan dapat mengembangkan produk-produk baru yang lebih ramah lingkungan, proses produksi yang lebih hemat energi, atau teknologi-teknologi baru untuk mendaur ulang limbah. Manajemen dapat mempertimbangkan penguatan dan perluasan praktik CSR termasuk komitmen lingkungan sebagai bagian integral dari strategi bisnis mereka. Para pemangku kepentingan perlu melihat transparansi dalam komunikasi tentang investasi hijau dan inovasi hijau sehingga mereka dapat meningkatkan kinerja keuangan dan nilai perusahaan.

INTRODUCTION

Globalization has brought about changes in business practices and operating systems in all sectors of the industry. With globalization resulting in increased market complexity, climate change, environmental pollution, dependence on fossil fuels, companies are forced to act in a dynamic and challenging environment. The problem of the activities of an industry in every company causes problems, one of which is pollution in the production process such as production waste which can increase air, water and soil pollution to dangerous levels (Bride, 2023).

Environmental protection tax is a tax whose collection is based on a physical unit that has been proven to have a negative impact on the environment (Tommy, 2023). The purpose of environmental taxes is to reduce environmental damage and pollution and minimize the scarcity of resources for current and future generations. Indonesia has begun to launch

environmental taxes under the administration of Joko Widodo with the issuance of Government Regulation No. 46 of 2017 concerning Environmental Economic Instruments (Tommy, 2023). Environmental protection taxes have been implemented in developed countries, such as Canada, Denmark, France, Germany, Japan, the Netherlands, Norway, Sweden and the United Kingdom. Indonesia has also started to implement environmental protection taxes, the implementation of environmental taxes can refer to Regulation No. 46 of 2017 concerning Environmental Economic Instruments. The three forms of environmental financing are the Environmental Recovery Guarantee Fund (DJPLH), the Pollution Reduction and/or Environmental Damage Recovery Fund (DP2KPLH), and the Conservation Trust/Assistance Fund consisting of the State Budget, Regional Budget, subsidies, and environmental taxes (Gyan, 2023). With the existence of an environmental protection tax, companies get economic incentives or subsidies.

Green innovation is an innovation concept that produces new products, processes, or technologies that are environmentally friendly, efficient in the use of resources, and reduce negative impacts on the environment (Khusnah, 2023). The application of green innovation in a company is expected to provide good value for the company and get easy subsidies from the government. Green innovation is suitable for companies whose operational activities have the risk of damaging the environment, such as mining, manufacturing, and construction companies. These companies are important to carry out green innovation so that the company's operational activities can be sustainable.

In line with this, green investment, which coordinates a balanced relationship between economic growth and environmental conservation, is compatible with the development of green innovations in terms of development motivation and development benefits. Green investment is a branch of socially responsible investment with triple surplus features, and plays an important role in driving the low-carbon green transition and green economic growth (Chen & Ma, 2021). The greening of the capital market has become a major trend due to the growth of sustainable development. In order to achieve the transformation from green "inputs" to green "outputs" through the development of green investments, it is essential to understand precisely the relationship between green investments and green innovation in highly polluting businesses (Zhang et al., 2023). Unfortunately, the relationship between the role of green investment and corporate green innovation has been studied by fewer experts in depth.

The most relevant aspect of the current research is empirical on green development and innovation in companies. The existing literature has not reached a consensus, with some arguing that corporate green development sacrifices production costs and hinders the progress of innovative research and development. Green investment explicitly guarantees preferential access for green innovation initiatives to the benefits generated. Due to the occurrence of unfavorable selection in the investment market market, green innovation projects with long payback periods and large capital expenditures are sometimes difficult to obtain capital through conventional investment channels. Green investments can provide long-term and sustainable financial assistance for such initiatives, bridging the green gap and guaranteeing the growth of green innovations of the highest quality (Zhang et al., 2023).

There are several mediating factors that can also affect a company's green innovation, namely digitalization, *corporate social responsibility* (CSR) and *environmental, social, and governance* (ESG) (Cao & Dia, 2024). Digitalization is one of the factors that plays an important role in green innovation. Companies can use digitalization to reduce greenhouse gas emissions and address

the negative impact on climate change. With digitalization, companies can use technology to create renewable energy that is environmentally friendly.

CSR is also one of the factors that plays a role in green innovation. CSR is defined by aspects of social relations, economic growth, and environmental awareness that affect the performance of companies and economic sectors (Sari & Tarigan, 2022). CSR is considered in line with green innovation because it still pays attention to the environment and society in running business.

ESG is also one of the factors that play a role in green innovation. The impact of ESG performance on green innovation encourages companies with better ESG performance to focus more on environmental protection, thereby indirectly affecting the role of environmental protection taxes on green innovation. Based on resource-based theory, Hart and Dowell claim that the active disclosure of ESG information, which includes comprehensive performance of environmental protection, social responsibility, and corporate governance, facilitates the formation of an image both for maintaining a positive reputation and recognition generated by environmental performance (Cao et al., 2024).

The novelty of this study is the use of variables *Green Invesment* in accordance with research conducted by (Zhang et al., 2023) which states that the implementation of green investment in cleaner production and environmental control processes provides empirical evidence and positive feedback for future technological innovations, thereby encouraging the improvement and development of green innovations. In addition, the use of environmental orientation in research conducted by (Y. Yang & Jiang, 2023) Explaining that the orientation of the internal and external environment positively affects green innovation, this must be translated into the company's strategy and plan if it is going to carry out green innovation.

Green innovation is becoming increasingly important in global efforts to address environmental challenges. Environmental protection taxes are useful as a market incentive-based environmental regulation tool, strengthening the enforcement of environmental laws and restrictions on enterprises, such as carbon taxes and emission taxes, are applied to encourage companies to reduce their environmental impacts. However, empirical evidence is still needed to understand the extent to which these taxes can affect green innovation in companies. Today, experts point to diverse perspectives on the relationship between green environmental taxes and green innovation. Deng et al., concluded that the implementation of a green environmental tax increases legitimacy pressure on companies, forcing polluting entities to step up legitimacy management efforts and increase investment in green research and development (Cao et al., 2024). Environmental economic theory states that environmental protection taxes can internalize the cost of negative externalities generated by economic activity. Previous empirical studies have shown mixed results on the effects of environmental regulation on green innovation, but there is a lack of direct evidence regarding the effects of environmental taxes (Cao et al., 2024).

Green Investment (Green investment) can have an influence on the company's green innovation. This may be due to green investments that play a significant and beneficial role in the process of supporting the state of R&D, improving green R&D processes, and leveraging the results of a company's green innovation. In particular, green investment plays the role of a facilitator in the "quality" and "quantity" dimensions of a company's green innovation. In comparison, the effects of green investment on substantive innovation are better, suggesting that green investment is more effective in promoting green innovation. This may be due to the fact green investments increase the transparency of corporate information, which allows capital to flow more precisely into high-quality green innovations (Amighini et al., 2022).

Concept *environmental, social, and governance* (ESG) has undergone rapid change and widespread acceptance globally. Many institutional investors and fund managers now consider ESG factors as an integral component of their decision-making process. As a new development concept, high-quality development is characterized by innovation, greenery, coordination, openness, and sharing, providing an important guarantee for sustainable economic development and forming a global development consensus. Worse, companies are also facing pressure for green transformation from the government, all sectors of society, and even consumers. Green innovation, as a type of innovation, helps enterprises achieve green transformation, improve resource utilization efficiency, and reduce pollution emissions through the development of green environmental technologies, environmentally friendly products, and services (C. Yang et al., 2024).

In this era, having the belief that companies have responsibility to society is not new. Where environmental issues are increasingly a global concern, companies are faced with pressure to be socially and environmentally responsible. Corporate Social Responsibility (CSR) includes a variety of corporate activities that aim to make a positive contribution to society and the environment. For companies, the existence of CSR signifies new opportunities, namely being able to improve the company's reputation along with increasing competition (Andrés et al., 2019).

CSR is a very broad concept, this causes no researcher to find a standard definition of CSR and the basis for measuring CSR (Margaretha & Witedjo, 2017). Today, many companies are aware of their CSR responsibilities to achieve green innovation. It is important to understand how CSR efforts can drive green innovation, i.e. the development of technologies and practices that reduce negative impacts on the environment. Previous studies have shown that CSR initiatives can improve a company's reputation, operational efficiency, and relationships with stakeholders, which in turn can drive green innovation (Cao et al., 2024).

The era of digitalization is increasingly affecting various aspects of life and business, and digitalization can affect green innovation efforts. Digitalization not only changes the way companies operate, but it can also be a catalyst for greener business practices. Digitalization also supports companies in achieving green innovation (Cao et al., 2024). The rapid development of digital technology is marked by the presence of a number of various cutting-edge tools, such as producing and processing (Purnama, 2022). In this era, many companies are making digital investments to support corporate green innovation. Theories about innovation and technology show that digitalization can improve efficiency, reduce waste, and enable the development of new, more sustainable solutions (Cao et al., 2024).

The relationship between these factors can be complex and mutually influencing. For example, strict environmental protection tax policies can encourage companies to invest in green technologies, the implementation of green investments can coordinate a balanced relationship between economic growth and environmental conservation, compatible with the development of green innovation in terms of development motivation and development benefits on green innovation, with environmental orientation used as a key step in developing pro-environmental practices Such as green innovation, because company behavior is shaped by company perception and recognition, while digitalization can accelerate the implementation of these innovations. On the other hand, strong CSR practices can strengthen a company's commitment to green innovation, which in turn can improve the company's reputation and attractiveness for environmentally conscious consumers. In research on this relationship, it is important to consider the interactions between some of these factors and how they can mutually reinforce or

limit their effects on green innovation (Cao et al., 2024). Based on the relationship between the variables that have been presented, the conceptual framework in the study can be described as follows:

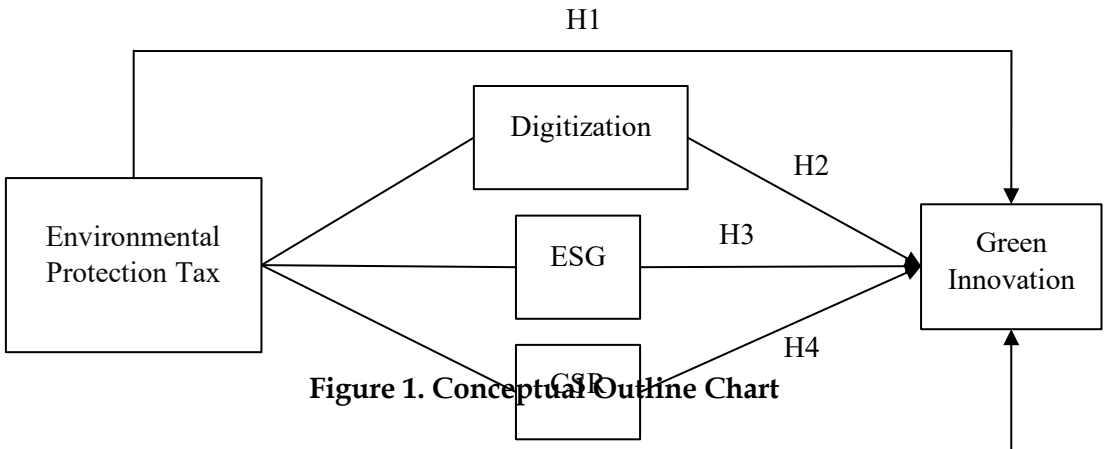

Figure 1. Conceptual Outline Chart

Today, experts point to diverse perspectives on the relationship between Environmental Protection Tax and Green Innovation. Zhao et al., 2022 confirmed that the Environmental Protection Tax improves the efficiency of green research and development (green R&D) of enterprises, in particular increasing the green innovation of highly polluting enterprises. Second, Regarding the impact of the inhibition, the implementation of the Environmental Protection Tax increases the environmental costs borne by the company, reduces the input of innovation resources, and harms the company's Green Innovation. Berrone et al., 2013 concluded that the implementation of the Environmental Protection Tax increases the cost of corporate compliance, encouraging adaptive responses to regulatory pressures, such as improving production lines to achieve environmentally friendly production.

Further Tchorzewska et al., 2022 supports the hypothesis that an increase in the Environmental Protection Tax can encourage the adoption of green technologies by companies and increase the level of green investment. Then according to Deng et al., 2023, environmental protection taxes increase the level of green innovation where the increase in environmental management costs forces companies to increase their R&D investments. In addition, the results of the study Kang, 2024 shows that the reform of the environmental tax system effectively motivates companies to take action in green innovation and improve the quality of their innovation. Based on this, a hypothesis is formulated as follows:

H_1 : Environmental Protection Tax affects Green Innovation.

Zhou et al., 2022 argued that the application of digital technology provides technical support for companies to build environmentally friendly production processes. Chen et al., 2022 argued that the environmental reputation pressure caused by the Environmental Protection Tax could drive digital transformation, thereby increasing the company's green competitive advantage. According to Hao et al., 2023, digitalization and green economic growth show a stable growth trend, and digitalization as a whole significantly promotes green economic growth. Gupta & Bose, 2022 concluded that digital transformation allows companies to respond

quickly to environmental concerns, improving decision-making efficiency. In short, the Environmental Protection Tax serves to influence Green Innovation through digitalization. Then according to Li et al., 2023, the digitalization of enterprises not only promotes green innovation directly, but also promotes green innovation by improving human resources.
H_2 : Digitalization plays a mediating role in the relationship between Environmental Protection Tax and Green Innovation

ESG (Environmental, Social, and Governance) and green innovation are closely intertwined and play an important role in creating a sustainable future. In the research conducted by Li & Li, 2022, environmental protection tax in China can greatly improve ESG performance and green technology innovation, with ESG performance showing a partial mediation effect in promoting green technology innovation of enterprises. Then X. Wang & Ye, 2024 found that EPT has a positive effect on companies' ESG investments. Moreover Cao et al., 2024 states that EPT significantly boosts a company's GI. Mechanism tests show that ESG mediates the relationship between EPT and GI. Furthermore, according to research J. Wang et al., 2023 found that companies covered by ESG rating agencies significantly increased green innovation outcomes by 3.9%, mainly as an increase in green invention patents. Significant improvement in national ESG performance drives green innovation (Long et al., 2023).
H_3 : ESG acts as a mediator in the relationship between Environmental Protection Tax and Green Innovation

Green innovation and corporate social responsibility have a strong dynamic impact, and each has a beneficial impact on each other (Handayani et al., 2017 and Shahzad et al., 2020). Previous research conducted by Yuan & Cao, 2022 supporting the hypothesis that CSR practices significantly encourage green product innovation and green process innovation. Then in the research conducted by Dai et al., 2022 shows that CSR has a significant positive impact on green innovation. Furthermore, research conducted by Mo et al., 2022 explained that the company's CSR positively improves the company's green innovation performance. In addition, the results of the study Martínez-Falcó et al., 2023 shows that there is a positive and significant relationship between CSR and green innovation performance. Then according to LI, 2022 shows that CSR has a positive effect on green business strategies, green innovation, exports and environmental performance. The benefits of implementing corporate social responsibility include improving the company's image and staff skills, customer happiness, increasing the workforce, and environmental friendliness (Gürlek & Tuna, 2018; Mazodier et al., 2021).
H_4 : CSR plays a mediating role in the relationship between Environmental Protection Tax and Green Innovation

Green investment is a kind of investment of companies with different environmental objectives. As an approach to strike a balance between ecological growth and the economic benefits of companies, green investment has grown rapidly around the world in recent years (Adekoya et al., 2021). Zhang *et al*., 2023 concluded that green investment significantly contributes to green innovation in business practices. Furthermore, according to Li *et al*., 2023 Green investment can significantly increase green innovation, the positive effect of green investment on green innovation is more clearly seen in state-owned enterprises, enterprises with a higher proportion of long-term green investment, and after the green financial system is

proposed. In addition, green investment funds can significantly enhance a company's green innovation (Chi et al., 2023)

H_5 : Green investment affects Green Innovation.

RESEARCH METHODS

The measurement of each variable used in this study aims to determine the relationship between the independent variable and the control variable to the dependent variable. The independent variables in this study are environmental tax protection which is measured by the logarithm of environmental protection tax, green investment is measured by the logarithm of green investment in the form of environment-related items that are still under construction and administrative costs including environmental protection facilities and equipment, improvement of environmental protection technology, waste treatment facilities, and others. Mediation variables consist of digitalization which is measured using digitalization logarithms in the form of many digitalization words mentioned in the company's annual report such as digitalization investment, green digitalization, technology digitalization, and others. The next mediating variable is CSR which is measured by CSR logarithms, then ESG mediation variables which are measured by measuring in millions of tons of CO2 emissions, while the dependent variable is green innovation which is measured by green innovation logarithms. The measurements of each variable are as follows:

Table 1. Variable Operational Definition

Types of Variables	Variable Name	Code	Measurement	Source
Dependent Variables	Green Innovation	GI	Logarithms (number of environmentally friendly invention patent applications + 1)	Cao et al., (2024)
Independent Variables	Environmental Protection Tax	TAX	Logarithm (total environmental protection tax + 1)	Cao et al., (2024)
	Green Investment	GIV	$\frac{Total\ investasi\ lingkungan}{Total\ aset}$	Zhang et al., (2023)
Mediation Variables	Digitization	DIG	Logarithm (frequency of digital Green Innovation technology words in a year report + 1)	Cao et al., (2024)
	ESG	ESG	Measuring in millions of tonnes of CO2 emissions	(Baratta et al., 2023)
	CSR	CSR	Logarithm of CSR Costs	Cao et al., (2024)

Source: Researcher'S Observation, 2023

The research conducted was quantitative and the data was obtained in the form of secondary data. The data source comes from the Indonesia Stock Exchange (https://www.idx.co.id/) website and from the website of each company with the object of research for the last 5 years, namely from 2019-2023. The data was obtained from companies that

include Srikehati that publish their financial statements and annual reports. The unit of analysis used in this study is a manufacturing company listed on the Indonesia Stock Exchange.

The sampling technique in this study is based on *the purposive sampling method*, which is specifically for the Srikehati company during 2019-2023. This is based on considerations adjusted to the variables used in this study in order to get appropriate results.

This study uses a sample of Srikehati companies listed on the Indonesia Stock Exchange in the 2019-2023 period. The results of sample selection using *the purposive sampling* method during the observation period of 2019-2023 and not *delisting* during the research period and support in the acquisition of research data, obtained a total of 20 samples. The sampling process can be seen in the following table:

Table 2. Sample Population

Criterion	Number of Companies
Srikehati Company on the Indonesia Stock Exchange in 2019-2023	25
Srikehati companies that do not have complete information in issuing *Sustainability reports* and *Annual reports* in 2019-2023;	5
Amount of data that can be used	**20**
Number of years of research	**5**
Total sample data	**100**

Source: research data, processed, 2024

Based on the 100 samples, then tests were carried out including descriptive statistics and analysis based on the results of measuring the research variables to answer the research hypothesis. Structural *Equation Model* analysis is used in this study considering the use of *mediating variables* that mediate the relationship of independent variables to their dependent variables. The analysis tool for the structural model in this study uses Smart PLS software.

RESULTS AND DISCUSSION

Descriptive statistics provide an overview of the minimum value, maximum value, average value, and standard deviation of each variable. The use of descriptive statistics provides an overview in decision-making. Here is a descriptive statistical table for each of the research variables:

Table 3. Descriptive Statistics of Research Variables

Research Variables	Min.	Max.	Mean	Std. Deviation
Green Inovation (GI)	9,76	14,05	11,9414	0,97219
Environmental Protection Tax (TAX)	8,38	13,19	11,3214	1,17261
Green Investment (GIV)	0,01	1,46	0,0474	0,18460
Digitalization (DIG)	0,30	2,73	1,4196	0,53920
Environmental, Social, and Governance (ESG)	0,01	67,83	2,1545	8,13776
Corporate Social Responsibility (CSR)	7,16	11,91	10,4244	0,98285

Source: research data, processed, 2024

The table above presents descriptive statistics for several variables related to ownership and company characteristics. *Green Innovation* (GI) as a dependent variable is the Logarithmic value of the value of environmentally friendly invention patent applications, has a minimum value of 9.76 found in PT Indocement Tunggal Perkasa (INTP) in 2021 and a maximum value of 14.05 in PT Jasamarga (Persero) in 2023. The average value of *green innovation* is 11.94 with a standard deviation of 0.97, where the average value is higher than the standard deviation shows that the distribution of data is less varied with a small deviation.

Environmental Protection Tax (TAX) as an independent variable is the Logarithmic value of the total environmental protection tax, has a minimum value of 8.38 at PT Kalbe Farma Tbk (KLBF) in 2019, and a maximum value of 13.19 at PT bank Rakyat Indonesia Tbk (BBRI) in 2021. The average value of the environmental protection tax is 11.32 with a standard deviation of 1.17 where this average value is higher than the standard deviation, indicating that the distribution of data is less varied with a small deviation.

Green Investment (GIV) as an independent variable, has a minimum value of 0.01 at PT Indocement Tunggal Perkasa Tbk. (INTP) in 2022, and a maximum value of 1.46 at PT Indofood CBP Sukses Makmur Tbk (ICBP) in 2019. The average value of green investment is 0.04 with a standard deviation of 0.18 where this average value is lower than the standard deviation, indicating that the distribution of data varies with a small deviation.

Digitalization (DIG) as a mediating variable is the Logarithmic value of the frequency of the word green technology digital green innovation, has a minimum value of 0.30 at PT Astra Agro Lestari Tbk. (AALI) in 2019 and PT Indofood CBP Sukses Makmur Tbk (ICBP) in 2019 and a maximum value of 2.73 at PT Astra International Tbk. (ASII) in 2022. The average value of digitization is 1.42 with a standard deviation of 0.54 where this average value is higher than the standard deviation, indicating that the distribution of data is less varied with a small deviation.

ESG (ESG) as a mediating variable which is the amount of emissions in millions of tons of CO2 produced by the company, has a minimum value of 0.01 at PT Dharma Satya Nusantara Tbk. (DSNG) in 2022 and a maximum value of 67.83 at PT Aneka Tambang Tbk (ANTM) in 2023. The average ESG value is 2.15 with a standard deviation of 8.14 where this average value is lower than the standard deviation, indicating that the distribution of data varies with large deviations.

CSR (CSR) as a mediating variable is the Logarithmic value of the company's CSR costs, has a minimum value of 7.16 at PT Dharma Satya Nusantara Tbk. (DSNG) in 2023 and a maximum value of 11.91 at PT United Tractors Tbk. (UNTR) in 2023. The average value of CSR is 10.42 with a standard deviation of 0.98 where this average value is lower than the standard deviation, indicating that the distribution of data is less varied with a small deviation.

Partial Test (T-test)

This test was carried out to find out whether each independent variable had a significant influence on the dependent variable. The recruitment criteria are:

If the sig of t < 0.05 then H0 is rejected

If the sig of t > 0.05 then H0 is accepted

The results of individual tests using the strutkural model are shown by the following table:

Table 4. Hypothesis Test Results

Hypothesis Testing	Estimate	P- Values	Conclusion
H1: → Green Innovation Environmental Protection Tax	0,397	0,000	H1 is significantly positive
H2: Environmental Protection Tax Digitalization → → of Green Innovation	0,119	0,116	H2 is not significant
H3: → Green Innovation→ ESG Environmental Protection Tax	0,004	0,837	H3 is insignificant
H4: Green → Innovation CSR → Environmental Protection Tax	0,093	0,018	H4 is significantly positive
H5: Green Investment → , Green Innovation	0,259	0,005	H5 is significantly positive

Source: data processed with Smart PLS, 2024

Based on the results of the t-test test in the table above, for the environmental protection tax on *green innovation*, a significance value of 0.000 was obtained, which means it is less than 0.05 (0.000 < 0.05) and a coefficient value of 0.397 with a positive direction. So it can be concluded that **H1 is accepted**, this means that the environmental protection tax variable has an effect on *green innovation*.

Based on the results of the t-test test from the table, the environmental tax deduction on green innovation mediated by digiltalization obtained a significance value of 0.116 which means greater than 0.05 (0.116 > 0.05) and a coefficient value of 0.119 with a positive direction. Therefore, it can be concluded that **H2 was rejected**, this means that the Digitalization variable does not play a mediating role in the relationship between environmental protection taxes and affects green innovation.

Based on the results of the t-test test from the table, the effect of environmental protection tax on green innovation dioediated by digiltalization was obtained with a significance value of 0.837 which means greater than 0.05 (0.837 > 005) and a coefficient value of 0.004 with a positive direction. Therefore, it can be concluded that **H3 was rejected**, which means that ESG variables do not play a mediating role in the relationship between environmental protection taxes and green innovation.

Based on the results of the t-test test from the table in the green innovation regression model mediated by CSR, a significance value of 0.018 was obtained, which means it is smaller than 0.05 (0.018 < 0.05) and a coefficient value of 0.093 with a positive direction. So it can be concluded that **H4 is accepted**, this means that the CSR variable plays a mediating role in the relationship between environmental protection taxes and green innovation.

Based on the results of the t-test test from the table on Environmental Protection Tax on Green Innovation obtained a significance value of 0.005 which means less than 0.05 (0.005 < 0.05) and a coefficient value of 0.259 with the direction of positive. So it can be concluded that **H5 accepted**, this means that the variable *green investment* affect green innovation.

Discussion

The Effect of Environmental Protection Tax on Green Innovation

The results of the hypothesis test show that there is an influence between *Environmental Protection Tax* towards green innovation. The results of this study are in accordance with research conducted by Cao, et.al (2024) which shows that environmental protection taxes have a significant positive effect on *Green innovation*. More research by Tchorzewska et al., 2022 supports the hypothesis that an increase in the Environmental Protection Tax can encourage the

adoption of green technologies by companies and increase the level of green investment. Then according to Deng et al., 2023, environmental protection taxes increase the level of green innovation where the increase in environmental management costs forces companies to increase their R&D investments.

Environmental protection taxes are often applied to internalize negative externalities resulting from economic activities against the environment. The implementation of taxes can transform economic costs and incentives, encouraging companies to adopt cleaner technologies or invest in green practices such as green investments. Environmental protection taxes can serve as an economic incentive for companies to make green investments. By increasing the operating costs of companies that create pollution or damage the environment, taxes can encourage companies to look for more environmentally friendly alternatives, such as investments in green technology or sustainable business practices.

The theory of green investment in sustainable builders emphasizes the importance of investing in green technology innovation and sustainable business practices as a way to minimize negative impacts on the environment. Environmental protection taxes can be a catalyst to accelerate this investment, by providing a clear price signal that environmental costs should be considered in a company's investment decisions.

The Effect of Digitalization-Mediated Environmental Protection Tax on Green Innovation

The results of the hypothesis test show that there is no influence between *environmental protection taxes* and green innovation mediated by Digitalization. Digitalisai cannot be a mediator between *protection tax* and *green innovation*, this can be due to the implementation of *green innovation* which is still new recently so that digital technology is not enough to support businesses so that environmental protection taxes are not optimal. The results of this study do not support the research conducted by Cao, et.al (2024) which shows that digitalization can be a mediating factor in the influence of environmental protection taxes on *green innovation.*

The Innovation and Technology Theory states that digitalization can be a catalyst for innovation in various industries, including green innovation. With the adoption of digital technology, companies can find more efficient and environmentally friendly solutions to reduce their environmental impact, without having to rely entirely on environmental tax policies as the main incentive.

In Industrial Disruption Theory, Digitalization often changes the industrial landscape profoundly. In this context, companies that adopt digital technologies can more easily adapt to changes in environmental regulations or tax policies, without having to rely entirely on those policy incentives to remain competitive. Digitalization affects not only how companies operate internally, but also how they interact with the external environment, including in terms of compliance with environmental regulations and investment decisions. Digitalization can improve companies' ability to manage and integrate information about ESG (Environmental, Social, and Governance) factors in their strategic decision-making.

An analysis based on these theories suggests that digitalization can reduce companies' reliance on environmental tax policies as the only incentive to innovate in green matters. Companies that are advanced in digitalization may be better able to explore more flexible and innovative technology solutions to achieve their environmental goals, without having to rely entirely on fiscal incentives from the government. In addition, digitalization can also expand the scope of companies' green innovation strategies, allowing them to optimize production processes, supply chain management, and environmental impact monitoring more effectively

and efficiently. Therefore, the results of the hypothesis test that shows that digitalization weakens the influence of environmental protection taxes on green innovation can be seen as a reflection of the transformational role of digital technology in changing the way companies interact with today's environmental challenges

The Effect of ESG-Mediated Environmental Protection Tax on Green Innovation

The results of the hypothesis test show that there is no influence between environmental protection taxes and green innovation mediated by ESG. ESG cannot be a mediator of the influence of protection taxes on green innovation, this can be because the implementation of ESG needs a long process so that it does not mediate the influence of environmental protection taxes on *green innovation*. The results of this study do not support the research conducted by Cao, et.al (2024) which shows that digitalization can be a mediating factor in the influence of environmental protection taxes on *green innovation.*

Based on signal theory, it emphasizes that price signals, such as environmental protection taxes, can influence a company's investment decisions. However, if ESG (Environmental, Social, and Governance) factors are taken into account in investment decision-making, companies may be more likely to consider these factors than just responding to environmental tax price signals. This can reduce the direct impact of environmental taxes. Similarly, the Theory of Organizational Behavior underlines that ESG factors can influence organizational behavior, including the decision to invest in green innovation. If companies have a strong commitment to ESG, they may be more inclined to allocate resources to initiatives that support those goals rather than just responding to environmental tax policies. Investors and other stakeholders are increasingly paying attention to ESG factors in risk assessment and investment decisions. In this context, if companies can demonstrate good performance in ESG, they may have easier access to capital at a lower cost, so that the direct influence of environmental taxes on investment decisions can be reduced.

An analysis based on these theories suggests that ESG can play a role as a moderator that reduces the direct influence of environmental protection taxes on green innovation. Companies that prioritize ESG tend to have a tendency to make investment decisions that are more oriented towards sustainable and social values, rather than simply responding to the financial incentives provided by environmental taxes. Therefore, the results of this hypothesis test can be understood as a reflection of the complexity in corporate investment decision-making involving broader external and internal factors than just environmental tax price signals

The Effect of CSR-Mediated Environmental Protection Tax on Green Innovation

The results of the hypothesis test show that there is a positive influence between *Environmental Protection Tax* with green innovation mediated by CSR. CSR as an intermediary/mediator of influence Environmental Protection Tax against *green innovation*. The results of this study support research conducted by Baratta, et.al (2024) which shows that ESG can be a mediating factor in the influence of environmental protection taxes on *Green innovation.* Other research conducted by Yuan & Cao, 2022 supporting the hypothesis that CSR practices significantly encourage green product innovation and green process innovation. Then in the research conducted by Dai et al., 2022 shows that CSR has a significant positive impact on green innovation.

The Stewardship Theory highlights that companies that have a strong commitment to corporate social responsibility (CSR) tend to be more proactive in taking steps to protect the

environment. In this context, if companies have strong CSR practices, they may be better able and motivated to respond positively to environmental protection tax policies by investing in green innovation. CSR can be an internal mechanism in mediating the influence of environmental taxes on strategic decisions to advance environmentally friendly technologies and business practices.

Based on Legitimacy Theory, it shows that companies respond to external pressures and people's expectations in maintaining their legitimacy. By implementing strong CSR practices, companies can build and maintain a good reputation in the eyes of the public and stakeholders. In this context, strengthening investment in green innovation in response to environmental tax policies can increase the legitimacy of companies as socially and environmentally responsible entities.

Meanwhile, the Resource and Capability Theory emphasizes that companies with strong capabilities in managing resources can be more effective in utilizing external policies and incentives such as environmental taxes to create added value in the form of green innovation. CSR can act as an internal resource that allows companies to allocate resources efficiently and effectively for CSR goals, including green innovation in response to environmental regulations.

Analysis based on these theories shows that CSR can play a mediating role in the influence of taxes, environmental protection, and green innovation. Companies that implement strong CSR practices tend to have a tendency to take further initiative in integrating environmental principles in their business strategies, especially in the context of green innovation adoption. This can not only improve compliance with environmental regulations, but also lead to the creation of long-term value through improved efficiency and company reputation.

The Influence of Environmental Green Investment on Green Innovation

The results of the hypothesis test show that there is an influence between *green investment* and green innovation. The results of this study are in accordance with the research conducted by Zhang *et al*., 2023 which concluded that green investment significantly contributes to green innovation in business practices. Furthermore, according to Li *et al*., 2023 Green investment can significantly increase green innovation, the positive effect of green investment on green innovation is more clearly seen in state-owned enterprises, enterprises with a higher proportion of long-term green investment, and after the green financial system is proposed. In addition, green investment funds can significantly enhance a company's green innovation (Chi et al., 2023)

Based on the theory of Technological Innovation, it is proposed that investment in green technology can be the main driver to create green innovation. By investing in research and development of environmentally friendly technologies, companies can come up with new solutions or improve products and processes that are more environmentally efficient. This could lead to green innovations that allow companies to meet increasingly stringent environmental regulations or to capitalize on growing market opportunities in the green sector.

Meanwhile, the Theory of Sustainable Finance emphasizes that green investment can provide good long-term returns both financially and in terms of environmental sustainability. Investments dedicated to reducing carbon footprint, improving energy efficiency or utilizing renewable resources not only meet the demands of current markets and regulations, but also position companies to survive and grow in an increasingly sustainability-oriented economy. And with Investment Decision Theory it considers factors such as risk, return, and policy incentives in investment decision-making. In this context, green investments are often driven by a combination of fiscal incentives, the need to comply with environmental regulations, as well

as the potential to reduce long-term costs through operational efficiency. This influences companies to explore and adopt green innovations as part of their investment strategies.

Analysis based on these theories shows that the influence between green investment and green innovation reinforces each other. Green investment not only produces technological innovations that are more environmentally friendly, but also creates an environment conducive to the development and adoption of new innovations. This not only supports the goal of environmental protection, but can also improve the competitiveness and long-term sustainability of the company in an increasingly environmentally conscious global economy. Thus, the results of the hypothesis test that show a positive relationship between green investment and green innovation can be seen as a reflection of the complex dynamics between technological innovation, investment decisions, and responses to market and regulatory demands.

CONCLUSION

Based on the results of the analysis carried out, there are several conclusions that can be drawn from this study, including the following: Environmental Protection Tax has a significant effect on green innovations. Taxes affect production costs and investment decisions of companies, it can be expected that more companies will switch to more environmentally friendly technologies and practices, supporting the goal of long-term environmental protection as well as sustainable economic development. There is no influence between *environmental protection taxes* and green innovation mediated by Digitalization. Digitalization is not a mediation of the influence of environmental protection taxes on green innovation can be seen as a reflection of the transformational role of digital technology in changing the way companies interact with today's environmental challenges. There is no influence between *environmental protection taxes* and green innovation mediated by ESG. ESG has not been able to play a role as a modicure in the influence of environmental protection taxes on green innovation. Companies that prioritize ESG tend to have a tendency to make investment decisions that are more oriented towards sustainable and social values, rather than simply responding to the financial incentives provided by environmental taxes. There is an influence between *environmental protection taxes* and green innovation mediated by CSR. CSR can play a mediating role in the positive influence between environmental protection taxes and green innovation. Companies that implement strong CSR practices tend to have a tendency to take further initiative in integrating environmental principles in their business strategies, especially in the context of green innovation adoption. Green Investment has a significant effect on green innovations. Green investment not only produces technological innovations that are more environmentally friendly, but also creates an environment conducive to the development and adoption of new innovations.

REFERENCES

Adekoya, O. B., Oliyide, J. A., Asl, M. G., & Jalalifar, S. (2021). Financing the green projects: Market efficiency and volatility persistence of green versus conventional bonds, and the comparative effects of health and financial crises. *International Review of Financial Analysis*, *78*(May), 101954. https://doi.org/10.1016/j.irfa.2021.101954

Amighini, A., Giudici, P., & Ruet, J. (2022). Green finance: An empirical analysis of the Green Climate Fund portfolio structure. *Journal of Cleaner Production*, *350*(March). https://doi.org/10.1016/j.jclepro.2022.131383

Andrés, M., Agudelo, L., & Jóhannsdóttir, L. (2019). *A literature review on the history and evolution of corporate social responsibility*. *0*, 1–23.

Baratta, A., Cimino, A., Longo, F., Solina, V., & Verteramo, S. (2023). The Impact of ESG Practices in Industry with a Focus on Carbon Emissions: Insights and Future Perspectives. *Sustainability (Switzerland)*, *15*(8). https://doi.org/10.3390/su15086685

Berrone, P., Fosfuri, A., Gelabert, L., & Gomez-Mejia, L. R. (2013). Necessity as the mother of "green" inventions: Institutional pressures and environmental innovations. *Strategic Management Journal*, *34*(8), 891–909. https://doi.org/10.1002/smj.2041

Cao, G., She, J., Cao, C., & Cao, Q. (2024). Environmental Protection Tax and Green Innovation: The Mediating Role of Digitalization and ESG. *Sustainability (Switzerland)*, *16*(2). https://doi.org/10.3390/su16020577

Chen, Y., & Ma, Y. (2021). Does green investment improve energy firm performance? *Energy Policy*, *153*(121), 112252. https://doi.org/10.1016/j.enpol.2021.112252

Chi, Y., Hu, N., Lu, D., & Yang, Y. (2023). Green investment funds and corporate green innovation: From the logic of social value. *Energy Economics*, *119*. https://doi.org/10.1016/j.eneco.2023.106532

Dai, X., Siddik, A. B., & Tian, H. (2022). Corporate Social Responsibility, Green Finance and Environmental Performance: Does Green Innovation Matter? *Sustainability (Switzerland)*, *14*(20), 1–17. https://doi.org/10.3390/su142013607

Deng, J., Yang, J., Liu, Z., & Tan, Q. (2023). Environmental protection tax and green innovation of heavily polluting enterprises: A quasi-natural experiment based on the implementation of China's environmental protection tax law. *PLoS ONE*, *18*(6 June). https://doi.org/10.1371/journal.pone.0286253

Gupta, G., & Bose, I. (2022). Digital transformation in entrepreneurial firms through information exchange with operating environment. *Information and Management*, *59*(3). https://doi.org/10.1016/j.im.2019.103243

Gürlek, M., & Tuna, M. (2018). Reinforcing competitive advantage through green organizational culture and green innovation. *Service Industries Journal*, *38*(7–8), 467–491. https://doi.org/10.1080/02642069.2017.1402889

Handayani, R., Wahyudi, S., & Suharnomo, S. (2017). The effects of corporate social responsibility on manufacturing industry performance: The mediating role of social collaboration and green innovation. *Business: Theory and Practice*, *18*, 152–159. https://doi.org/10.3846/btp.2017.016

Hao, X., Li, Y., Ren, S., Wu, H., & Hao, Y. (2023). The role of digitalization on green economic growth: Does industrial structure optimization and green innovation matter? *Journal of Environmental Management*, *325*. https://doi.org/10.1016/j.jenvman.2022.116504

Kang, W. (2024). Research on the Impact of Environmental Protection Tax on Green Technology Innovation of Enterprises. *Transactions on Economics, Business and Management Research*, *6*, 1–20. https://doi.org/10.62051/brcq1632

Li, J., & Li, S. (2022). Environmental protection tax, corporate ESG performance, and green technological innovation. *Frontiers in Environmental Science*, *10*. https://doi.org/10.3389/fenvs.2022.982132

Li, J., Wang, L., & Nutakor, F. (2023). Empirical research on the influence of corporate digitalization on green innovation. *Frontiers in Environmental Science*, *11*. https://doi.org/10.3389/fenvs.2023.1137271

LI, Y. (2022). Corporate Social Responsibility of Chinese Manufacturing Companies' effect on

Green Business Strategy, Innovation and Performance. *Technium Social Sciences Journal*, *31*, 522–552. https://doi.org/10.47577/tssj.v31i1.6382

Long, H., Feng, G. F., Gong, Q., & Chang, C. P. (2023). ESG performance and green innovation: An investigation based on quantile regression. *Business Strategy and the Environment*, *32*(7), 5102–5118. https://doi.org/10.1002/bse.3410

Margaretha, F., & Witedjo, C. G. (2017). Csr, Company Value and Corporate Financial Performance in the Mining and Manufacturing Industry in Indonesia. *Accounting, Auditing & Information Research Media*, *14*(1), 89–114. https://doi.org/10.25105/mraai.v14i1.1754

Martínez-Falcó, J., Marco-Lajara, B., Zaragoza-Sáez, P., & Millán-Tudela, L. A. (2023). Analyzing the effect of Corporate Social Responsibility on Green Innovation Performance in the Spanish wine industry: A structural equation modeling analysis. *Agribusiness*, *39*(4), 985–1006. https://doi.org/10.1002/agr.21820

Mazodier, Marc, Francois Anthony Carrillat, Claire Sherman, and C. P. (2021). *Can donations be too little or too much?*

Mo, X., Boadu, F., Liu, Y., Chen, Z., & Ofori, A. S. (2022). Corporate Social Responsibility Activities and Green Innovation Performance in Organizations: Do Managerial Environmental Concerns and Green Absorptive Capacity Matter? *Frontiers in Psychology*, *13*(July). https://doi.org/10.3389/fpsyg.2022.938682

Purnama, H. (2022). THE ROLE OF CSR IN MEDIATING THE INFLUENCE OF DIGITALIZATION, INVESTMENT DECISIONS AND FINANCIAL PERFORMANCE ON COMPANY VALUE (Study on Pharmaceutical Companies on the IDX for the 2016-2020 Period). *Medikonis*, *13*(1), 29–40. https://doi.org/10.52659/medikonis.v13i1.52

Shahzad, M., Qu, Y., Zafar, A. U., Rehman, S. U., & Islam, T. (2020). Exploring the influence of knowledge management process on corporate sustainable performance through green innovation. *Journal of Knowledge Management*, *24*(9), 2079–2106. https://doi.org/10.1108/JKM-11-2019-0624

Sukmawati, riski arum. (2023). *THE EFFECT OF GREEN INNOVATION AND ENVIRONMENTAL RESPONSIBILITY ON THE COMPANY'S VALUE*.

Tchorzewska, K. B., Garcia-Quevedo, J., & Martinez-Ros, E. (2022). The heterogeneous effects of environmental taxation on green technologies. *Research Policy*, *51*(7). https://doi.org/10.1016/j.respol.2022.104541

Wang, J., Ma, M., Dong, T., & Zhang, Z. (2023). Do ESG ratings promote corporate green innovation? A quasi-natural experiment based on SynTao Green Finance's ESG ratings. *International Review of Financial Analysis*, *87*. https://doi.org/10.1016/j.irfa.2023.102623

Wang, X., & Ye, Y. (2024). Environmental protection tax and firms' ESG investment: Evidence from China. *Economic Modelling*, *131*. https://doi.org/10.1016/j.econmod.2023.106621

Wen, Chen; yufeng, Zhu; zehui, he; yang, yang. (2022). *The effect of local government debt on green innovation: Evidence from Chinese listed companies*.

Yang, C., Zhu, C., & Albitar, K. (2024). ESG ratings and green innovation: A U-shaped journey towards sustainable development. *Business Strategy and the Environment*, *December 2023*, 1–22. https://doi.org/10.1002/bse.3692

Yang, Y., & Jiang, Y. (2023). Does suppliers' slack influence the relationship between buyers' environmental orientation and green innovation? *Journal of Business Research*, *157*(January), 113569. https://doi.org/10.1016/j.jbusres.2022.113569

Yuan, B., & Cao, X. (2022). Do corporate social responsibility practices contribute to green innovation? The mediating role of green dynamic capability. *Technology in Society*,

68(December 2021), 101868. https://doi.org/10.1016/j.techsoc.2022.101868

Zhang, X., Song, Y., & Zhang, M. (2023). Exploring the relationship of green investment and green innovation: Evidence from Chinese corporate performance. *Journal of Cleaner Production*, *412*(April), 137444. https://doi.org/10.1016/j.jclepro.2023.137444

Zhao, A., Wang, J., Sun, Z., & Guan, H. (2022). Environmental taxes, technology innovation quality and firm performance in China—A test of effects based on the Porter hypothesis. *Economic Analysis and Policy*, *74*, 309–325. https://doi.org/10.1016/j.eap.2022.02.009

Zhou, Z.Q.; Liu, W.Y.; Wang, H.L.; Yang, J. . (2022). *The Impact of Environmental Regulation on Agricultural Productivity: From the Perspective of Digital Transformation*.