Carbon Emission Disclosure and the Allocation of Value added: Employee, Shareholder, Tax, and Creditor Views

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Abstract: This study examines the effect of carbon emission disclosure on the allocation of value added to key stakeholders-employees, shareholders, tax authorities, and creditors-using a stakeholder-oriented value added framework. The study employs an panel dataset comprising 628 firm-year observations of manufacturing publicly listed companies over the period 2019-2023. Panel data regression with industry and year fixed effects is applied as the main analytical method. The empirical results indicate that carbon emission disclosure functions as a value redistribution mechanism rather than a practice that uniformly enhances value for all stakeholders. Carbon emission disclosure is consistently negatively associated with value added allocated to employees and creditors, while it is positively related to value added distributed to shareholders, particularly after accounting for time effects. In contrast, no significant relationship is found between carbon emission disclosure and value added allocated to tax authorities, suggesting that value distribution to the government is more strongly driven by firms' structural characteristics, such as size and leverage. The robustness tests confirm that these findings remain consistent after controlling for firm heterogeneity and unobserved selection bias. Theoretically, this study contributes to stakeholder theory, signaling theory, and legitimacy theory by demonstrating that carbon disclosure reshapes the internal distribution of corporate value. Practically, the findings offer important implications for managers, investors, and policymakers in designing more inclusive and sustainable environmental disclosure strategies.

Keywords: Carbon Emission Disclosure, Value Added, Stakeholders, Value Distribution, Environmental Disclosure

1. Introduction

Carbon emission disclosure has emerged as a critical mechanism through which firms communicate their climate-related activities to stakeholders, as growing environmental challenges increasingly demand greater corporate transparency, enabling informed decision-making by shareholders, creditors, and other constituents (Wahyuningrum et al., 2024). Internal organizational characteristics significantly influence the extent of ESG disclosure, indicating potential trade-offs in stakeholder-oriented reporting (Tang, 2025).

Climate change disclosure is increasingly used by firms as a legitimacy mechanism to respond to environmental pressures and stakeholder expectations (Butar Butar et al., 2025).

ESG disclosure reflects managerial priorities shaped by governance structures and stakeholder pressures rather than purely ethical considerations (Itan et al., 2025). Legitimacy theory posits that firms engage in environmental, social, and governance reporting to maintain legitimacy and conform to societal expectations, using ESG disclosures to fulfill social contracts and ensure organizational survival (Hartoni & Djakman, 2025). Stakeholder theory emphasizes that value creation extends beyond shareholder primacy, recognizing employees, creditors, government entities, and communities as legitimate claimants to organizational wealth (Johannsdottir & Davidsdottir, 2024).

The relationship between carbon emission disclosure and corporate financial performance remains contentious within academic literature, with empirical findings revealing complex and sometimes contradictory patterns. Research indicates that carbon disclosure can significantly improve corporate financial performance by reducing debt financing costs and increasing institutional investor shareholding (Xu et al., 2025) However, empirical evidence suggests that carbon disclosure may exert negative effects on financial performance in the short term due to increased compliance and reporting costs, while generating positive impacts over the long term through improved transparency and risk management, indicating intertemporal dynamics in value creation (Lu et al., 2021). A comprehensive review of literature reveals inconclusive relationships between carbon disclosure and financial measures, potentially resulting from variations in measurement approaches, sample geographies, and methodological differences (Santos, 2024). Prior evidence shows that ESG disclosure may generate economic consequences that are not always immediately beneficial to firm performance (Tang et al., 2025). These divergent findings underscore the necessity for nuanced investigations that account for contextual factors, temporal dimensions, and measurement specifications when examining carbon disclosure outcomes. More importantly, emerging evidence suggests that ESG practices may alter firms' economic behavior and redistribute risk and returns among stakeholders rather than uniformly enhancing firm value (Hesniati et al., 2025).

Value added statements represent an underutilized yet potentially powerful framework for understanding how firms create and distribute wealth among stakeholders beyond traditional shareholder-centric metrics. The distribution of value added becomes crucial when companies implement strategies to minimize costs and maximize revenues, as such approaches may constitute wealth appropriation favoring shareholders at the expense of other stakeholders through mechanisms like tax minimization or labor cost reduction (Santos, 2024).

Government's role as a value recipient through taxation and regulatory engagement represents a frequently overlooked yet essential component of value added distribution

frameworks in carbon disclosure contexts. Firms engaging in carbon disclosure may seek economic benefits from government including tax breaks and financial subsidies, with resource allocation tilting toward environmentally responsible organizations (Aragon-Correa et al., 2021). The relationship between ESG disclosure and tax practices can be examined through stakeholder theory, which suggests companies should give back to society for resource utilization through taxation and other mechanisms (Amarna et al., 2025). Legitimacy theory alternatively proposes that firms may use ESG disclosure to obscure or counteract negative impressions created by tax avoidance practices that could impact firm value and stakeholder relationships (Alomair & Metwally, 2025).

The impact mechanism of carbon disclosure on firm value remains partially unexplored, with the internal logic of value creation processes inadequately understood (Rachmadhika & Firmansyah, 2025). Existing research predominantly focuses on singular stakeholder perspectives or aggregate financial outcomes rather than examining comprehensive value distribution patterns. This fragmented approach limits understanding of how carbon disclosure simultaneously affects multiple stakeholder groups and whether transparency engenders more equitable wealth allocation or primarily serves strategic legitimacy purposes without substantively altering distribution dynamics.

This study addresses identified research gaps by investigating the relationship between carbon emission disclosure and value added allocation to employees, shareholders, tax authorities, and creditors using a comprehensive analytical framework. The research objectives encompass first, examining whether firms engaging in carbon emission disclosure demonstrate differential patterns in value added creation and distribution compared to non-disclosing firms; second, analyzing how disclosure quality and comprehensiveness influence the proportion of value allocated to respective stakeholder groups; third, investigating whether carbon disclosure mediates relationships between firm characteristics and stakeholder value distribution; and fourth, assessing contextual factors that moderate these relationships across industries, regions, and temporal periods.

This research contributes to theory and practice by integrating carbon disclosure literature with value added frameworks, providing empirical evidence on the tangible outcomes of environmental transparency for multiple stakeholders simultaneously. Theoretically, the study extends stakeholder theory by demonstrating how specific disclosure practices influence value distribution mechanisms (Al Amosh & Khatib, 2022), enriches legitimacy theory by examining whether carbon disclosure represents substantive wealth redistribution or symbolic

legitimation (Kono et al., 2023), and advances signaling theory by analyzing which stakeholder groups respond most strongly to environmental information signals.

Literature Review and Hypothesis Development

Legitimacy Theory

Contemporary legitimacy theory conceptualizes corporate legitimacy as a dynamic condition requiring continuous alignment between organizational actions and evolving societal expectations, particularly regarding environmental responsibility and sustainability (Olateju & Olateju, 2021). In the context of climate change, firms in environmentally sensitive industries face heightened legitimacy pressures from public concern, regulatory scrutiny, and investor demand, leading them to adopt environmental and carbon emission disclosures as mechanisms to signal conformity with social norms (Cho et al., 2015). Prior studies suggest that such disclosures may function as strategic legitimacy responses that are symbolic rather than fully substantive, as firms can enhance external legitimacy without proportionally reallocating internal resources (Meng et al., 2019; Herbert and Graham, 2022). As a result, carbon emission disclosure may produce asymmetric economic outcomes by strengthening capital market legitimacy while generating internal trade-offs in stakeholder-oriented value added allocation, supporting legitimacy theory as a framework for explaining uneven value distribution among stakeholders (Olateju & Olateju, 2021). Accordingly, legitimacy theory provides a coherent theoretical foundation for explaining why carbon emission disclosure may reshape stakeholder-oriented value added allocation rather than uniformly increasing value creation for all stakeholders.

Stakeholder Theory

Stakeholder theory views corporations as economic and social institutions whose purpose extends beyond shareholder wealth maximization to the creation and distribution of value among multiple stakeholder groups (Schnure Baumfield, 2016). Because firms depend on diverse stakeholders for critical resources, value creation and value distribution are inherently interconnected and shaped by managerial decisions and disclosure practices (Freeman et al., 2020; Re et al., 2025). Within this framework, environmental and carbon emission disclosure functions not only as an informational tool but also as a governance mechanism that influences stakeholder relationships by altering perceptions of risk and long-term sustainability (Johannsdottir & Davidsdottir, 2024). Given heterogeneous and competing stakeholder interests, enhanced transparency may strengthen some stakeholder claims while constraining others, implying that carbon emission disclosure can reshape the internal

allocation of value added among employees, shareholders, tax authorities, and creditors rather than uniformly improving stakeholder welfare (Brühl and Osann, 2010; Upton and Fleishman, 2020). Accordingly, stakeholder theory provides a coherent foundation for analyzing carbon emission disclosure as a mechanism that reshapes the internal allocation of value added among employees, shareholders, tax authorities, and creditors, rather than as a practice that uniformly increases welfare for all stakeholders.

Institutional Theory

Institutional theory explains corporate disclosure behaviour as a response to external institutional pressures, including regulatory requirements, investor expectations, and industry norms, which shape organizational practices beyond efficiency considerations (Wright, 2025; Pozzoli et al., 2023). As carbon emission disclosure becomes institutionalized as a governance expectation, firms tend to prioritize compliance with regulatory and capital market norms, which can redirect managerial attention and resources toward institutionally favoured objectives (Kaplan & Levy, 2025).

Consequently, institutional pressures associated with carbon disclosure can indirectly influence internal resource allocation decisions, potentially favouring stakeholder groups aligned with dominant institutional logics, such as shareholders and creditors, while limiting managerial flexibility in value allocation to other stakeholders, including employees and tax authorities (Herold, 2018; Pinheiro et al., 2023). Accordingly, institutional theory provides a coherent theoretical foundation for analysing carbon emission disclosure as an externally driven mechanism that reshapes stakeholder-oriented value added allocation rather than uniformly enhancing value creation across all stakeholder groups (D. M. Herold et al., 2019).

Carbon Emission Disclosure and Value added Framework

The value added Statement emerges as a superior analytical instrument for examining stakeholder wealth distribution compared to conventional profit-oriented financial statements. Unlike traditional income statements that prioritize shareholder returns exclusively, the value added Statement explicitly quantifies wealth creation and its allocation among employees through compensation, shareholders through dividends, governments through taxation, and creditors through financing costs (Jaenudin et al., 2025). This approach aligns conceptually with stakeholder theory's emphasis on multi-constituent value creation while providing quantifiable metrics for empirical investigation.

Carbon Disclosure and Employee Value Allocation

Carbon emission disclosure represents a form of environmental accountability that entails additional compliance, monitoring, and reporting costs, which can alter firms' internal cost structures and reduce short-term financial flexibility (Kotchen et al., 2020). Environmental economics literature further indicates that environmental regulation and climate-related policy interventions increase operational costs, prompting firms to undertake internal cost adjustments to maintain competitiveness, particularly in environmentally sensitive industries (Kotchen et al., 2020; Kennard, 2020). Empirical evidence shows that labor-related expenditures often serve as a primary adjustment margin when firms face rising environmental costs, as wages, employment growth, and employee benefits are relatively more flexible in the short run than fixed financial obligations or regulatory requirements (Heutel & Zhang, 2021). Consequently, firms operating under stronger environmental constraints may restrain wage growth, limit employment intensity, or reduce labor compensation to absorb the financial burden associated with environmental policies and disclosure requirements (Heutel & Zhang, 2021).

From a disclosure and legitimacy perspective, carbon emission disclosure is frequently adopted as a strategic response to regulatory and societal pressures, whereby firms prioritize external compliance and reputational considerations while internalizing the associated costs through internal resource reallocation rather than external value distribution (Cho et al., 2015). This internalization implies that the economic consequences of carbon disclosure are uneven across stakeholder groups, as firms adjust internal cost allocations to protect external legitimacy and market standing (Cho et al., 2015). Within a value added framework, these internal cost adjustments suggest that increased emphasis on carbon disclosure and environmental compliance may reduce the proportion of value added allocated to employees (Kotchen et al., 2020; Heutel and Zhang, 2021). Consequently, enhanced carbon emission disclosure is expected to be associated with a lower share of value added distributed to employees.

Based on this reasoning, this study proposes the following hypothesis:

H1: Carbon emission disclosure negatively influences the allocation of value added to employees.

Carbon Disclosure and Shareholder Value Allocation

Carbon emission disclosure enhances the informational environment of capital markets by increasing transparency regarding firms' exposure to climate-related risks and environmental strategies, thereby reducing information asymmetry between firms and equity investors (Moussa & Elmarzouky, 2024). Improved carbon-related disclosure enables investors

to better assess long-term risk and expected returns, which can strengthen investor confidence and increase firms' attractiveness to equity capital providers (Han & Lu, 2023).

Empirical evidence indicates that firms with stronger environmental and carbon disclosure tend to exhibit higher firm valuation, greater stock price resilience, and more favorable investor responses, suggesting that environmental transparency is positively valued by shareholders (Hsieh & Fu, 2025). From a signaling perspective, carbon emission disclosure serves as a credible signal of proactive environmental risk management and long-term strategic orientation, which attracts long-term investors and supports shareholder wealth creation (Mirza Aulia et al., 2024). Within a value added framework, these capital market benefits imply that firms engaging in carbon emission disclosure are more likely to allocate a greater proportion of value added to shareholders (Kim & Kim, 2018). Accordingly, this study hypothesizes:

H2: Carbon emission disclosure positively influences the allocation of value added to shareholders.

Carbon Disclosure and Tax Authority Value Allocation

Carbon emission disclosure increases transparency regarding firms' environmental performance, which can intensify public and regulatory scrutiny of corporate reporting and tax compliance, thereby influencing corporate tax planning behaviour (Gu & Wang, 2023). Prior studies show that enhanced environmental information disclosure is associated with changes in tax avoidance practices, as firms adjust tax strategies in response to heightened regulatory and public pressure (Gu & Wang, 2023). Environmental disclosure may also prompt stronger tax authority monitoring and enforcement, increasing tax compliance costs and limiting opportunities for aggressive tax planning, which can indirectly affect taxable income and tax payments (Asmoro et al., 2024). Consistent with this view, research on ESG and tax behaviour indicates that stronger environmental performance is associated with reduced tax avoidance, implying that firms with higher environmental accountability may allocate a larger proportion of economic value to tax obligations (Lee, 2024). Consequently, carbon emission disclosure may constrain firms' discretion over tax minimization strategies, suggesting a negative relationship between carbon emission disclosure and the allocation of value added to tax authorities.

Accordingly, this study hypothesizes:

H3: Carbon emission disclosure negatively influences the allocation of value added to tax authorities.

Carbon Disclosure and Creditor Value Allocation

Carbon emission disclosure enhances transparency regarding firms' environmental risk exposure, enabling creditors to better assess default and transition risks that may affect debt repayment and credit quality (Nasih et al., 2024). More comprehensive disclosure reduces information asymmetry between management and debt holders and can influence lending terms and interest rates based on perceived climate risk profiles (Nasih et al., 2024). Empirical evidence further indicates that higher levels of carbon emission disclosure are associated with lower cost of debt, as creditors interpret improved transparency as a signal of better risk management and reduced uncertainty (Nasih et al., 2024).

However, enhanced disclosure also increases the visibility of long-term liabilities and regulatory compliance costs related to climate transition, which may heighten creditors' risk perceptions and constrain debt pricing, thereby reducing the proportion of value received through interest and financing costs (Owolabi et al., 2024) Within a value added framework, since interest and financing expenses represent the primary channel through which value is allocated to creditors, reduced borrowing costs or tighter debt pricing imply a lower share of value added allocated to creditors (Nasih et al., 2024; Owolabi et al., 2024). Accordingly, carbon emission disclosure is expected to be negatively associated with the allocation of value added to creditors (Kleimeier & Viehs, 2016).

Therefore, this study proposes:

H4: Carbon emission disclosure negatively influences the allocation of value added to creditors.

Research Framework

This study examines the relationship between carbon emission disclosure and stakeholder-oriented value added allocation. Carbon emission disclosure is specified as the independent variable, while value added allocation represents the distribution of economic value among employees, shareholders, tax authorities, and creditors. The analysis controls for firm size, leverage, and commissioner independence to account for differences in organizational scale, financial structure, and governance characteristics that may influence value distribution decisions.

2. Research Method

Research Design

This study adopts a quantitative research design using an archival panel data approach, consistent with prior studies examining sustainability or environmental disclosure and value-

added distribution from a stakeholder perspective (Joudeh et al., 2024). Panel data analysis allows the study to capture both cross-sectional and time-series variations, improving estimation efficiency while controlling for unobserved firm-specific heterogeneity, as commonly applied in sustainability disclosure and value-added studies (Joudeh et al., 2024).

Sample and Data Sources

The research sample comprises non-financial publicly listed firms observed from 2019 to 2023, resulting in an unbalanced panel of 628 firm-year observations. Consistent with prior disclosure-based studies, the sample requires the availability of annual and sustainability reports. Financial data are obtained from audited annual reports, while carbon emission disclosure data are manually collected from sustainability reports and corporate disclosures following established methodologies (Joudeh et al., 2024). Industry classification is based on the Standard Industrial Classification (SIC) system to support the application of industry fixed effects.

Variables Measurement

Independent Variable

Table 1 Independent Variable

Variable	Measurement/Definition	Source
Carbon Emission Disclosure	Carbon emission disclosure: GRI 305 disclosure index (GRI 305-1 to 305-7), scored 1 if disclosed and 0 otherwise; total score divided by 7.	Joudeh et al., 2024

The independent variable in this study is Carbon Emission Disclosure, measured as a binary indicator, where firms that disclose carbon emission–related information are assigned a value of 1 and 0 otherwise, as summarized in Table 1. This operationalization follows the sustainability disclosure measurement approach based on the Global Reporting Initiative (GRI) framework, which assigns disclosure presence rather than disclosure intensity (Joudeh et al., 2024). This binary measurement reflects firms' commitment to environmental transparency and has been applied extensively in prior sustainability and value-added literature (Joudeh et al., 2024).

Dependent Variables

The dependent variables represent value added allocation from a stakeholder perspective, measured following value-added accounting principles:

Table 2. Dependent Variables

Variable	Measurement/Definition	Source
Employee value added	Salary and employee benefits divided by total value added.	Joudeh et al., 2024

Shareholder value added	Dividends divided by total value added.	Joudeh et al., 2024
Tax authority value added	Income tax expense divided by total value added.	Joudeh et al., 2024
Creditor value added	Interest and financing expenses divided by total value added.	Joudeh et al., 2024

This stakeholder-based value-added structure is consistent with prior studies examining sustainability disclosure and value creation across multiple stakeholder groups (Joudeh et al., 2024).

Control Variables

To isolate the effect of carbon emission disclosure, the model incorporates several control variables commonly used in sustainability and value-added studies:

Table 3. Control Variables

Variable	Measurement/Definition	Source
Firm Size	Natural logarithm of total assets.	Joudeh et al., 2024
Leverage	Total liabilities divided by total assets.	Benlemlih et al., 2018
Commissioner Independence	Proportion of independent commissioners on the board of commissioners.	García-Sánchez et al., 2022

The inclusion of firm size and leverage follows prior empirical research showing their influence on disclosure practices and value distribution, while commissioner independence captures governance quality effects (Joudeh et al., 2024).

Data Analysis Techniques

The analysis proceeds in several stages. Descriptive statistics are used to summarize the distribution and dispersion of the variables, followed by Pearson correlation analysis to examine bivariate relationships and assess multicollinearity (Joudeh et al., 2024). In addition, a Heckman two-stage selection model is employed as a robustness test to correct for potential selection bias in value-added allocation models (Joudeh et al., 2024).

3. Results and Discussion

3.1 Results

Descriptive Statistics

To establish an initial understanding of the data structure and distributional properties, Table 1 presents the descriptive statistics for all variables, providing an overview of value added allocation across stakeholder groups, carbon emission disclosure, and key firm characteristics.

Table 1 Descriptive Statistics

	Mean	Median	Minimum	Maximum
VAE	0.373	0.414	-34.450	31.031
VASH	0.081	0.000	-0.379	1.252

VATA	0.093	0.071	-0.990	13.509
VACR	0.093	0.060	-27.106	13.182
CEDI	0.200	0.000	0.000	1.000
FSIZE	28.599	28.369	25.049	33.731
LEV	0.498	0.428	0.002	5.168
KOMINDP	0.419	0.400	0.167	1.000

Source: Data processed –Stata17

The descriptive statistics indicate substantial heterogeneity in value added allocation across firms. Employee value added shows the highest mean (0.373), suggesting that employees receive the largest share on average, although the wide range reflects considerable cross-firm variation in labor cost structures. In contrast, shareholder value added exhibits a low mean (0.081) and a median of zero, indicating that many firms allocate little or no value to shareholders in certain periods. Tax authority and creditor value added display similar mean values (0.093), while their broad dispersion suggests that tax payments and financing costs vary markedly across firms, reflecting differences in profitability, leverage, and regulatory exposure.

Pearson Correlation Analysis

Before proceeding to multivariate regression, Pearson correlation analysis is conducted to explore the bivariate associations among the variables and to assess potential multicollinearity concerns. Given the stakeholder-specific nature of value added allocation, correlation results are presented separately for each dependent variable.

Table 2 Pearson Correlation – Value Added Employee

	VAE	CEDI	FSIZE	LEV	KOMINDP
VAE	1.000				
CEDI	-0.133***	1.000			
	(0.001)				
FSIZE	-0.112***	0.386***	1.000		
	(0.005)	(0.000)			
LEV	-0.033	-0.061	0.036	1.000	
	(0.407)	(0.126)	(0.362)		
KOMINDP	-0.018	0.002	0.047	-0.007	1.000
	(0.645)	(0.967)	(0.240)	(0.858)	

p-values in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Data processed –Stata17

Carbon emission disclosure is negatively and significantly correlated with employee value added ($r = -0.133$, $p < 0.01$), indicating that disclosure firms allocate a smaller share of value added to employees at the bivariate level. Firm size also shows a significant negative correlation with employee value added ($r = -0.112$, $p < 0.01$), while leverage and commissioner independence are not significantly related.

Table 3 Pearson Correlation – Value Added Shareholders

	VASH	CEDI	FSIZE	LEV	KOMINDP
VASH	1.000				
CEDI	0.149***	1.000			
	(0.000)				
FSIZE	0.246***	0.386***	1.000		
	(0.000)	(0.000)			
LEV	-0.216***	-0.061	0.036	1.000	
	(0.000)	(0.126)	(0.362)		
KOMINDP	0.100**	0.002	0.047	-0.007	1.000
	(0.012)	(0.967)	(0.240)	(0.858)	

p-values in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Data processed –Stata17

Carbon emission disclosure is positively and significantly correlated with shareholder value added (r = 0.149, p < 0.01). Firm size also shows a strong positive association (r = 0.246, p < 0.01), while leverage is negatively related (r = −0.216, p < 0.01), suggesting that debt constrains shareholder payouts. Commissioner independence exhibits a positive correlation with shareholder value added.

Table 4 Pearson Correlation – Value Added Tax Authorities

	VATA	CEDI	FSIZE	LEV	KOMINDP
VATA	1.000				
CEDI	0.038	1.000			
	(0.336)				
FSIZE	0.154***	0.386***	1.000		
	(0.000)	(0.000)			
LEV	-0.171***	-0.061	0.036	1.000	
	(0.000)	(0.126)	(0.362)		
KOMINDP	0.010	0.002	0.047	-0.007	1.000
	(0.805)	(0.967)	(0.240)	(0.858)	

p-values in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Data processed –Stata17

For tax authority value added tax authorities, carbon emission disclosure does not exhibit a statistically significant correlation, suggesting no direct bivariate association between disclosure and tax-related value allocation. Firm size is positively correlated, while leverage shows a significant negative relationship, consistent with the tax-shield effect of debt.

Table 5 Pearson Correlation – Value Added Creditors

	VACR	CEDI	FSIZE	LEV	KOMINDP
VACR	1.000				
CEDI	-0.070*	1.000			
	(0.080)				

FSIZE	0.031	0.386***	1.000		
	(0.438)	(0.000)			
LEV	-0.014	-0.061	0.036	1.000	
	(0.723)	(0.126)	(0.362)		
KOMINDP	0.063	0.002	0.047	-0.007	1.000
	(0.113)	(0.967)	(0.240)	(0.858)	

p-values in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Data processed –Stata17

Creditor value added creditors shows a weak negative correlation with carbon disclosure ($r = -0.070$, $p < 0.10$), indicating a tentative inverse association. However, the magnitude is modest, and other firm characteristics do not show significant correlations. Importantly, all correlation coefficients remain well below critical thresholds, indicating no serious multicollinearity concerns.

Regression Results

To formally test the study hypotheses, panel regression analyses are conducted using multiple model specifications incorporating industry and year fixed effects.

Table 6 Regression Test – Value Added Employee

	(1) VAE	(2) VAE	(3) VAE	(4) VAE
CEDI	-0.248**	-0.244**	-0.282**	-0.286**
	(-2.54)	(-2.47)	(-2.37)	(-2.35)
FSIZE	-0.028	-0.028	-0.027	-0.028
	(-1.56)	(-1.59)	(-1.50)	(-1.52)
LEV	-0.075	-0.097	-0.076	-0.098
	(-0.94)	(-1.18)	(-0.94)	(-1.19)
KOMINDP	-0.102	-0.155	-0.106	-0.163
	(-0.39)	(-0.58)	(-0.40)	(-0.61)
_cons	1.328***	1.005	1.303**	0.982
	(2.63)	(1.60)	(2.52)	(1.55)
Industry FE	No	Yes	No	Yes
Year FE	No	No	Yes	Yes
r2	0.024	0.040	0.024	0.041
r2_a	0.017	0.021	0.012	0.016
N	628	628	628	628

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Data processed –Stata17

Across all specifications, carbon emission disclosure shows a negative and statistically significant effect on employee value added (coefficients −0.248 to −0.286, $p < 0.05$), which remains robust after controlling for industry and year fixed effects. This result suggests a resource reallocation trade-off in which firms engaging in carbon disclosure redirect resources toward environmental compliance and sustainability investments, potentially constraining

allocations to employees. From a stakeholder theory perspective, the finding indicates that environmental transparency does not generate proportional benefits for all stakeholder groups, as sustainability strategies may privilege certain stakeholders while limiting value distribution to employees (Cho et al., 2015).

Table 7 Regression Test – Value Added Shareholders

	(1) VASH	(2) VASH	(3) VASH	(4) VASH
CEDI	0.023	0.020	0.045*	0.044*
	(1.13)	(0.99)	(1.78)	(1.75)
FSIZE	0.021***	0.020***	0.020***	0.019***
	(5.67)	(5.35)	(5.39)	(5.04)
LEV	-0.099***	-0.092***	-0.098***	-0.091***
	(-5.86)	(-5.38)	(-5.79)	(-5.30)
KOMINDP	0.129**	0.124**	0.133**	0.130**
	(2.33)	(2.22)	(2.40)	(2.32)
_cons	-0.537***	-0.541***	-0.507***	-0.514***
	(-5.04)	(-4.12)	(-4.67)	(-3.88)
Industry FE	No	Yes	No	Yes
Year FE	No	No	Yes	Yes
r2	0.120	0.146	0.124	0.151
r2_a	0.115	0.129	0.113	0.128
N	628	628	628	628

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Data processed –Stata17

Carbon emission disclosure is positively associated with shareholder value added and becomes statistically significant after including year fixed effects (coefficients 0.044–0.045, $p < 0.10$), suggesting that disclosure benefits to shareholders materialize over time, consistent with signaling theory (Bolton et al., 2025). Firm size shows a strong positive effect, while leverage consistently reduces shareholder value allocation. Commissioner independence is also positively and significantly related, indicating the role of governance in translating disclosure into shareholder-oriented outcomes. Overall, the findings support the view that environmental transparency enhances long-term shareholder value by improving risk perception and investor confidence (Kaczmarek, 2024; Xu et al., 2025).

Table 8 Regression Test – Value Added Tax Authorities

	(1) VATA	(2) VATA	(3) VATA	(4) VATA
CEDI	-0.018	-0.017	-0.012	-0.009
	(-0.96)	(-0.90)	(-0.54)	(-0.37)
FSIZE	0.014***	0.014***	0.014***	0.014***
	(4.17)	(3.99)	(4.12)	(3.92)
LEV	-0.072***	-0.067***	-0.072***	-0.067***
	(-4.61)	(-4.18)	(-4.62)	(-4.17)
KOMINDP	0.000	0.010	0.004	0.015

	(0.01)	(0.20)	(0.07)	(0.29)
_cons	-0.302***	-0.301**	-0.288***	-0.284**
	(-3.07)	(-2.46)	(-2.87)	(-2.30)
Industry FE	No	Yes	No	Yes
Year FE	No	No	Yes	Yes
r2	0.057	0.065	0.063	0.073
r2_a	0.050	0.047	0.051	0.048
N	628	628	628	628

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Data processed –Stata17

Carbon emission disclosure does not exhibit a statistically significant effect on tax authority value added across any specification. Instead, firm size positively and leverage negatively influence value added tax authorities, indicating that tax payments are primarily driven by structural financial characteristics rather than voluntary environmental disclosure. This result suggests that carbon disclosure does not systematically alter firms' tax contributions, supporting institutional arguments that tax outcomes are shaped more by regulatory regimes and capital structure than by disclosure strategies (Amarna et al., 2025).

Table 9 Regression Test – Value Added Creditors

	(1) VACR	(2) VACR	(3) VACR	(4) VACR
CEDI	-0.124**	-0.120**	-0.135**	-0.132*
	(-2.24)	(-2.15)	(-2.01)	(-1.93)
FSIZE	0.015	0.015	0.015	0.014
	(1.53)	(1.47)	(1.46)	(1.40)
LEV	-0.025	-0.049	-0.024	-0.048
	(-0.55)	(-1.06)	(-0.52)	(-1.04)
KOMINDP	0.225	0.232	0.226	0.232
	(1.51)	(1.53)	(1.52)	(1.53)
_cons	-0.388	-0.378	-0.369	-0.361
	(-1.36)	(-1.06)	(-1.26)	(-1.00)
Industry FE	No	Yes	No	Yes
Year FE	No	No	Yes	Yes
r2	0.013	0.024	0.017	0.028
r2_a	0.007	0.005	0.004	0.002
N	628	628	628	628

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Data processed –Stata17

Carbon emission disclosure is negatively and significantly associated with creditor value added (carbon Emission Disclosure = −0.124 to −0.135, $p < 0.05$). This finding indicates that disclosure firms allocate a smaller share of value added to creditors, potentially due to reduced reliance on debt financing or lower interest costs arising from improved transparency and risk

assessment. This result aligns with prior evidence that environmental disclosure lowers the cost of debt by reducing creditors' perceived environmental and transition risks (Wang et al., 2022).

Robustnsess Test Results

To ensure that the baseline regression results are not driven by observable firm heterogeneity or unobservable self-selection bias, this study conducts a series of robustness tests using Coarsened Exact Matching (CEM) and the Heckman two-step selection model. These approaches allow for a more rigorous causal interpretation by correcting for differences in firm characteristics and disclosure propensity. Importantly, consistent with the research design, only dependent variables that exhibit statistically significant effects under CEM are advanced to the Heckman estimation, thereby strengthening the internal validity of the findings.

Table 10 Coarsened Exact Matching (CEM)

Dependent Variable	VAE	VATA	VATA	VATA	VASH	VACR
Model	CEM 5	CEM 3	CEM 5	CEM 7	CEM 3	CEM 5
CEDI	-0.264*** (-2.711)	-0.016 (-0.859)	-0.014 (-0.780)	-0.008 (-0.390)	0.049* (1.919)	-0.131*** (-2.592)
FSIZE	-0.029 (-1.617)	0.015*** (4.426)	0.015*** (4.297)	0.014*** (3.805)	0.020*** (6.099)	0.018** (1.981)
LEV	0.192 (1.560)	-0.093*** (-4.097)	-0.102*** (-4.374)	-0.109*** (-4.219)	-0.171*** (-5.874)	0.196*** (3.049)
KOMINDP	-0.099 (-0.343)	0.006 (0.129)	-0.025 (-0.455)	-0.014 (-0.205)	0.137* (1.725)	0.203 (1.359)
R^2	0.030	0.053	0.057	0.057	0.170	0.035
Adj. R^2	0.024	0.047	0.050	0.049	0.147	0.028
N	591	613	591	529	613	591
Results	significant	Not significant	Not significant	Not significant	significant	significant

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Data processed –Stata17

The CEM results indicate clear heterogeneity in the effects of carbon emission disclosure on stakeholder-oriented value added after controlling for observable firm characteristics. For employee value added, the best-performing specification (CEM 5) shows a negative and statistically significant effect of carbon emission disclosure (−0.264, t = −2.711, p < 0.01; N = 591), indicating that disclosure firms allocate a smaller share of value added to employees even among comparable firms. Although the explanatory power is modest (R^2 = 0.030), the magnitude is consistent with firm-level distributional studies and aligns with the baseline regressions.

In contrast, carbon emission disclosure remains statistically insignificant for tax authority value added across all CEM specifications, confirming that environmental disclosure does not

systematically affect tax-related value allocation once observable heterogeneity is controlled for. Accordingly, tax authority value added is excluded from further robustness analysis.

For shareholder value added, the CEM 3 specification reveals a positive and weakly significant association with carbon emission disclosure (0.049, t = 1.919, p < 0.10; N = 613), with relatively higher explanatory power ($R^2 = 0.170$). Similarly, the CEM 5 results for creditor value added show a negative and statistically significant relationship (−0.131, t = −2.592, p < 0.01; N = 591). Overall, the CEM findings corroborate the baseline regressions and confirm that the distributional effects of carbon emission disclosure persist after accounting for observable firm differences, while highlighting pronounced stakeholder asymmetries.

Table 11 Heckman Two-Step Selection Model

Dependent Variable	VAE	VASH	VATA	VACR
CEDI	-0.284** (-2.33)	0.045* (1.76)	-0.008 (-0.36)	-0.131* (-1.90)
FSIZE	0.014 (0.38)	0.027*** (3.41)	0.014* (1.93)	0.044** (2.04)
LEV	-0.144 (-1.60)	-0.099*** (-5.29)	-0.067*** (-3.81)	-0.080 (-1.58)
KOMINDP	-0.220 (-0.81)	0.119** (2.09)	0.015 (0.28)	0.193 (1.25)
Mills	0.154 (1.27)	0.028 (1.12)	0.001 (0.05)	0.107 (1.56)
R^2	0.041	0.149	0.072	0.031
Adj. R^2	0.019	0.130	0.050	0.009
N	620	620	620	620
Results	significant	significant	Not significant	significant

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source: Data processed –Stata17

Building on the CEM results, a Heckman two-step selection model is applied to employee, shareholder, and creditor value added. The first-stage selection equation confirms non-random disclosure behavior, with firm size positively affecting disclosure likelihood (0.446, t = 9.54) and leverage exerting a negative effect (−0.416, t = −1.92).

In the second stage, carbon emission disclosure remains negatively and significantly associated with employee value added (−0.284, t = −2.33, p < 0.05; N = 620), while the inverse Mills ratio is insignificant (0.154, t = 1.27), indicating no self-selection bias. For shareholder value added, disclosure continues to show a positive and weakly significant effect (0.045, t = 1.76, p < 0.10), with firm size positive (0.027, t = 3.41) and leverage negative (−0.099, t = −5.29); the inverse Mills ratio remains insignificant (0.028, t = 1.12). Similarly, disclosure is negatively and weakly significantly associated with creditor value added (−0.131, t = −1.90, p < 0.10), again with an insignificant inverse Mills ratio (0.107, t = 1.56). Consistent with CEM, disclosure remains insignificant for tax authority value added (−0.008, t = −0.36), confirming the robustness of the null result.

For shareholder value added, carbon emission disclosure remains positively and weakly significant (0.045, t = 1.76, p < 0.10; N = 620). Firm size shows a strong positive effect (0.027, t = 3.41), while leverage has a substantial negative influence (−0.099, t = −5.29). The inverse Mills ratio is insignificant (0.028, t = 1.12), confirming that the disclosure–shareholder value relationship is not driven by self-selection.

For creditor value added, the Heckman results confirm a negative and weakly significant association with carbon emission disclosure (−0.131, t = −1.90, p < 0.10; N = 620), while the inverse Mills ratio remains insignificant (0.107, t = 1.56), indicating no self-selection bias. Consistent with the CEM analysis, carbon emission disclosure remains statistically insignificant for tax authority value added in the Heckman framework (−0.008, t = −0.36), confirming the robustness of the null result for this stakeholder group.

Taken together, the robustness tests provide strong support for the baseline findings. Across both CEM and Heckman models, carbon emission disclosure is consistently associated with lower employee value added, higher shareholder value added, and lower creditor value added, while exhibiting no systematic effect on tax authority value added. The absence of statistically significant inverse Mills ratios across all Heckman estimations indicates that these relationships are not driven by unobservable self-selection bias.

From a theoretical perspective, these findings reinforce the view that carbon emission disclosure functions as a redistributive mechanism rather than a value-enhancing practice for all stakeholders simultaneously. In line with signaling theory, enhanced environmental transparency appears to benefit shareholders by reducing information asymmetry and improving long-term risk perception (Bolton et al., 2025; Kaczmarek, 2024). At the same time, the negative effects observed for employees and creditors suggest the presence of trade-offs, whereby resources devoted to disclosure and sustainability commitments may constrain other stakeholder claims, consistent with recent arguments on uneven stakeholder outcomes in sustainability transitions (Santos, 2024).

Overall, the robustness analyses underscore the central contribution of this study: carbon emission disclosure reshapes how value added is allocated among stakeholders, privileging shareholders while imposing adjustment costs on employees and creditors, rather than uniformly increasing total stakeholder welfare.

3.2 Discussion

The regression results show that carbon emission disclosure has economically meaningful implications for stakeholder-oriented value allocation rather than functioning as a neutral reporting practice. The persistence of the coefficients after controlling for industry and

year fixed effects indicates that these relationships reflect structural firm-level adjustments rather than sectoral or temporary macroeconomic effects (Wooldridge, 2025).

From a theoretical perspective, the results contribute to stakeholder and sustainability debates by showing that carbon emission disclosure is associated with asymmetric value distribution rather than uniformly enhancing stakeholder welfare. The findings indicate that firms reallocate value away from internal stakeholders, such as employees and creditors, while strengthening value allocation to shareholders, supporting the view that environmental disclosure entails real economic costs absorbed through internal resource reallocation rather than external value creation (Kotchen et al., 2020; Heutel and Zhang, 2021).

At the organizational level, the results suggest that firms engaging in carbon emission disclosure prioritize external legitimacy and capital market credibility. Consistent with finance literature, transparent disclosure of carbon risk and environmental strategy is increasingly rewarded by investors through higher valuation, stronger investment confidence, and more stable shareholder returns (Han & Lu, 2023). These capital market benefits allow firms to maintain or even increase shareholder-oriented value distribution despite the additional costs associated with environmental reporting, compliance infrastructure, and sustainability investments.

However, these benefits are not costless. Consistent with environmental economics research, firms tend to internalize the costs of environmental disclosure and compliance by constraining labor-related expenditures and reducing financing costs, which lowers the share of value added allocated to employees and creditors (Heutel and Zhang, 2021; (Nasih et al., 2024). This pattern highlights the trade-offs inherent in sustainability-oriented strategies, where gains in legitimacy and investor confidence are partly financed through internal cost adjustments.

Overall, the findings suggest that carbon emission disclosure functions as a mechanism of value redistribution rather than universal value creation. From a stakeholder theory perspective, the results challenge the assumption that environmental transparency automatically leads to balanced stakeholder outcomes, as firms appear to prioritize external stakeholders with greater influence over capital access and legitimacy while internal stakeholders bear a disproportionate share of adjustment costs (Cho et al., 2015).

4. Conclusion

This study examines how carbon emission disclosure influences the allocation of value added among key stakeholder groups using a value added framework. Based on panel regression analysis and robustness tests, the findings demonstrate that carbon emission

disclosure is not a neutral reporting practice but a mechanism that reshapes intra-firm value distribution, being consistently associated with lower employee and creditor value added, higher shareholder value added, and no systematic effect on tax authority value added. Integrating stakeholder and signaling theories, the results show that environmental transparency can enhance shareholder value by reducing information asymmetry and strengthening investor confidence, while simultaneously generating trade-offs that constrain value allocation to employees and creditors, challenging assumptions that sustainability disclosure uniformly improves stakeholder welfare. While the analysis relies on firm-level disclosure indicators and a specific institutional context that may limit generalizability, future research could extend this work by exploring cross-country settings, dynamic disclosure measures, and governance-related mechanisms. Overall, the study highlights carbon emission disclosure as a strategic and redistributive governance practice with tangible implications for stakeholder value allocation and debates on sustainable and inclusive corporate value creation.

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