



## Green Disclosure and Innovation to Corporate Loan: Case of LQ45 Index Companies

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**ABSTRACT:** Following the Paris Agreement on Climate Change, Indonesia committed to reducing greenhouse gas emissions by 29% through its own efforts and 49% with international support. To achieve this, the Indonesian government is advancing sustainable finance, as mandated by the 1945 Constitution, which ensures the right to a proper environment and sustainable economic principles. Supported by the Financial Services Authority (OJK), Indonesia introduced regulations like POJK No.51/POJK.03/2017 and POJK 60/POJK.04/2017, requiring financial institutions to adopt sustainable finance principles and develop environmentally friendly securities. Commercial banks must submit a Sustainable Finance Action Plan (RAKB) and sustainable reports to OJK, with green credit being a key component. This study employed a quantitative approach to examine the relationships between Green Credit Policy, corporate access to bank loans, environmental disclosure, and green innovation in Indonesian commercial banks. The analysis of historical data revealed that the Green Credit Policy significantly influenced corporate loan accessibility. Companies with robust environmental disclosures and a history of green innovation also experienced better loan acquisition outcomes.

**KEYWORDS:** Corporate loan accessibility, External Environmental disclosure, Green Credit Policy, Internal Green Innovation.

### 1. INTRODUCTION

In recent years, there has been a growing global concern for environmental sustainability and its integration into economic activities. This paradigm shift has prompted governments, businesses, and financial institutions to reevaluate their priorities and practices in light of the environmental impacts of their actions (Tang et al., 2022). The pressing issue of climate change, exemplified by rising global temperatures, has led to natural disasters such as floods, heat waves, droughts, and forest fires. To address these challenges, approximately 197 countries have committed to the Paris Agreement, which aims to reduce greenhouse gas (GHG) emissions by 29% through national efforts and by 49% with international support (Siber et al., 2023).

Indonesia, the world's 16th largest economy, reflects significant growth across various sectors such as manufacturing, services, and agriculture. However, this economic progress has environmental repercussions, positioning Indonesia as the tenth largest emitter of GHGs globally. The primary sources of Indonesia's GHG emissions are the land-use and energy sectors, which together account for 84% of the total emissions. Deforestation, peatland degradation, and forest fires are major contributors within the land-use sector, while the energy sector's reliance on fossil fuels for electricity generation and transportation further exacerbates emissions. Efforts to mitigate these emissions are crucial, as highlighted by data from the World Resources Institute (WRI), which provides a detailed sectoral breakdown of emissions. Such information is vital for designing targeted interventions like reforestation initiatives, peatland restoration, and the transition to renewable energy sources. The Government of Indonesia has been proactive in developing sustainable finance initiatives, as mandated by Articles 28H and 33 of the 1945 Constitution, which ensure the right to a proper environment and promote sustainability in economic activities (Siber et al., 2023).

The Financial Services Authority (OJK) plays a pivotal role in supporting the government's sustainability goals. OJK Regulation No. 51/POJK.03/2017 mandates financial service institutions, issuers, and public companies to incorporate sustainable finance principles into their operations. Additionally, Regulation No. 60/POJK.04/2017 focuses on the development of environmentally friendly securities. These regulations aim to foster sustainable finance awareness within the financial services industry, providing guidelines to determine the alignment of activities, products, or services with green criteria. This framework supports the broader initiatives to promote environmentally friendly practices and contribute to Indonesia's sustainable development goals and net-zero emissions targets. The Indonesia Green Taxonomy 1.0, developed by OJK in collaboration with various stakeholders, serves as a



guideline for identifying and categorizing environmentally sustainable economic activities. This taxonomy aids financial institutions in directing credit and investment towards green projects. Additionally, OJK Regulation No. 51/2017 outlines the obligations of financial service institutions to integrate sustainability principles into their business strategies, risk management, and investment decisions. OJK has also established an information hub and initiated pilot projects for green finance to enhance industry understanding of sustainable finance and promote the uptake of green credit practices.

Commercial banks in Indonesia are required to implement sustainable finance based on their core capital, with larger banks starting from January 1, 2019, and smaller banks from January 1, 2020. These banks must prepare a Sustainable Finance Action Plan (RAKB) and publish sustainable reports, which are submitted to OJK. The evaluation of green credit policy implementation is essential to determine whether companies' sustainability efforts align with OJK's criteria for accessing green credit. This assessment is crucial in determining whether companies can benefit from the financial support provided by banks through green credit initiatives.

As environmental concerns continue to rise, stakeholders such as investors and consumers demand greater corporate transparency. Environmental disclosure has become a benchmark for assessing a company's commitment to sustainable practices. Analyzing the impact of environmental disclosure on corporate access to bank loans in Indonesia, a country with diverse industries ranging from agriculture to manufacturing, reveals complex dynamics (Liebman et al., 2019).

Green innovation is a critical component in this landscape. Encouraged by environmentally friendly policies implemented by the central bank of Indonesia, businesses are exploring new techniques to reduce environmental impact while promoting economic growth. Green innovation goes beyond compliance, seeking creative solutions to environmental challenges (Liebman et al., 2019). This approach can transform existing industries and create new pathways for sustainable development in a resource-rich country like Indonesia. This study aims to investigate the intricate relationship between environmental disclosure, green innovation, and corporate access to bank loans in Indonesia, particularly after the implementation of green credit policies. By examining these relationships, the study seeks to provide valuable insights for academia, policymakers, financial institutions, and businesses in understanding the complex interplay between sustainability, financial mechanisms, and economic growth in Indonesia.

## 2. LITERATURE REVIEW

### 2.1. The Need for Green Financing and Regulation

The global emphasis on environmental sustainability has spurred policies and initiatives promoting green practices within the corporate sector. Prominent among these is the Green Credit Policy, especially in countries like Indonesia. This policy incentivizes businesses to adopt environmentally friendly practices while enhancing their access to bank loans (Liebman et al., 2019). By linking credit availability to environmental performance, it encourages companies to reduce their ecological footprint. In a rapidly industrializing nation with rich biodiversity like Indonesia, this policy addresses the dual challenge of environmental degradation and economic growth.

Research has extensively explored the relationship between the Green Credit Policy and corporate access to bank loans. Wang et al. (2021) highlight benefits such as preferential interest rates, extended repayment terms, and larger loan sizes for companies adopting green practices. These advantages lower financial barriers for firms committed to sustainability.

Environmental disclosure, the transparency of a company's environmental impact and mitigation efforts, is crucial in this context. Comprehensive disclosure enhances a firm's reputation and provides a basis for financial institutions to assess creditworthiness accurately (Wang et al., 2021). This transparency instills confidence in lenders, leading to more favorable lending terms. Green innovation, involving new technologies, processes, and products that promote sustainability, is another key factor. Zhang et al. (2021) show that green innovation positively influences a company's eligibility for green credit and access to bank loans. Financial institutions view innovative companies as less risky and more adaptable to environmental regulations and consumer preferences.

Comparative studies highlight the benefits and challenges of green financing. Ilić, Stojanovic, and Pavicevic (2018) compare Indonesia and Serbia, emphasizing the need for supportive policies to promote green financial practices and enhance loan access. Liebman et al. (2019) discuss regulatory support, financial innovation, and capacity building as crucial for implementing green finance in Indonesia. Islamic green banking also enriches the discourse. Rahmayati, Mujiatun, and Sari (2022) explore integrating Islamic principles into green banking to promote environmentally responsible financing. This research highlights how religious considerations can influence green credit policies and loan access.



Ratnasari, Surwanti, and Pribadi (2021) evaluate the financial outcomes of incorporating environmental considerations into the operations of Indonesian commercial banks, providing insights into how green banking practices affect corporate financial health and loan accessibility. Siahaan et al. (2020) analyze the sustainability of green banking and its impact on the financial performance of banks listed on the Indonesia Stock Exchange, offering a nuanced understanding of how green credit policies can yield tangible financial benefits for both banks and borrowing corporations. Soejachmoen (2017) provides practical insights into implementing green finance in Indonesia, highlighting the challenges and opportunities in financing the nation's green transformation. By addressing practical concerns, this work contributes significantly to the ongoing discourse on formulating and executing effective green credit policies.

In summary, the interplay between environmental disclosure, green innovation, and regulatory frameworks is critical. Comprehensive disclosures, strategic green innovations, and robust regulatory support are essential to leveraging the benefits of green credit policies. This body of research offers valuable insights into the complex dynamics of green credit policies and their implications for corporate behavior, financial performance, and sustainable economic growth.

## 2.2. The Role of Environmental Disclosure

Environmental disclosure involves the provision of information about a company's environmental performance and sustainability initiatives to stakeholders, including investors, regulators, customers, and the public, either voluntarily or mandatorily. The underlying rationale is that transparency in environmental matters can lead to improved environmental performance, enhanced stakeholder trust, and increased access to financial resources. In Indonesia, environmental disclosure is crucial in shaping the relationship between the green credit policy and corporate access to bank loans. As global sustainability efforts intensify, governments and financial institutions are increasingly integrating environmental considerations into their policies and decision-making processes. This literature review explores the multifaceted role of environmental disclosure in facilitating corporate access to bank loans within Indonesia's green credit policy framework, emphasizing the interplay between disclosure, green innovation, and financial outcomes.

Environmental disclosure serves as a vital communication channel between corporations and stakeholders, including financial institutions. The extent and quality of environmental disclosure can significantly influence banks' perceptions of a company's environmental commitment and risk management, ultimately affecting their lending decisions (Arora and Aliani, 2024). Empirical studies across various contexts consistently show that robust environmental disclosure positively correlates with enhanced corporate reputation, reduced information asymmetry, and increased transparency (Arora and Aliani, 2024). These factors build trust among financial institutions, potentially leading to lower borrowing costs and greater access to bank loans. In the context of Indonesia's green credit policies, which aim to direct funding towards sustainable projects, the availability of reliable environmental disclosure is even more critical.

Indonesia's commitment to sustainability is evident in its policies, including the Green Credit Policy, which encourages banks to allocate a portion of their loan portfolios to environmentally friendly projects. Arora and Aliani (2024) found that firms engaging in extensive environmental disclosure tend to align better with the objectives of such policies. Banks, guided by a comprehensive understanding of a company's environmental efforts, are more likely to extend credit to these firms due to perceived lower environmental risks and enhanced compatibility with the policy's intent. Furthermore, environmental disclosure acts as a catalyst for green innovation. As companies across Indonesia disclose their sustainability initiatives, they signal their commitment to adopting environmentally responsible practices, fostering the development of greener technologies and processes. This evolution aligns with global environmental goals and enhances the attractiveness of firms to financial institutions under green credit policies. Studies by Fabrizio and Kim (2019) demonstrated that companies with more comprehensive environmental disclosures tend to have better credit ratings, implying a positive relationship between disclosure and creditworthiness. Similarly, Xing, Zhang, and Tripe (2021) found that firms with higher environmental disclosure scores experienced lower lending costs, suggesting that banks perceive them as less risky due to their proactive approach to environmental matters. Conversely, Gilchrist, Yu, and Zhong (2021) found that environmental disclosure had no direct impact on loan terms, indicating a complex interaction between disclosure and financial outcomes.

Numerous studies have examined the relationship between environmental disclosure and corporate access to bank loans, suggesting that higher levels of environmental disclosure enhance a company's creditworthiness in the eyes of lenders, leading to more favorable lending terms. These disclosures provide insights into a firm's commitment to sustainability and its ability to manage environmental



risks, factors that banks consider when assessing credit risk. However, some counterarguments suggest that banks may prioritize traditional financial indicators over environmental factors. Recent research by Suttipun and Yordudom (2022) presents a more nuanced perspective, finding that while environmental disclosure alone might not directly influence loan decisions, it moderates the relationship between environmental performance and loan terms. This suggests that disclosure acts as a signaling mechanism, enhancing the visibility of a company's environmental efforts and indirectly influencing credit decisions.

Based on the reviewed literature, the following hypothesis is developed:

**H1: There is a relationship between company's green disclosure and access to corporate loans**

While studies in some countries indicate a positive impact of environmental disclosure on loan access, others, such as in China, show no significant effect. This research aims to study the impact of environmental disclosure in the context of Indonesia, a gap that has not been thoroughly addressed in previous studies.

### 2.3. The Role of Green Innovation

Green innovation significantly influences corporate environmental disclosure practices, as organizations engaging in sustainable innovation are more likely to transparently report their environmental performance and initiatives. This alignment between green innovation efforts and sustainability commitments enhances the credibility of corporate disclosures, providing essential information for stakeholders, including financial institutions, to assess environmental performance and risk exposure (Khan, Johl, and Johl, 2021). Companies with robust green innovation records typically offer more comprehensive and transparent environmental disclosures, facilitating lenders' evaluations of their creditworthiness.

In economies prioritizing environmental sustainability, such as Indonesia, green innovation can positively impact a corporation's access to bank loans. Financial institutions increasingly incorporate environmental considerations into their lending criteria, viewing companies committed to green innovation as less risky borrowers (Khan, Johl, and Johl, 2021). These innovation efforts demonstrate a proactive approach to managing environmental risks, enhancing corporate reputation and lender credibility. Regulatory pressures and environmental standards set by governments and international bodies incentivize companies to innovate towards sustainable practices. Additionally, consumer demand for environmentally friendly products and services drives innovation to meet market preferences (Kolcava, Rudolph, and Bernauer, 2021). Investments in sustainability-focused research and development can provide companies with a competitive edge by creating innovative solutions that comply with evolving regulations and cater to customer needs.

Despite the clear benefits, companies often face barriers to implementing green innovation. Financial constraints can limit investments in sustainable R&D, while a lack of awareness and knowledge about green technologies can hinder progress (Kolcava, Rudolph, and Bernauer, 2021). Furthermore, uncertainty regarding return on investment and the risks associated with adopting new technologies can discourage companies from pursuing green innovation.

Comprehensive environmental disclosure demonstrates a company's commitment to sustainability, fostering accountability and trust among stakeholders. For banks, such transparency provides valuable insights into a firm's environmental risks and mitigation efforts. Firms that disclose their environmental practices are more likely to align with regulatory requirements and industry best practices, positively influencing lenders' perceptions of their creditworthiness and potentially resulting in favorable loan terms.

The synergy between green innovation and environmental disclosure enhances banks' loan evaluations. Companies engaging in sustainable innovation are likely to implement energy-efficient processes, reduce carbon footprints, and adopt cleaner technologies (Tang et al., 2022). When substantiated by detailed environmental disclosures, these efforts provide lenders with a holistic view of a firm's sustainability commitment, enhancing credibility and showcasing a proactive approach to minimizing environmental risks. Based on the literature, the following hypothesis is developed:

**H2: There is a relationship between company's green innovations and access to corporate loans**

This hypothesis posits that as corporations invest in green innovation, they are more inclined to disclose their environmental practices, enhancing their appeal to banks aligning with sustainable lending principles. By integrating green innovation and environmental disclosure, corporations contribute to a greener economy and position themselves as attractive borrowers, potentially benefiting from favorable loan terms and broader access to credit.



**2.4. The Role of Control Variables**

In examining the impact of green disclosure quality and green innovations on corporate access to bank loans, it is essential to consider other influential factors, known as control variables, that may affect the dependent variable. These control variables (Table 1) encompass various aspects of a company's financial health, industry characteristics, and corporate governance, each playing a significant role in determining a firm's access to credit.

**Table 1. Control Variables**

<b>Financial Performance</b>	<b>Corporate Governance</b>	<b>Normal Innovation</b>
<p><i>Growth Ability (Growth)</i> The growth rate of a company, measured by the percentage change in sales revenue, is a crucial determinant of its access to corporate bank loans. A higher growth rate signals robust business expansion, which can positively influence lenders' decisions.</p>	<p><i>Ownership Concentration (Top)</i> The shareholding percentage of the largest shareholder indicates ownership concentration. High ownership concentration may raise concerns about governance and stability, potentially affecting lenders' perceptions and loan decisions.</p>	<p><i>R&amp;D Investment</i> The ratio of R&amp;D expenditure to total sales is an indicator of a company's commitment to innovation. Companies investing heavily in research and development are viewed as forward-thinking and capable of sustained growth, positively influencing loan accessibility.</p>
<p><i>Cash Holding (Cash)</i> The ratio of corporate cash holdings to total assets can significantly impact loan accessibility. Companies with higher cash reserves are viewed as financially stable and capable of meeting short-term obligations, making them more attractive to lenders.</p>	<p><i>Manager Shareholding</i> The percentage of shares held by directors and management reflects their stake in the company's success. Higher managerial shareholding aligns management interests with those of shareholders, potentially enhancing the company's credibility with lenders.</p>	<p><i>Normal Innovation</i> The impact of normal innovation, measured by the logarithm of (1 + the number of patents), indicates a company's innovation capacity. A higher number of patents suggests a strong focus on developing new products or services, which can enhance access to corporate loans</p>
<p><i>Asset Tangibility (PPE)</i> The asset tangibility ratio, calculated by dividing tangible assets by total assets, serves as a measure of collateral value. Companies with higher tangible assets, such as property, plant, and equipment (PPE), provide greater security to lenders, thus enhancing their ability to secure loans.</p>		
<p><i>Financial Performance (ROA)</i> Return on assets (ROA), indicating a company's efficiency in generating earnings from its assets, is a key indicator of financial health. A higher ROA suggests better profitability, making the company more appealing to lenders due to perceived lower risk.</p>		
<p><i>Investment Expenditure (Expend)</i> Investment in long-term assets, reflected by the ratio of long-term asset purchases to total assets, indicates a</p>		



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company's growth and expansion potential. Higher investment expenditure signals a forward-looking approach, which can positively influence lenders' perceptions and loan approval.

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#### Company Size (Size)

Company size, determined by the logarithm of total assets, is often associated with financial stability and established market presence. Larger companies generally have greater financial resources and credibility, which can enhance their access to corporate loans.

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#### Financial Leverage

Financial leverage, measured by the ratio of total assets to total liabilities, reflects a company's reliance on debt. While higher leverage indicates greater risk, it also signifies the potential for higher returns. Lenders may weigh these factors when making loan decisions.

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#### Risk:

The variance of the return on assets (ROA) over the last three years serves as a measure of financial stability. Lower variance indicates consistent profitability, reducing perceived risk and potentially improving access to loans.

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### Conceptual Framework

The conceptual framework in this research explores the influence of environmental transparency and eco-friendly innovations on corporate financing access. A figure is presented to clarify the relationships between these variables. Sustainability reports are documents voluntarily produced by companies to demonstrate their commitment to environmental, social, and governance (ESG) goals. In Indonesia, regulations on good corporate governance (GCG) govern the principles that guide a company's management activities in accordance with legal requirements, regulatory standards, and ethical norms. Strong GCG practices, including the presence of audit committees and boards of directors, can assist companies in obtaining green financing or green credit from financial institutions.

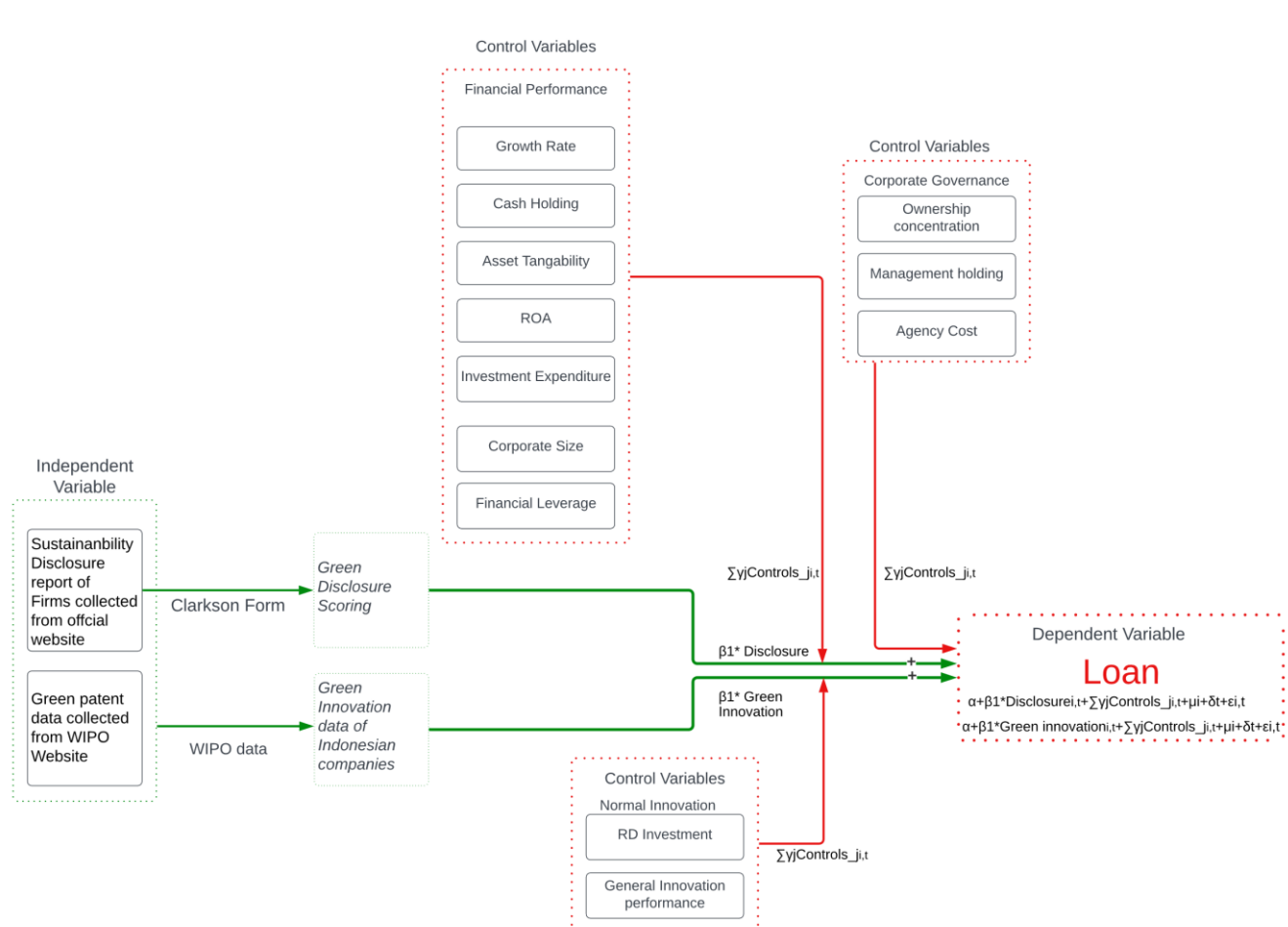


Fig. 1 Conceptual Framework

### 3. METHODOLOGY

This research aims to investigate the impact of Indonesia's Green Credit Policy on corporate financing access for non-financial companies listed on the LQ45 index. Employing a quantitative research method, the study explores how two key environmental performance metrics, green disclosure and green innovation, influence a company's ability to secure corporate loans. A comprehensive literature review is conducted to examine how environmental disclosure practices and eco-friendly innovation efforts can impact a firm's financing prospects, as well as to identify other control variables that may affect corporate loan access (Liebman et al., 2019; Linnenluecke et al., 2020). Using panel data from LQ45 companies during the period of 2018-2022, the research applies linear panel regression analysis to quantify the relationship between a company's environmental initiatives and its ability to obtain loans.

Two equations are developed from the literature review, as follows:

**Equation 1:**

$$\text{Corporate Loan}(i,t) = \beta_0 + \beta_1 \text{Green Disclosure}(i,t) + \gamma_1 \text{Growth Rate}(i,t) + \gamma_2 \text{Cash Holding}(i,t) + \gamma_3 \text{Asset Tangability}(i,t) + \gamma_4 \text{ROA}(i,t) + \gamma_5 \text{Investment Expenditure}(i,t) + \gamma_6 \text{Corporate Size}(i,t) + \gamma_7 \text{Financial Leverage}(i,t) + \gamma_8 \text{Ownership Concentration}(i,t) + \gamma_9 \text{Management Holding}(i,t) + \mu(i) + \epsilon(i,t).$$

**Equation-2:**

$$\text{Corporate Loan}(i,t) = \beta_0 + \beta_1 \text{Green Innovation}(i,t) + \gamma_1 \text{Growth Rate}(i,t) + \gamma_2 \text{Cash Holding}(i,t) + \gamma_3 \text{Asset Tangability}(i,t) + \gamma_4 \text{ROA}(i,t) + \gamma_5 \text{Investment Expenditure}(i,t) + \gamma_6 \text{Corporate Size}(i,t) + \gamma_7 \text{Financial Leverage}(i,t) + \gamma_8 \text{Ownership Concentration}(i,t) + \gamma_9 \text{Management Holding}(i,t) + \mu(i) + \epsilon(i,t).$$



Where: (i) indexes the companies in the LQ45 index; (t) indexes the time (2018–2022);  $\beta_0$  = intercept,  $\beta_1$  = coefficient for independent variable,  $\gamma_1, \dots, \gamma_9$  = coefficient for control variable,  $\mu_i$  = unobserved company-specific effect,  $\epsilon_{i,t}$  is the idiosyncratic error term

Where the first equation models the impact of environmental disclosure on corporate loans, while the second equation models the impact of green innovation (Arora & Aliani, 2024; Khan et al., 2021). Control variables such as growth rate, asset ownership, financial performance, and other company characteristics are also considered in these equations, following previous studies (Meuleman & De Maeseeneire, 2012; Şahin & OZTURK, 2022). Data is collected through archival research and secondary literature, including company financial reports, annual reports, and sustainability reports (Dźwigoł, 2020; Leavy, 2017). Ethical considerations such as privacy, confidentiality, and data security are also addressed during the data collection process (Lindner & Greiff, 2023). The results of the linear panel regression analysis are expected to provide empirical insights into the relationship between a company's environmental initiatives and its access to corporate financing, as well as test the proposed hypotheses. These findings can contribute to the discussion on the effectiveness of Indonesia's Green Credit Policy and its alignment with the Nationally Determined Contribution (NDC) objectives and the broader Paris Agreement mandates (Moustafa, 2023)

### 3.1. Population and Sample

According to Creswell (2014), the population for a study includes all individuals or objects with specific characteristics that the researcher wishes to investigate, influencing the study's validity and reliability. In this study, the population consists of companies listed in the LQ45 index from 2018 to 2022. The LQ45 index includes the 45 most liquid companies with the largest market capitalizations on the Indonesia Stock Exchange (IDX), known for their high-profile disclosures of environmental practices and innovations. The sample, representing this population, includes all LQ45 companies influenced by or directly involved with Indonesia's Green Credit Policy, excluding banks and financial institutions. This exclusion ensures the research focuses on the policy's effects on non-financial companies, with banks and financial institutions acting as facilitators rather than recipients of the policy's impact. This approach helps accurately assess how the Green Credit Policy influences corporate behavior towards sustainability. Identifying these companies ensures a focused and relevant sample for evaluating the policy's impact.

### 3.2. Data Collection

Data was collected from LQ45-listed companies through archival research and secondary literature. Archival research, as described by Dźwigoł (2020), involved primary sources such as financial reports, manuscripts, documents, and electronic records. This method provided detailed information on the environmental performance, innovation, and loan trends of LQ45 companies from 2018 to 2022. Financial statement reports and annual company reports offered data on variables like sales revenue, cash holdings, total assets, tangible assets, return on assets, investment expenditures, and financial leverage. Sustainability reports were used to gather information on environmental performance and innovation. The advantage of archival research is its in-depth analysis and the ease of verifying and validating company-specific information (Kang et al., 2020). However, challenges include potential biases in sources and difficulty extracting precise information relevant to the study, which could lead to inconclusive findings.

Secondary literature was also utilized, as noted by Leavy (2017). This data source includes professional and academic insights that provide a broader understanding of corporate environmental performance and green credit. Secondary sources were particularly useful in the literature review to understand the relationship between financial performance variables of LQ45 companies and their access to bank loans. The main advantage of using secondary literature is its cost-effectiveness, as it provides accessible information without additional costs (Adams, Smart, and Huff, 2017). However, a limitation is the lack of control over the content, which may result in one-sided perspectives depending on the secondary sources used

**Table 2. Data Collection**

Types	Variables	Abbreviation	Specification	Reference
<b>Dependent Variable</b>	Corporate Loan	Loan	Logarithm of the 1+ total debt of the company	(Nandy & Lodh, 2012)
<b>Independent Variable</b>	Green Disclosure	Green Disclosure	Natural logarithm of quality disclosed	(X. Du, 2018)





Types	Variables	Abbreviation	Specification	Reference
<b>Control Variables</b>	Green Innovation	Green Innovation	information by interpreting in the Clarkson form after adding 1 Number of innovations related to environment reported by companies in their sustainability reports and public exposure	(Hu et al., 2021)
	Corporate Growth ability	Growth	The percentage increase in corporate operating revenue	(E. Bailey et al., 2011)
	Cash Hold	Cash Holding	The cash and cash equivalents as a percentage of total assets	(Meuleman & De Maeseneire, 2012)
	Asset Tangibility	Asset Tangibility	The net value of fixed assets and inventory as a percentage of total assets.	(Chen & Matousek, 2020; Meuleman & De Maeseneire, 2012)
	Financial Performance	ROA	The net profit divided by average total assets.	(W. Bailey et al., 2011)
	Investment Expenditure	Investment Expenditure	The cash paid for the acquisition of long-term assets divided by total assets.	(J. Du et al., 2018)
	Enterprise Scale	Size	The natural logarithm of total assets.	(Love, 2003)
	Financial Leverage	Financial Leverage	The total liabilities divided by total assets.	(Meuleman & De Maeseneire, 2012)
	Risk Taking	Risk	The variability of the return on total assets in previous three years	(John et al., 2008)
	Ownership concentration	Ownership concentration	The percentage of shareholding held by the largest shareholder.	(T. Nguyen et al., 2015)
Management Share Holding	Managers hold	The percentage of shareholding held by all board members and the executive.	(Amore & Bennedsen, 2016; Ang & Ding, 2006)	

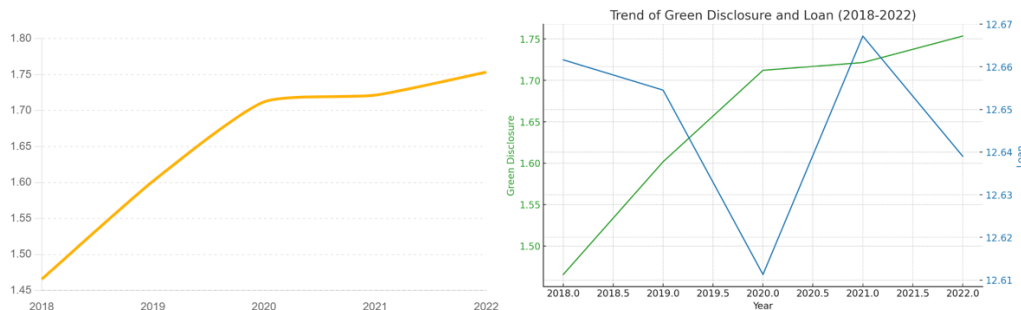
4. ANALYSIS

4.1. Data Interpretation

The analysis of yearly trends indicates an increasing focus on green disclosure and innovation from 2018 to 2022. Companies' efforts to enhance transparency and adopt environmentally friendly practices have shown positive trends.

**Green Disclosure and Green Innovation**

In Green Disclosure, companies' green disclosure scores increased over the years, reflecting improved transparency and commitment to environmental practices. In Green Innovation, data shows a general increase in recognized environmentally friendly innovations.



**Fig. 2 Trend for Green Disclosure and Green innovation along with loan change over the years**

The green disclosure scores have shown a consistent upward trend from 2018 to 2022. This indicates that companies are increasingly focusing on and reporting their environmental and sustainability practices. This growing trend may be attributed to heightened awareness of environmental issues, regulatory pressures, and a shift towards corporate social responsibility. The average loan amounts have shown a slight decline over the same period. This trend suggests that companies might be reducing their reliance on external borrowing. Possible reasons for this could include improved cash flows, better financial management, increased profitability, or alternative funding sources becoming more accessible.

An inverse relationship appears to exist between green disclosure and loan amounts. As companies invest more in green initiatives and improve their environmental disclosure, their need for loans seems to decrease. This inverse trend might imply that companies focusing on sustainability may be financially healthier or more attractive to investors, thus reducing their need for borrowing. Alternatively, these companies might be using their resources more efficiently, leading to lower borrowing requirements. The increasing trend in green disclosure aligns with global movements towards greater sustainability and environmental responsibility among businesses. Initiatives like the Paris Agreement and growing investor demand for sustainable practices likely contribute to this trend. The declining loan amounts may reflect broader economic conditions, such as lower interest rates, improved economic performance, or shifts in corporate financial strategies towards reducing debt and enhancing equity funding.

Green innovation measures the number of environmentally friendly patents or innovations a company has produced. The green innovation scores fluctuate more than green disclosure. For instance, the same company's score decreased from 4 in 2018 to 2 in 2020, then increased back to 4 in 2022. This variability suggests that following the implementation of the government's green credit policy, companies initially shifted their organizational culture towards sustainability improvement initiatives. However, this trend was disrupted by the COVID-19 global pandemic and various internal company factors, resulting in a decline in the number of reported innovations during the 2019 to 2021 period. Nonetheless, starting from 2022, there appears to be a resurgence in positive trends. The trend plot above displays the green innovation and loan values for each company from 2018 to 2022. The trend for green innovation appears to have a noticeable dip from 2018 to 2020, followed by a rise from 2020 to 2022. This pattern is consistent across multiple companies, indicating a possible broader industry trend or external influence affecting green innovation activities. The loan values generally show a declining trend from 2018 to 2020, followed by a stabilization or slight increase from 2020 to 2022. Correlation with Loan: Green innovation shows a stronger correlation with loan values compared to green disclosure. This suggests that companies investing more in green innovation tend to have more significant changes in their borrowing patterns.

Trend Patterns: Both green innovation and loan values exhibit a downward trend from 2018 to 2020, followed by an upward trend from 2020 to 2022. This indicates that the factors affecting green innovation (e.g., economic conditions, regulatory changes) might also influence loan values similarly.

#### 4.2. Panel Regression Analysis

##### Panel Regression for Equation-1

This study employs both random effects (RE) and fixed effects (FE) models to analyze panel data, capturing variations across companies and time periods. By comparing these models, we aim to understand their differing estimations. To determine the appropriate model, we conduct a Hausman test, which assesses whether the RE model's assumption—that individual-specific effects



are uncorrelated with independent variables—holds true. This test guides us in selecting the model that offers greater efficiency and consistency for our dataset.

The primary focus is on the statistical significance of the independent variable "green disclosure" on the dependent variable "loan." If green disclosure does not show a statistically significant impact, it suggests that environmental disclosure practices may not directly influence loan decisions in our context. In such a case, we will shift our analysis to a sectoral perspective, grouping companies by industry to identify broader trends in the relationship between environmental disclosure and loan outcomes within different sectors.

The primary hypothesis, addressed by Equation 1, examines the impact of green disclosure on corporate loan access:

$$\text{Corporate Loan}(i,t) = \beta_0 + \beta_1\text{Green Disclosure}(i,t) + \gamma_1\text{Growth Rate}(i,t) + \gamma_2\text{Cash Holding}(i,t) + \gamma_3\text{Asset Tangibility}(i,t) + \gamma_4\text{ROA}(i,t) + \gamma_5\text{Investment Expenditure}(i,t) + \gamma_6\text{Corporate Size}(i,t) + \gamma_7\text{Financial Leverage}(i,t) + \gamma_8\text{Ownership Concentration}(i,t) + \gamma_9\text{Management Holding}(i,t) + \mu(i) + \varepsilon(i,t).$$

This equation was analyzed using both RE and FE models in STATA, with the Hausman test determining the suitable model for this analysis.

**a. Hausman Test Results**

The Hausman test determines whether a fixed effects (FE) or random effects (RE) model is more appropriate for the data (Hausman, 2015). This test compares the consistency of an estimator to an alternative, less efficient estimator that is consistent. The null hypothesis (H0) of the Hausman test posits that the preferred model is the random effects model, meaning that differences in coefficients are not systematic. Conversely, the alternative hypothesis (Ha) suggests that the fixed effects model is preferred, indicating systematic differences in coefficients.

Key indicators for interpreting the Hausman test include the test statistic, specifically the Chi-square value, and its corresponding p-value. In this study, the Chi-square value is 16.29, and the p-value is 0.1782. A high p-value, greater than the conventional threshold of 0.05, suggests that we fail to reject the null hypothesis. This result indicates that the differences in coefficients are not systematic, and thus, the random effects model (RE) is preferred over the fixed effects model (FE) for this dataset.

**Table 3. Hausman test results**

Variable	fe1_Coefficients	re1_Coefficients	Difference (b-B)	Std. err
green_disc	0.1499359	0.3217924	-0.1718565	0.079867
growth	-0.0105316	-0.1155937	0.105062	0.0421581
cash_holding	-1.782046	-1.925168	0.1431218	0.2795481
asset_tang	-0.6898992	-0.6220164	-0.0678828	0.296395
roa	-0.2099691	-0.3029531	0.092984	0.1420502
investment	-3.757311	-10.61727	6.859963	18.09332
size	0.2806966	0.4233999	-0.1427033	0.0447631
financial	0.6870084	0.5524823	0.1354261	0.0563379
risk	0.9312783	0.8364193	0.0948591	0.7417158
RDIInvestment	4.325283	10.69115	-6.365872	17.75587
ownership	-0.9859678	-1.588194	0.6022265	1.211227
management	0.5993379	0.396465	0.2028728	1.049827

The p-value of 0.1782, which is greater than the significance level of 0.05, indicates that the random effects model is more appropriate for this dataset. The differences in coefficients between the FE and RE models (b-B) are not statistically significant, as suggested by the standard errors. Therefore, based on the Hausman test results, the random effects model (RE) is selected. This model assumes that



The individual-specific effects are uncorrelated with the independent variables, which is a valid assumption for this dataset. The positive coefficient for Green Disclosure (green\_disc) suggests a potential positive relationship between green disclosure and the amount of loans received by firms. However, this effect is not statistically significant, indicating that the relationship is not strong enough to be considered reliable. This implies that while firms with better green disclosure practices may receive more loans, the evidence is not sufficient to make a definitive claim. This highlights the complexity of factors influencing loan decisions, beyond just green disclosures.

**b. Random effect model results**

Dependent Variable: Loan. This analysis investigates how various financial and operational factors influence loan amounts within companies.

**Table 4. Random effect model results**

. xtreg loan green_disclosure growth cash_holding asset_tangibility roa investment_expenditure size financial_leverage > risk RDInvestment ownership_concentration management_holding, re						
<b>Random-effects GLS regress</b>	Number of obs =	190				
Group variable: company_id	Number of groups =	38				
R-squared:	Obs per group:					
Within = 0.4445	min =	5				
Between = 0.5805	avg =	5				
Overall = 0.5221	max =	5				
	Wald chi2(12)	161.84				
corr(u_i, X) = 0 (assumed)	Prob > chi2 =	0				
loan	Coefficient	Std. err.	z	P> Z	95% conf. Interval	
green_disclosure	0.32	0.20	1.58	0.114	-0.0767394	0.7203241
growth	-0.12	0.13	-0.89	0.373	-0.3697305	0.1385432
cash_holding	-1.93	0.48	-3.99	0	-2.869842	-0.9804934
asset_tangibility	-0.62	0.34	-1.84	0.065	-1.283575	0.0395426
roa	-0.30	0.31	-0.97	0.334	-0.9178752	0.311969
investment_expenditure	-10.62	47.75	-0.22	0.824	-104.2147	82.98012
size	0.42	0.08	5.37	0	0.2687417	0.578058
financial_leverage	0.55	0.08	6.57	0	0.3876545	0.7173101
risk	0.84	1.32	0.63	0.527	-1.754771	3.42761
RDInvestment	10.69	46.69	0.23	0.819	-80.81931	102.2016
ownership_concentration	-1.59	0.64	-2.47	0.013	-2.846662	-0.3297262
management_holding	0.40	0.57	0.7	0.486	-0.7178307	1.510761
_cons	8.73	1.13	7.73	0	6.514899	10.93932
sigma_u	0.44977325	fraction of variance due to u_i				
sigma_e	0.56928713					
rho	0.38431268					

**Green Disclosure**

The coefficient for green disclosure is 0.3217924, suggesting a slight positive impact on loan value. However, with a p-value of 0.114 and a 95% confidence interval that includes zero, this effect is not statistically significant. This implies that green disclosure levels do not significantly impact loan amounts.

**Growth**

The coefficient for growth is -0.1155937, indicating a slight negative impact on loan value. However, with a p-value of 0.373 and a confidence interval including zero, this effect is also not statistically significant. Thus, growth does not significantly influence loan amounts.



Cash Holding

The coefficient for cash holding is -1.925168, indicating a significant negative impact on loan amounts. This relationship is statistically significant with a p-value of 0.000 and a confidence interval that does not include zero. Higher cash reserves are associated with lower loan amounts.

Asset Tangibility

The coefficient for asset tangibility is -0.6220164, suggesting a negative effect on loan value. With a p-value of 0.065, this effect is marginally significant, indicating that tangible assets have a weak influence on loan amounts.

ROA (Return on Assets)

The coefficient for ROA is -0.3029531, indicating a negative effect on loan value. However, with a p-value of 0.334 and a confidence interval including zero, this effect is not statistically significant. Profitability does not significantly impact loan amounts.

Investment Expenditure

The coefficient for investment expenditure is -10.61727, suggesting a large negative impact on loan value. However, with a p-value of 0.828 and a confidence interval including zero, this effect is not statistically significant, indicating it does not significantly affect loan amounts.

Size

The coefficient for size is 0.4233999, indicating a significant positive impact on loan amounts. This relationship is statistically significant with a p-value of 0.000 and a confidence interval that does not include zero. Larger companies tend to have higher loan amounts.

Financial Leverage

The coefficient for financial leverage is 0.5524823, indicating a significant positive impact on loan amounts. This relationship is statistically significant with a p-value of 0.000 and a confidence interval that does not include zero. Higher leverage is associated with higher loan amounts.

Model Statistics

The model's R-squared values are 0.4445 (within), 0.5805 (between), and 0.5221 (overall), indicating a good fit. The Wald chi2 value of 161.84 with a p-value of 0.0000 confirms the model's statistical significance, meaning the independent variables collectively have a significant impact on loan amounts.

c. Sectoral Analysis

A sectoral analysis provides deeper insights into the impact of green disclosure on loans across different industries. By examining these relationships, we can identify whether certain sectors benefit more from green disclosure practices, revealing sector-specific dynamics.

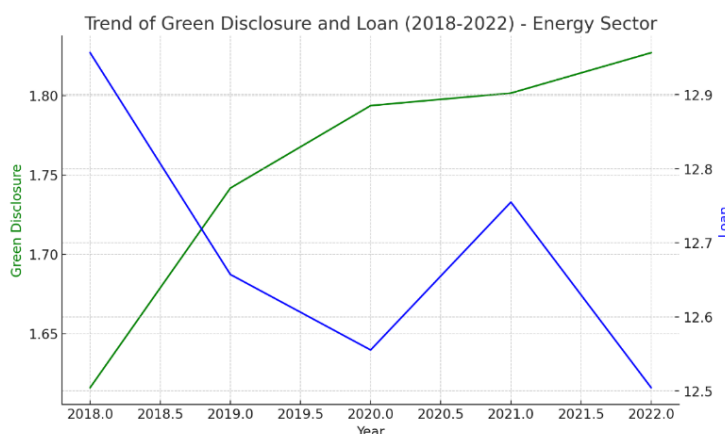


Figure 3. Trend of Green Disclosure and Loan 2018 - 2022



## Energy Sector

The analysis of green disclosure in the energy sector shows a negative relationship between green disclosure and loans. Despite improvements in green disclosure, energy companies experienced a significant reduction in loan amounts from 2021 to 2022. Further analysis using a random effects model for the energy sector reveals a negative relationship between green disclosure levels and loan amounts. This unexpected outcome suggests that improved environmental transparency did not enhance the ability to secure loans in the energy sector. The model results indicated that while green disclosure and asset tangibility were positively significant at the 5% and 1% levels respectively, other factors such as growth, cash holding, and ROA were not significant. Financial leverage and size were also positively significant at the 1% level, while ownership concentration was negatively significant at the 1% level, and management holding was marginally significant at the 10% level.

## Basic Materials Sector

In the basic materials sector, there is a clear upward trend in green disclosure from 2018 to 2022, indicating a growing commitment to environmental practices. However, loan amounts have shown significant variability, reflecting changes in economic conditions and company-specific factors. The regression analysis indicates a positive but statistically insignificant relationship between green disclosure and loan amounts, with a p-value of 0.122. This suggests that while companies in this sector are increasingly adopting and reporting environmentally friendly practices, these efforts have not significantly impacted their ability to secure loans.

## Consumer Cyclic and Consumer Defensive Sectors

From 2018 to 2022, green disclosure scores in the consumer cyclic and consumer defensive sectors generally increased, indicating enhanced environmental transparency. However, loan amounts showed a slight decreasing trend, suggesting that improved green disclosure did not translate into higher loan amounts. The regression analysis shows a positive relationship between green disclosure and loan amounts, which is statistically significant with a p-value of 0.000. The model explains a substantial portion of the variance in loan amounts, indicating that higher green disclosure is associated with higher loan amounts. This sector demonstrates that while companies have been placing more emphasis on environmental transparency and sustainability practices, it has not yet consistently led to increased loan amounts.

## Communication Sector

In the communication sector, both green disclosure and loan amounts have generally shown an upward trend from 2018 to 2022, with significant increases in green disclosure from 2019 to 2022, despite a minor dip in 2021. Loan amounts have also increased steadily, recovering after a slight dip in 2021. However, the regression analysis indicates that green disclosure does not have a statistically significant impact on loan amounts, with a coefficient of -0.2047507 and a p-value of 0.806. This suggests that changes in green disclosure levels do not significantly predict loan amounts in this sector.

## Panel regression for Equation-2:

The research on the second hypothesis will be conducted in panel regression using STATA. Here the impact of the independent variable green innovation and other control variables growth, cash holding, asset tangibility, roa, investment expenditure, size financial leverage, risk, R&D investment, ownership concentration and management holding are analyzed in the similar pattern as we did for equation 1.

$$\text{Corporate Loan}(i,t) = \beta_0 + \beta_1 \text{Green Innovation}(i,t) + \gamma_1 \text{Growth Rate}(i,t) + \gamma_2 \text{Cash Holding}(i,t) + \gamma_3 \text{Asset Tangibility}(i,t) + \gamma_4 \text{ROA}(i,t) + \gamma_5 \text{Investment Expenditure}(i,t) + \gamma_6 \text{Corporate Size}(i,t) + \gamma_7 \text{Financial Leverage}(i,t) + \gamma_8 \text{Ownership Concentration}(i,t) + \gamma_9 \text{Management Holding}(i,t) + \mu(i) + \varepsilon(i,t).$$

### a. Hausman test

The Hausman test is used to compare the fixed effects model (FE) and the random effects model (RE) in panel data analysis, helping to determine which model is more appropriate. The null hypothesis (H0) posits that the difference in coefficients between the models is not systematic. The table below shows the coefficients obtained from both the fixed effects model (FE) and the random effects model (RE), along with the difference between them and the standard error of the difference.



The test statistic (chi2) is calculated as follows:

$$\chi^2(12) = (b - B)' \left[ \frac{1}{V_b - V_B} \right] (b - B) = 22.27$$

The probability (Prob > chi2) associated with this test statistic is 0.0346, indicating that the p-value is less than 0.05.

The probability (Prob > chi2) associated with this test statistic is 0.0346, indicating that the p-value is less than 0.05. Since the p-value is below this threshold, we reject the null hypothesis (H0). This suggests that the differences in coefficients between the fixed effects and random effects models are systematic, leading to the preference for the fixed effects model in this analysis.

**Table 5. Hausman Test**

Variable	fe2	re2	Difference	Std. err.
green_inno~n	0.039786	0.035731	0.004055	0.006477
growth	-0.01091	-0.11745	0.106533	0.038666
cash_holding	-1.69343	-1.88119	0.187761	0.270597
asset_tang~y	-0.66412	-0.61911	-0.04505	0.279434
investment~e	2.082484	-3.96519	6.047676	16.84572
roa	-0.23375	-0.25553	0.021773	0.127954
size	0.257318	0.381267	-0.12395	0.037243
financial_~e	0.678508	0.558698	0.11981	0.053828
risk	0.481544	-1.14005	0.621952	0.705078
RD_investm~t	-1.42524	4.173496	-5.59874	16.54225
ownership~n	-0.98886	-1.73625	0.747393	1.185815
management~g	0.623549	0.494522	0.129027	1.025539

**b. Fixed effect model results**

The dependent variable in this analysis is the loan amount. The R-squared values provide insight into the explanatory power of the model. The within R-squared value of 0.4757 indicates that 47.57% of the variation in the loan amount within entities over time is explained by the independent variables. The between R-squared value of 0.4204 means that 42.04% of the variation between different entities is explained. The overall R-squared value of 0.4414 shows that 44.14% of the total variation in the loan amount is explained by the model.



Table 6. Fixed effect model results

```
. xtreg loan green_innovation growth cash_holding asset_tangibility roa investment_expenditure size financial_leverage
> risk RDInvestment ownership_concentration management_holding, fe
```

Fixed-effects (within) regression						
Number of obs = 190						
Group variable: company_id						
Number of groups = 38						
R-squared: Obs per group:						
Within = 0.4757			min =		5	
Between = 0.4204			avg =		5	
Overall = 0.4414			max =		5	
			F(12, 140)		= 10.58	
corr(u <sub>ij</sub> Xb) = -0.1133			Prob > F		0	
loan	Coefficient	Std. err.	t	p>  t	[95% conf. interval]	
green_innovation	0.0397861	0.0190955	2.08	0.039	0.0020333	0.077539
growth	-0.0109146	0.1344949	-0.08	0.935	-0.2768183	0.2549891
cash_holding	-1.693425	0.5514925	-3.07	0.003	-2.783756	-0.6030952
asset_tangibility	-0.6641174	0.4381514	-1.52	0.132	-1.530366	0.2021314
roa	-0.2337521	0.3306328	-0.71	0.481	-0.8874309	0.4199268
investment_expenditure	2.082484	50.43425	0.04	0.967	-97.62873	101.7937
size	0.2573182	0.0834559	3.08	0.002	0.0923215	0.422315
financial_leverage	0.6785079	0.0995494	6.82	0	0.4816935	0.8753224
risk	0.481544	1.384673	0.35	0.729	-2.256028	3.219116
RDInvestment	-1.425244	49.33479	-0.03	0.977	-98.96277	96.11228
ownership_concentration	-0.9888561	1.352353	-0.73	0.466	-3.66253	1.684818
management_holding	0.6235492	1.176743	0.53	0.597	-1.702936	2.950034
_cons	10.31573	1.19141	8.66	0	7.960244	12.67121
sigma_u	0.59916163	fraction of variance due to u <sub>i</sub>				
sigma_e	0.56160346					
rho	0.53232255					
F test that all u <sub>i</sub> =0: F(37, 140) = 4.05 Prob > F = 0.0000						

The analysis is based on 190 observations across 38 unique entities. The F-test result, with an F-statistic of 10.58 and a p-value of 0.0000, indicates that the model is statistically significant.

For the variable analysis, the coefficient for green innovation is 0.0397861, with a t-value of 2.08 and a p-value of 0.039, indicating a statistically significant positive effect on the loan amount. Growth has a coefficient of -0.0109146, with a t-value of -0.08 and a p-value of 0.935, showing no significant impact. Cash holding has a coefficient of -1.693425, with a t-value of -3.07 and a p-value of 0.003, indicating a significant negative effect. Asset tangibility has a coefficient of -0.6641174, with a t-value of -1.52 and a p-value of 0.132, showing no significant impact.

Return on assets (ROA) has a coefficient of -0.2337521, with a t-value of -0.71 and a p-value of 0.481, indicating no significant impact. Investment expenditure has a coefficient of 2.082484, with a t-value of 0.04 and a p-value of 0.967, showing no significant impact. Size has a coefficient of 0.2573182, with a t-value of 3.08 and a p-value of 0.002, indicating a significant positive effect. Financial leverage has a coefficient of 0.6785079, with a t-value of 6.82 and a p-value of 0.000, indicating a significant positive effect. Risk has a coefficient of 0.481544, with a t-value of 0.35 and a p-value of 0.729, showing no significant impact. RD investment has a coefficient of -1.425244, with a t-value of -0.03 and a p-value of 0.977, indicating no significant impact. Ownership concentration has a coefficient of -0.9888561, with a t-value of -0.73 and a p-value of 0.466, showing no significant impact. Management holding has a coefficient of 0.623492, with a t-value of 0.53 and a p-value of 0.597, indicating no significant impact.

Additional model statistics include Sigma\_u, which is 0.59916163, indicating the variability between entities, and Sigma\_e, which is 0.56160346, indicating the variability within entities over time. Rho, the proportion of variance due to between-entity differences, is 0.53232255, suggesting that 53.23% of the total variance is due to differences between entities.





The F-test for  $u_i = 0$  yields an F-statistic of 4.05 with a p-value of 0.0000, indicating significant variability between entities, thus justifying the use of a random effects model.

### 4.3. Discussion

#### Positive but Insignificant Impact of Green Disclosure on Loan Size

The study employed both random effects (RE) and fixed effects (FE) models to investigate the relationship between green disclosure and loan size. The Hausman test indicated that the RE model was more appropriate for the analysis (Hausman, 2015). The results show that the coefficient for green disclosure is positive (0.3218), but with a p-value of 0.114, it is not statistically significant (Xing et al., 2021). This implies that firms with better green disclosure practices may receive more loans, but the evidence is not conclusive. Greenwashing, where firms provide symbolic rather than substantive disclosures, undermines the effectiveness of environmental disclosure in improving access to loans (Lyon & Montgomery, 2015). Banks may be cautious due to the risk of misleading information (Delmas & Burbano, 2011). High-quality, verifiable environmental disclosures are crucial, and banks need robust mechanisms to distinguish between genuine and superficial disclosures to ensure loans are granted to firms with true environmental commitments (Marquis et al., 2016).

The study found that hard disclosure, involving concrete and verifiable data, marginally promotes loan size. In contrast, soft disclosure, with more narrative claims, tends to have a negative impact due to banks' wariness of potential greenwashing (Amin et al., 2024). This highlights the importance of substantive and verifiable environmental disclosures in securing bank loans.

For green credit policies to be effective, there must be a stronger emphasis on promoting and verifying substantive green innovations within firms (Wang et al., 2022). Policies should aim to reduce greenwashing and encourage genuine environmental improvements (Testa et al., 2018). Firms should focus on substantive green innovations and ensure their environmental disclosures are comprehensive and backed by verifiable data (Truant et al., 2017).

The study analyzed the relationship between green disclosure and loan amounts in various sectors. In the energy sector, despite improvements in green disclosures, companies experienced a significant reduction in loans from 2021 to 2022, suggesting that enhanced environmental transparency does not translate into increased borrowing capabilities, possibly due to sector-specific risks and regulatory pressures (Johnson & Greenwell, 2022). The basic materials sector showed a positive but not statistically significant relationship, with variability influenced by economic conditions and sector-specific factors like commodity prices (Lee, 2022). In the consumer cyclic and consumer defensive sectors, loan amounts have shown a slight decreasing trend despite an increase in green disclosure scores, indicating that other factors, such as market conditions and financial health, play a critical role in determining loan amounts (Liu et al., 2021). The communication sector showed a general upward trend in both green disclosure and loan amounts, but green disclosure does not have a statistically significant impact on loan amounts, possibly due to the lower capital intensity of this sector (T. H. Nguyen et al., 2023).

#### Positive Impact of Green Innovation on Loan Size

The significance of green innovation in securing bank loans cannot be overstated. A recent study reveals that firms engaging in innovative green practices are more likely to receive larger loans from banks (Smith et al., 2023). This positive impact is attributed to the improved corporate environmental performance resulting from green innovation, which enhances banks' confidence in firms' ability to manage environmental risks effectively (Li et al., 2023). Moreover, green innovation supports long-term corporate development, aligning with the dynamic capability theory by enhancing firms' adaptability and competitive advantage (Lee, 2022).

It is crucial to distinguish between green innovation and environmental disclosure. Green innovation is an internal process, while environmental disclosure is an external communication to stakeholders (Liu et al., 2021). Banks respond more positively to firms with strong green innovation performance rather than those with high environmental disclosure quality (Wang et al., 2022). This finding highlights the importance of substantive green innovations in securing bank loans.

For green credit policies to be effective, there must be a stronger emphasis on promoting substantive green innovations (Amit R et al., 2024). Banks should prioritize loans to firms with genuine environmental commitments demonstrated through innovative practices (T. H. Nguyen et al., 2023). Consequently, firms should focus on implementing meaningful green innovations and ensure that these efforts are well-documented and verifiable to enhance their credibility with banks (Sharma et al., 2022).



4.4. Solution and Implementation Recommendation

Table 3. Solutions

No.	Solution/Recommendation	Objective	Expected Outcome	Implementation Details
1	Prioritize green disclosure	Improve the quality, transparency, and comprehensiveness of environmental reporting.	Build trust and credibility with lenders and stakeholders, leading to potentially more favorable lending terms.	Develop a standardized framework for sustainability reporting that aligns with international standards. Conduct training sessions for staff on effective reporting techniques.
2	Invest in green innovation	Allocate resources towards developing eco-friendly technologies, products, and processes.	Differentiate in the market, comply with regulations, and meet the demand for sustainable solutions, enhancing financial performance.	Set up a dedicated R&D team focused on green innovation. Partner with universities and research institutions for advanced eco-technological developments.
3	Optimize cash management	Maintain an optimal level of cash holdings for financial flexibility and efficient resource allocation.	Improve borrowing capacity and demonstrate effective financial management to lenders.	Regular review of cash flow and financial strategies to ensure optimal use of resources. Implement software solutions for better cash flow management.
4	Scale up sustainably	Focus on growth strategies that expand business and asset base sustainably, especially for smaller firms.	Improve creditworthiness and access to loans over time by demonstrating responsible growth.	Invest in sustainable practices and technologies. Explore new markets and form strategic partnerships to enhance business scalability.
5	Tailor sustainability strategies to industry context	Develop sector-specific sustainability approaches that consider unique risks, opportunities, and expectations.	Address specific industry challenges and opportunities in sustainability, enhancing sector-specific performance and compliance.	Conduct industry-specific assessments and develop tailored sustainability strategies that respond to specific needs and challenges of different sectors.
6	Integrate sustainability into core business strategy	Embed sustainability in the business model and decision-making processes.	Manage risks, seize opportunities, and create long-term value for stakeholders.	Align sustainability goals with financial objectives, engage stakeholders in decision-making processes, and foster a culture of environmental responsibility.
7	Collaborate with lenders and other stakeholders	Understand and align with the expectations and priorities of lenders and other financial partners related to sustainability.	Build stronger, more resilient relationships and facilitate access to capital.	Establish open and transparent communication channels with all stakeholders to ensure alignment and collaboration on sustainability strategies.



8	Monitor and adapt to evolving sustainability landscape	Stay informed about the latest sustainability regulations, reporting standards, and best practices.	Position the company to take advantage of new opportunities and avoid potential risks.	Invest in ongoing training and education on sustainability. Participate in industry initiatives and seek expert guidance to stay ahead of regulatory changes and market developments.
9	Measure and report on sustainability performance	Establish robust systems for measuring, monitoring, and reporting sustainability performance.	Provide clear and comparable data on environmental and social impacts, building trust with stakeholders.	Identify key sustainability metrics, set realistic targets, and use technology to regularly track and report on these metrics to stakeholders.
10	Seek out innovative financing solutions	Explore and utilize sustainable financing options like green bonds, sustainability-linked loans, and impact investing.	Access new sources of capital and demonstrate leadership in the transition to a low-carbon economy.	Research and develop knowledge on various sustainable financing instruments. Engage with financial institutions to create products that align with the company's sustainability goals.

To enhance sustainability and access to finance, companies should adopt a comprehensive approach. First, they need to improve the quality and transparency of their environmental reporting by aligning with international standards and conducting staff training. This builds trust with lenders and stakeholders. Additionally, investing in green innovation by developing eco-friendly technologies and partnering with universities can differentiate companies in the market and meet regulatory demands. Efficient cash management through optimal cash holdings, regular reviews, and advanced software solutions ensures financial flexibility. Companies should also scale sustainably by expanding their business responsibly, investing in sustainable practices, and forming strategic partnerships to enhance creditworthiness. Tailoring these strategies to industry-specific contexts and integrating them into core business practices will align sustainability efforts with financial goals, fostering long-term resilience and value creation.

**5. CONCLUSION**

To enhance sustainability frameworks and access to finance, companies should adopt rigorous and standardized sustainability reporting guidelines to improve transparency and build stakeholder trust, potentially leading to better lending terms. Continuous investment in green technologies and processes is crucial, possibly through innovation labs and collaborations with academic institutions and industry leaders. Companies should tailor sustainability strategies to their industry contexts, considering unique risks, opportunities, and regulatory demands. Strengthening stakeholder engagement through improved communication and collaboration with investors, customers, and regulatory bodies is essential. Comprehensive sustainability training programs for all employee levels should be implemented to ensure organization-wide understanding and commitment to sustainability goals. Finally, companies must stay vigilant in monitoring and adapting to evolving sustainability regulations and standards to effectively manage risks and seize new opportunities in sustainable finance.

**6. LIMITATION**

This study focuses on LQ45 companies, limiting generalizability to other sectors. Reliance on historical data may not reflect recent shifts in sustainability or financial strategies. The quantitative analysis may overlook qualitative factors such as corporate culture. The five-year study period may not capture long-term impacts of sustainability practices. Establishing causality is challenging due to unaccounted confounding variables. The study did not control for all external factors, and the COVID-19 pandemic introduced economic disruptions. Only total debt was considered, without distinguishing short-term and long-term debt, which could affect



accuracy. Future research should include broader data, longer analysis periods, and both qualitative and quantitative methods to better understand the relationship between sustainability and financial performance.

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