

THE EFFECT OF CSR AND FINANCIAL CONSTRAINTS ON FIRM VALUE THROUGH GREEN INNOVATION IN THE ENERGY SECTOR

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Abstrak

Penelitian ini menguji pengaruh Corporate Social Responsibility (CSR) terhadap Nilai Perusahaan, baik langsung maupun melalui Green Innovation sebagai mediator, serta peran Kendala Keuangan sebagai moderator, berdasarkan Teori Stakeholder. Metode menggunakan pendekatan kuantitatif eksplanatori dengan data panel perusahaan sektor energi yang terdaftar di BEI periode 2020–2024, sampel 42 perusahaan (210 observasi) melalui purposive sampling, dianalisis dengan Hayes' PROCESS Macro (Model 1, 4, 7). Hasil menunjukkan CSR berpengaruh positif signifikan terhadap Green Innovation, namun tidak berpengaruh signifikan terhadap Nilai Perusahaan baik langsung maupun melalui mediasi, dan Kendala Keuangan tidak terbukti memoderasi hubungan CSR terhadap Green Innovation. Penelitian selanjutnya disarankan memperluas model dan objek ke sektor lain; perusahaan sektor energi disarankan tetap merealisasikan komitmen CSR menjadi green innovation yang konkret.

Kata Kunci: Corporate Social Responsibility, Green Innovation, Kendala Keuangan, Nilai Perusahaan

Abstrak

This study examines the effect of Corporate Social Responsibility (CSR) on Firm Value, directly and through Green Innovation as a mediator, and the role of Financial Constraints as a moderator, based on Stakeholder Theory. Using an explanatory quantitative approach, panel data from energy sector companies listed on the Indonesia Stock Exchange (2020–2024) were analyzed; the sample of 42 companies (210 observations) was determined through purposive sampling and analyzed using Hayes' PROCESS Macro (Model 1, 4, 7). Results show CSR has a positive significant effect on Green Innovation, but not on Firm Value either directly or through mediation, and Financial Constraints do not moderate the CSR-Green Innovation relationship. Future research should extend

the model and object to other sectors; energy companies are advised to keep translating CSR commitments into concrete green innovation.

Keywords: *Corporate Social Responsibility, Green Innovation, Financial Constraints, Firm Value*

A. INTRODUCTION

Sustainability has become a strategic consideration for companies, particularly in the energy sector, whose operational activities directly affect the environment. Companies that are able to meet stakeholder expectations regarding social and environmental issues tend to gain greater resource support and trust, which ultimately contributes to business sustainability and increased firm value (Freeman, 1984). Corporate Social Responsibility (CSR) is one of the concrete manifestations of a company's efforts to meet these expectations, and is increasingly recognized as an integral part of corporate strategy for building stakeholder trust and market legitimacy (Cahyaningtyas et al., 2022); despite the growing attention to CSR, empirical evidence on its relationship with firm value remains inconsistent.

This inconsistency suggests that the interplay between CSR and firm value may not be direct, but rather channeled through other mechanisms, one of which is green innovation, namely the company's effort to integrate environmental aspects into its products, processes, and operational technology (Bansal, 2005; Chen & Lai, 2006). Green innovation is regarded as a concrete manifestation of stakeholder interest fulfillment whose benefits are directly felt, and has been shown to enhance firm performance and market valuation in prior studies (Liang et al., 2022), and is thus assumed to bridge the effect of CSR on firm value. Recent evidence from emerging markets further indicates that green innovation serves as a key pathway through which CSR translates into firm value (Sun et al., 2026). In addition, a company's capacity to realize green innovation cannot be separated from its financial condition; limited financial resources constrain a firm's ability to allocate resources efficiently to investments whose returns are realized over the medium to long term (Luo et al., 2021), and are thus assumed to influence the strength of the interaction between CSR and green innovation.

This study is specifically designed to examine the strength of the relationship among the core variables—CSR, green innovation, financial constraints, and firm value—solely from the perspective of Stakeholder Theory. This approach is intended to provide an understanding of how energy sector companies meet stakeholder expectations through CSR and green innovation. Based on the above description, this study seeks to investigate the impact of CSR on firm value both directly and through green innovation as a mediator, as well as to examine the role of financial constraints as a moderator in examining the association between CSR and green innovation, with the research object being energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2020–2024 period.

1. Theoretical Foundation: Stakeholder Theory

This study relies entirely on Stakeholder Theory as proposed by Freeman (1984), which states that a company's sustainability and value are determined not only by shareholder interests but also by the company's ability to meet the expectations of all stakeholders, including employees, customers, the government, and the surrounding community. Companies that are able to manage relationships with stakeholders well will gain stronger resource support, trust, and operational legitimacy, which in turn contributes to sustainability and increased firm value in the long term. Within the framework of this study, CSR is viewed as the company's primary instrument for meeting the interests of non-shareholder stakeholders, green innovation represents a concrete manifestation of that commitment whose benefits are directly felt by stakeholders, while financial constraints are viewed as a contextual factor that limits the company's capacity to meet those stakeholder expectations through the realization of green innovation.

2. The Effect of Corporate Social Responsibility on Firm Value

Based on Stakeholder Theory, companies that consistently meet stakeholder expectations through CSR activities will gain greater support and trust from stakeholders, including investors, thereby leading to an increase in firm value (Freeman, 1984). CSR disclosure strengthens the company's relationship with stakeholders and encourages investor interest,

thereby affecting the increase in firm value (Cahyaningtyas et al., 2022). Based on this argument, the first hypothesis is proposed as follows:

H1: Corporate Social Responsibility (CSR) has an effect on firm value.

3. The Effect of Corporate Social Responsibility on Green Innovation

Fulfilling stakeholder expectations through CSR encourages companies to change their production processes and technology to meet the sustainability demands expected by stakeholders (Bansal, 2005). Companies that consistently implement CSR tend to be more driven to develop environmentally friendly products, processes, and technologies as a concrete manifestation of meeting stakeholder interests, because CSR commitments that are merely symbolic without concrete action risk being perceived as greenwashing by increasingly critical stakeholders (Chen & Lai, 2006). Based on the above description, the second hypothesis is formulated as follows:

H2: Corporate Social Responsibility (CSR) has an effect on green innovation.

4. The Effect of Green Innovation on Firm Value

Green innovation represents the fulfillment of stakeholder interests related to environmental aspects whose benefits are directly felt, and is therefore responded to positively by stakeholders, including investors, through increased firm valuation (Liang et al., 2022). Companies that are actively engaged in green innovation are considered more responsive to stakeholder expectations and have lower long-term business risk compared to their competitors. Based on the above description, the third hypothesis is formulated as follows:

H3: Green Innovation has an effect on firm value.

5. Green Innovation Mediates the Effect of CSR on Firm Value

In line with the Stakeholder Theory perspective, CSR that is merely disclosed without being accompanied by concrete realization tends to be insufficiently convincing to stakeholders, so that green innovation acts as a bridge that translates CSR commitment into concrete outcomes that can be assessed and appreciated by stakeholders, including investors (Li et al., 2018). Previous empirical findings support this mediating role, where green innovation has been

shown to be the main pathway through which CSR affects firm value and performance (Sun et al., 2026). Based on the above description, the fourth hypothesis is formulated as follows:

H4: Green innovation mediates the effect of Corporate Social Responsibility (CSR) on firm value.

6. Financial Constraints Moderate the Effect of CSR on Green Innovation

A company's capacity to meet stakeholder expectations through the realization of green innovation cannot be separated from its financial condition. Financial constraints affect a company's ability to allocate resources to translate CSR commitments into green innovation, which requires substantial initial investment with results that only become apparent in the medium to long term (Luo et al., 2021). Based on the above description, the fifth hypothesis is formulated as follows:

H5: Financial constraints moderate the effect of Corporate Social Responsibility (CSR) on green innovation

B. METHOD

1. Research Design and Data Sources

This study adopts a quantitative approach using an explanatory research design to investigate the causal relationships among the variables (Sugiyono, 2020). Corporate Social Responsibility serves as the independent variable, Firm Value as the dependent variable, Green Innovation as the mediating variable, and Financial Constraints as the moderating variable. The data used is panel data in the form of secondary data sourced from the annual reports, sustainability reports, and financial statements the data were collected from energy sector companies through the official website of the Indonesia Stock Exchange (IDX) and the respective companies' official websites covering the period from 2020 to 2024.

2. Population, Sample, and Sampling Technique

The population of this study is all energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2020–2024 period, totaling 73 companies. The sample was

determined using a purposive sampling technique based on the criteria of companies that published complete annual reports and sustainability reports during the observation period, resulting in 42 companies with a total of 210 firm-year observations.

3. Operational Definition of Variables

Firm Value

Firm Value is investors' perception of the company's level of success as reflected in its market value, which can be observed through its stock price, determined by supply and demand in the capital market. Firm Value can be measured using the following equation (Damas et al., 2021):

$$\text{Tobin's Q} = \frac{\text{Market Value of Equity (MVE)} + \text{Total Liabilities}}{\text{Total Asset}}$$

Description:

Tobin's Q : Firm Value

MVE : Market Value of Equity (market value of all outstanding shares = stock price × number of shares outstanding)

Total Liabilities : Book value of the company's total debt

Total Assets : Book value of the company's total assets

Corporate Social Responsibility

Corporate Social Responsibility is the company's commitment to social and environmental responsibility toward stakeholders (Cahyaningtyas et al., 2022). It is measured through the CSR disclosure index based on POJK Regulation No. 51/POJK.03/2017, consisting of 50 disclosure items. Measurement is carried out by assessing each disclosed item; each disclosed item is assigned a score of 1, whereas each undisclosed item is assigned a score of 0. The extent of CSR disclosure can be measured using the following formula:

$$\text{CSR Index} = \sum \frac{Xi}{N}$$

Description:

CSR = Corporate Social Responsibility Disclosure Index

Xi = Disclosure item score (1 if disclosed, 0 if not)

N = Total number of disclosure items (50 items)

Green Innovation

Green Innovation is the company's strategy for supporting promoting sustainable development through the development of eco-friendly products and processes, technologies, and operational practices (Chen & Lai, 2006; Liang et al., 2022). It is measured through an annual report content index based on three indicators, namely energy/water/waste efficiency, the use of environmentally friendly materials, and recycling practices, using the following formula:

$$\text{Green Innovation} = \sum \frac{Xi}{N}$$

Description:

GI = Green Innovation Index

Xi = Indicator score (1 if disclosed, 0 if not)

N = Total number of indicators (3 indicators)

Financial Constraints

Financial Constraints refer to the condition in which a company experiences limitations in obtaining external funding sources to finance its investment and operational activities (Luo et al., 2021). Financial Constraints are measured using the Size-Age Index with the following formula (Hadlock & Pierce, 2010):

$$SA = (-0.737 \times \text{Size}) + (0.043 \times \text{Size}^2) - (0.040 \times \text{Age})$$

Description:

SA = Size-Age Index (Financial Constraints)

Size = Firm size (natural logarithm of total assets)

Age = Firm age (years since establishment or listing)

4. Data Analysis Technique

This study uses Hayes' PROCESS Macro version 4.2 as the data analysis technique with the aid of SPSS. Testing was carried out through three models. Model 1 was used to test whether

Financial Constraints moderate the effect of CSR on Green Innovation, with significance indicated by the CSR×Financial Constraints interaction coefficient. Model 4 was used to test whether Green Innovation mediates the effect of CSR on Firm Value, with the significance of the indirect effect indicated by a bootstrap confidence interval (BootLLCI and BootULCI) that does not cross zero. Model 7 was used to test both simultaneously (moderated mediation), to examine whether the strength of the mediating effect of Green Innovation differs across levels of Financial Constraints.

C. RESULTS AND DISCUSSIONS [Times New Roman 12, Bold]

1. Descriptive Statistics

Table 1 presents the descriptive statistics of the core research variables based on 138 observations (after outlier treatment).

Table 1. Descriptive Statistics

	N	Min	Max	Mean	Std. Deviation
Firm Value	210	-1,10	10,90	1,6067	1,55879
CSR	210	0,30	1,00	0,8124	0,22013
Green Innovation	210	0,00	1,00	0,7410	0,40586
Financial constraints	210	2,00	25,00	13,9524	3,29820
Valid N (listwise)	210				

Source: SPSS 27

Based on Table 1, the Firm Value variable has a mean of 1.6067 with a standard deviation of 1.55879, indicating fairly wide variation in valuation among the sample companies, with a

minimum value of -1.10 indicating that some companies were valued by the market below their book value. The CSR variable has a mean of 0.8124 and a standard deviation of 0.22013, indicating that CSR disclosure levels among the sample companies are relatively high and fairly uniform, since the mean is much larger than its standard deviation. The Green Innovation variable has a mean of 0.7410 and a standard deviation of 0.40586, with a value range of 0.00 to 1.00, indicating that some companies have not yet implemented any green innovation indicators, while others have fully implemented them. The Financial Constraints variable has a mean of 13.9524 and a standard deviation of 3.29820, with values ranging from 2.00 to 25.00, indicating fairly diverse levels of external funding limitations among the energy sector companies in the sample.

2. Hypothesis Testing Results

Tables 2–7 present the results of hypothesis testing using Hayes' PROCESS Macro Model 1, Model 4, and Model 7.

Table 2. Moderation Test Model 1 (Outcome: Green Innovation)

Antecedent	Coeff	SE	t	P	LLCI	ULCI
CSR	1,6839	0,1916	8,7880	<0,001	1,3061	2,0617
Financial constraints	-0,0141	0,0124	-1,1351	0,2576	-0,0386	0,0104
CSR x Financial constraints	0,0069	0,0145	0,4762	0,6344	-0,0217	0,0354
Constant	-0,5104	0,1573	-3,2439	0,0014	-0,8206	-0,2002

R = 0.9374; R-sq = 0.8788; F(3,206) = 497.7131; p < 0.001

Source: *PROCESS Macro v4.2 by Andrew F Hayes, SPSS 27*

Table 3. Mediation Test Model 4 (Consequent: Green Innovation and Firm Value)

Antecedent	Consequent					
	Green Innovation			Firm Value		
	Coeff	SE	p	Coeff	SE	p
CSR	1,7243	0,0453	<0,001	-1,4436	1,3788	0,2963
Green Innovation				0,3271	0,7478	0,6622
Constant	-0,6598	0,0381	<0,001	2,5370	0,6421	<0,001
R-sq = 0.8747; F(1,208) = 1451.4750; p < 0.001			R-sq = 0.0163; F(2,207) = 1.7188; p = 0.1818			

Source: *PROCESS Macro v4.2 by Andrew F Hayes, SPSS 27*

Table 4. Mediation Test Model 4 – Indirect Effect

	Effect	BootSE	BootLLCI	BootULCI
Green Innovation	0,5641	1,2395	-1,9545	3,0185

Source: *PROCESS Macro v4.2 by Andrew F Hayes, SPSS 27*

Table 5. Moderated Mediation Test Model 7 (Consequent: Green Innovation)

Antecedent	Consequent					
	Green Innovation			Firm Value		
	Coeff	SE	p	Coeff	SE	p
CSR	1,6839	0,1916	<0,001	-1,4436	1,3788	0,2963
Financial constraints	-0,0141	0,0124	0,2576			
CSR x Financial constraints	0,0069	0,0145	0,6344			
Green Innovation				0,3271	0,7478	0,6622
Constant	-0,5104	0,1573	0,0014	2,5370	0,6421	<0,001
R-sq = 0.8788; F = 497.7131; p < 0.001			R-sq = 0.0163; F = 1.7188; p = 0.1818			

Source: *PROCESS Macro v4.2 by Andrew F Hayes, SPSS 27*

Table 6. Conditional Indirect Effect Model 7

Financial constraints (Z)	Effect	BootSE	BootLLCI	BootULCI
11,00 (low)	0,5757	1,2718	-1,8825	3,0693
14,00 (medium)	0,5825	1,2837	-1,8751	3,1284
17,00 (high)	0,5892	1,2966	-1,8602	3,2031

Source: *PROCESS Macro v4.2 by Andrew F Hayes, SPSS 27*

Table 7. Index of Moderated Mediation

	Index	BootSE	BootLLCI	BootULCI
Financial constraints (Z)	0,0023	0,0133	-0,0178	0,0383

Source: *PROCESS Macro v4.2 by Andrew F Hayes, SPSS 27*

Table 8. Combined Regression Results

Path	Model 1	Model 4	Model 7
CSR → Green Innovation	1,6839*** (8,788)	1,7243*** (38,098)	1,6839*** (8,788)
Financial constraints → Green Innovation	-0,0141 (-1,135)		-0,0141 (-1,135)
CSR x Financial Constraints → Green Innovation	0,0069 (0,476)		0,0069 (0,476)
CSR → Firm Value (direct)		-1,4436 (-1,047)	
Green Innovation → Firm Value		0,3271 (0,438)	
CSR → Green Innovation → Firm Value (indirect)		0,5641 (Boot CI = -1,9545; 3,0185)	
Index of Moderated Mediation			0,0023 (Boot CI = -0,0178; 0,0383)
F, Sig.	497,7131*** (0,000)	1451,4750***/1,7188 (0,000/0,182)	497,7131***/1,7188 (0,000/0,182)
R ²	0,8788	0,8747/0,0163	

*p<0.10; **p<0.05; ***p<0.01

Source: *PROCESS Macro v4.2 by Andrew F Hayes, SPSS 27*

Table 9. Summary of Hypothesis Testing Results

Hypothesis	Result	Conclusion
CSR → Firm Value	Not significant ($\alpha = 5\%$)	H1 Not supported
CSR → Green Innovation	Positive and significant	H2 Supported
Green Innovation → Firm Value	Not significant ($\alpha = 5\%$)	H3 Not supported
Green Innovation mediates CSR → Firm Value	Bootstrap CI crosses 0	H4 not supported
Financial Constraints moderates CSR → Green Innovation	Interaction not significant	H5 Not supported

Source: *PROCESS Macro v4.2 by Andrew F Hayes, SPSS 27*

3. Discussion

The regression model for Firm Value in Model 4 and Model 7 was only able to explain 1.63% of the variation in Firm Value ($R\text{-sq} = 0.0163$; $p = 0.1818$, not significant overall). This indicates that CSR and Green Innovation are not yet strong enough to independently explain the variation in Firm Value among energy sector companies, and other factors outside the model likely play a more dominant role in influencing firm valuation.

The Effect of CSR on Firm Value (H1). The findings indicate that CSR does not significantly affect firm value, either in Model 4 or Model 7 (Coeff = -1.4436; $p = 0.2963 > 0.05$), so H1 is not supported. This result suggests that the capital market does not directly respond to CSR disclosure as a signal of stakeholder expectation fulfillment, but instead pays more attention to its concrete realization.

The Effect of CSR on Green Innovation (H2). CSR was found to have a positive and highly significant effect on Green Innovation across all models (Model 1: Coeff = 1.6839, $p < 0.001$; Model 4: Coeff = 1.7243, $p < 0.001$), so H2 is supported. This result is in line with the findings of the Stakeholder Theory perspective, in which companies that consistently implement CSR direct their resources toward realizing environmentally friendly innovation as a manifestation of meeting stakeholder expectations.

The Effect of Green Innovation on Firm Value (H3). Green Innovation was not found to have a

significant effect on Firm Value (Coeff = 0.3271; $p = 0.6622 > 0.05$), so H3 is not supported. This indicates that the realization of green innovation is not yet sufficient to directly influence market perceptions of firm valuation in the energy sector, suggesting that investor appreciation of environmental innovation may be more complex and not immediately reflected in stock prices in the short term.

The Mediating Role of Green Innovation (H4). The bootstrap results show an indirect effect of CSR on Firm Value through Green Innovation of 0.5641, with a range from BootLLCI -1.9545 to BootULCI 3.0185, which crosses zero, so the indirect effect is declared not significant and H4 is not supported. Although the coefficient direction remains positive, the mediating pathway of Green Innovation is not yet statistically strong enough to explain the effect of CSR on Firm Value among energy sector companies.

The Moderating Role of Financial Constraints (H5). The CSR×Financial Constraints interaction coefficient is not significant in either Model 1 (Coeff = 0.0069; $p = 0.6344$) or Model 7, and the Index of Moderated Mediation is also not significant (BootLLCI -0.0178 to BootULCI 0.0383, crossing zero), so H5 is not supported. Financial Constraints were not found to statistically moderate the relationship between CSR and Green Innovation, indicating that energy sector companies tend to remain consistent in translating CSR into green innovation regardless of the level of financial constraints they face.

D. CONCLUSIONS

This study found that Corporate Social Responsibility consistently drives energy sector companies to realize green innovation, in line with Stakeholder Theory, which views CSR as an instrument for meeting stakeholder expectations. However, the strength of the relationship between CSR and green innovation has not been convincingly reflected in firm value, whether through a direct effect, mediation by green innovation, or moderation by financial constraints. This finding indicates that the capital market in the energy sector may consider factors other than CSR and green innovation when valuing companies, so the relationship among these core variables still requires further investigation before it can be broadly generalized.

This study has limitations, including a sample scope limited to energy sector companies within a specific observation period, and a research model that only involves core variables without considering other factors that could potentially affect firm value. These limitations should be taken into account when interpreting and generalizing the research findings.

E. SUGGESTIONS

Future research is suggested to extend the model and research object to other industry sectors outside the energy sector to test the consistency of the findings in a broader context, as well as to consider adding other grand theories, such as Legitimacy Theory, as a complementary perspective to Stakeholder Theory. Future research may also consider other relevant variables beyond CSR, green innovation, and financial constraints to gain a more comprehensive understanding of the determinants of firm value. For energy sector companies, it is recommended that they continue to translate CSR commitments into concrete and measurable green innovation, given that the relationship between the two has proven strong and consistent in this study.

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