The Effects of Mandatory Sustainability Reporting on Banks' Lending Decisions: Evidence from Green Loan Portfolio Analysis

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Abstract

Using confidential data on banks' green and non-green loan portfolios at bank and loan levels, this study examines the real effects of mandatory sustainability reporting regulation in one of the major emerging markets, the Indonesian banking industry. The results show that treatment banks, which first disclosed their sustainability reports following the mandatory reporting regulation, experienced a greater increase in green loans. Since the regulation focuses solely on the disclosure of green loan amounts, and not on other types of loans or their features, it has no significant effect on non-green loan amounts or on other loan characteristics such as interest rates, loan periods, or collateral. Furthermore, this study finds that banks with higher creditor exposure, those adopting international sustainability standards, and those providing sustainability assurance have larger green loan portfolios after the mandatory sustainability reporting regulation.

Keywords: Bank, ESG Reporting, Real Effect, Loan, Indonesia JEL Classification: G18, G21, M14, M40, N20

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1. Introduction

The impact of the banking industry on the environment is mainly through its intermediary function of allocating funds to green and non-green activities. The World Bank defines green loans as financing channelled for activities that have a positive impact on the environment. This positive impact must be measurable and reportable, including through sustainability or environmental disclosures.¹ Prior studies have shown the economic consequences of mandatory non-financial disclosures (e.g., Christensen, Floyd, Liu, & Maffett, 2017; Chen, Hung, & Wang, 2018; Darendeli, Fiechter, Hitz, & Lehmann, 2022; Fiechter, Hitz, & Lehmann, 2022; Kruger, Sautner, Tang, & Zhong, 2024). In the banking industry, stakeholders pay attention to Environmental, Social, and Governance (ESG) disclosures,² and increase their pressure on banks' environmental and social performances (Chen, Hung, & Wang, 2023; Wang, 2023). Different from those studies, this study examines whether mandatory sustainability disclosures influence banks' green loan portfolios at bank and loan levels. Specifically, while prior studies have proxied banks' environmental performance using the ESG performance index, this study focuses on the impact of mandatory sustainability disclosures on banks' green loans, which directly capture banks' intermediary function of allocating funds to green or other activities.³

Data from the World Bank shows that green loans in developed countries are more than 90% of global outstanding green loans in 2021. As stakeholders in developed countries show greater interest in environmental issues, banks in developed countries face higher litigation risk if their borrowers have environmental issues (e.g., Boyer & Laffont, 1997; Aintablian, Mcgraw, & Roberts, 2007; Choy, Jiang, Liao, & Wang, 2024). Consequently, banks in developed countries have stronger incentives to rebalance their loan portfolio towards more sustainable borrowers. Compared to their peers in developed countries, banks in emerging countries have lower litigation risk regarding their non-green financing as they operate in different institutional environments, characterized by weaker governance and less stringent legal enforcement. In the absence of litigation risk, sustainability disclosure may provide greater incentives for banks in emerging markets to expand their green loan portfolios, as increased transparency could attract more stakeholder attention to their environmental

¹ https://www.worldbank.org/en/news/feature/2021/10/04/what-you-need-to-know-about-green-loans.

² In this study the terms sustainable and ESG disclosures are used interchangeably to explain non-financial reports that disclose environmental performances or impacts.

³ Amid more recent studies showing the positive impact of sustainability disclosure on banks' financial performances (e.g., Buallay 2019; Gupta, 2024), this study specifically focuses on non-financial disclosure's influence on banks' green loan portfolios.

performance. Therefore, the impact of mandatory sustainability reporting on banks' efforts to increase green loans is expected to be stronger in an emerging market.

Amid the vital role of green financing in emerging countries, this study focuses on bank loan portfolios for two main reasons. First, bank loan portfolio disclosure affects investor decisions, as it impacts banks' stock prices and liquidity (Madura & Zarruk, 1992; Liu & Ryan, 1995; Flannery, Kwan, & Nimalendran, 2004).⁴ Next, loan portfolios influence banks' internal financial performance. As green loan portfolio is lower than other types of loans, particularly in emerging countries, an increase in banks' green loans could indicate banks' higher ability to diversify their loan portfolios which could lead to cost efficiency, greater solvency, and enhanced bank stability (e.g., Rossi, Schwaiger, & Winkler, 2009; Shim, 2019). Nevertheless, prior studies also documented the adverse influence of loan portfolio diversification, including decreasing cost efficiency (Rossi, Schwaiger, & Winkler, 2009) and lower return (Acharya, Hasan, & Saunders, 2006; Hayden, Porath, & Westernhagen, 2007). As discussed later in this section, the negative consequences of loan diversification towards green portfolios could potentially undermine the mandatory sustainable disclosure influence on banks' green loan portfolios.

Prior empirical studies have shown links between non-financial disclosures and real economic outcomes (e.g., Al-Tuwaijri, Christensen, & Hughes II, 2004; Dhaliwal, Li, Tsang, & Yang, 2011; Ng & Rezaee, 2015). However, as discussed by Christensen, Hail, and Leuz (2021), it is more challenging to deduce causality between non-financial disclosure and firms' performance, as firms with business opportunities in the future may voluntarily disclose their sustainable activities. To construct a causal inference of environmental disclosure influence on banks' green loan portfolios, this study uses mandatory sustainability report implementation in Indonesia. The mandatory sustainability report regulation requires commercial banks to disclose their environmental impacts and performance, including loans to green activities.⁵ Nevertheless, several commercial banks in Indonesia voluntarily published their sustainability report before the regulation took effect, providing a setting for a quasi-experiment.

⁴ Banks' loan portfolios also reflect information asymmetry between managers and shareholders and serve as key determinant of loan provision, which is the focus of manager accounting discretion in the banking industry (Beatty & Liao, 2014).

⁵ Indonesia Financial Services Authority's regulation number 51/POJK.03/2017 concerning The Implementation of Sustainable Finance for Financial Services Institutions, Security Issuers, and Public Companies. The regulation requires banks to support sustainable growth which balances economic, social, and environmental interests but the regulation does not mandate banks to increase their green loan portfolios.

This setting allows us to use a difference-in-differences design to examine the influence of mandatory sustainability reports on banks' green loan portfolios. Banks that voluntarily published their sustainability report before the regulation are the control banks, while banks that first published their sustainability report after the mandatory regulation are the treatment banks. Based on the stakeholder theory, the mandatory sustainable disclosure regulation exposes the banking industry's environmental impacts and hence would increase stakeholders' attention and pressure on banks' environmental performance. Given banks' concern for their reputation, the regulation provides stronger incentives to increase their green loan portfolios. It is consistent with the prior empirical evidence of the real effects of mandatory ESG disclosures (e.g., Christensen, Floyd, Liu, & Maffett, 2017; Fiechter, Hitz, & Lehmann, 2022; Kruger, Sautner, Tang, & Zhong, 2024). Specifically, in the banking industry, Wang (2023) reveals that borrowers increase their environmental and social performances if their lender banks' home-country mandate ESG disclosures. Their findings imply that mandatory ESG disclosures improve stakeholder pressure on banks, which eventually influences their borrowers' performance toward environmental and social activities.

Nonetheless, our hypothesis that mandatory sustainable disclosure increases banks' green loan portfolios is not without tension. Prior empirical studies showed that mandatory reporting regulations may not always improve environmental disclosures (e.g., Larrinaga, Carrasco, Correa, Llena, & Moneva, 2010; Chauvey, Giordano-Spring, Cho, & Patten, 2015; Hummel & Schlick, 2016). One of the reasons is that the benefit from the disclosure incentives may not outweigh their cost. For example, banks with larger mortgage loan portfolios may find it more challenging to finance new green activities, as without adequate risk management, loan risk and other related expenses can increase. Hence, based on the voluntary disclosure theory that firms with better ESG performance have greater motivation to disclose their environmental activities (e.g., Ingram & Frazier, 1980; Al-Tuwaijri, Christensen, & Hughes II, 2004; Clarkson, Li, Richardson, & Vasvari, 2008; Hummel & Schlick, 2016), banks that voluntarily published their sustainability reports before the regulation may have early-adoption advantages, including expertise and experience, enabling them to consistently increase their green loan portfolios compared to banks that began disclosures after the regulation. Furthermore, recent studies showed that bank ESG disclosures may not always be consistent with their actual loan disbursements to socially and environmentally friendly activities (Basu, Vitanza, Wang, & Zhu, 2022; Giannetti, Jasova, Loumioti, & Mendicino, 2023).

To test the assumption that mandatory sustainability disclosure increases stakeholders' pressure on banks' green loan lending decisions, this study examines whether banks with higher wholesale creditor exposure experience a greater increase in green loan portfolios following the implementation of mandatory sustainability reporting. Wholesale creditors, hereafter referred to as creditors, are institutional stakeholders who lend money to the banks for investment purposes. ⁶ Empirical studies indicate that creditors incorporate their borrowers' ESG performance and disclosures into their lending decisions (e.g., Chava, 2014; Degryse, Goncharenko, Theunisz, & Vadasz, 2023). As a result, banks with greater exposure to creditors are considered to face higher pressure to increase their green loan portfolios after the implementation of the mandatory sustainability reporting regulation. Given that green loan portfolios reflect banks' environmental performance, this assumption is consistent with prior studies showing that banks with higher ESG performance benefit from lower interest rates charged by creditors and vice versa (e.g., Agnese & Giacomini, 2023; Andries & Sprincean, 2023). These findings highlight that creditors value their borrowers' environmental reputation and incorporate it into their financing decisions.

Furthermore, to control for the sustainability reporting characteristics that may influence our results, we incorporate sustainability report characteristics of international standards adoption and assurance services. Although there is no regulation that mandate banks to adopt the international sustainability standards or the inclusion of assurance services, some banks have voluntarily adopted Global Reporting Initiative (GRI) standards and have also included assurance services in their sustainability reports. We expect that the adoptions of GRI standards and assurance services provide banks with greater incentives to increase their green loan portfolios, as these practices enhance the comparability and credibility of sustainability reports (e.g., Simnett, Vanstraelen, & Chua, 2009; Braam, Weerd, Hauck, & Huijbregts, 2016; Yadava & Sinha, 2016; Fiechter, Hitz, & Lehmann, 2022), and thereby drawing greater stakeholder attention and pressure to further motivate banks allocating more loans to green activities.

⁶ Individually, creditors make larger investments that are not covered by the deposit insurance system. Hence, unlike depositors, who primarily place their money in banks for transaction purposes, creditors have a stronger incentive to monitor bank performance.

We use a unique dataset at bank and loan levels from 2015 to 2023. At the loan level data, we use 17,186,366 unique loans that reported by banks to the Indonesian Financial Services Authority (Otoritas Jasa Keuangan/OJK). The loan data contains information on loan amount, interest rate, period, collateral, and activity. We run ex-post identification and match activities in the loan report and activities classified in the taxonomy to classify a loan into green, transition, and unqualified groups based on the Indonesian Green Taxonomy. This process mitigates the selection bias if the green and non-green identification is done by the banks, and also ensures the comparability of the green and non-green portfolios among the banks. Based on the taxonomy, green loans are loans to activities that are directly classified as green or to activities that: do no significant harm, apply minimum safeguards, provide positive environmental impacts, and align with the taxonomy's environmental objectives. ⁷ Transition loans are those associated with activities that must meet specific criteria before being classified as green, while unqualified loans are loans to environmentally harmful and unclassified activities.

Our classification, which is based on a country taxonomy, has its own limitations. However, prior studies on green loans have also relied on country-specific classifications. For instance, Cui, Geobey, Weber, and Lin (2018) used China's Green Credit Policy classification, while Neagu, Tatarici, Dragu, and Stamate (2024) applied the green loan definitions established by the Romanian National Committee of Macroprudential Oversight. In line with these studies, this study's green classifications include environmentally friendly agriculture, transport efficiency, circular economics, and climate change adaptation activities.

In addition to the mandatory sustainability disclosure setting and the availability of green loan data, this study employs the Indonesian banking industry for two main reasons. First, Indonesia is an emerging country with a stable and profitable banking industry compared to its peers. The robust banking environment, characterized by ample solvency and provisions, gives the banking industry greater flexibility in rebalancing its loan portfolios. ⁸ Next, the ESG scores of firms in Indonesia are still low compared to peer countries (e.g., Singhania

⁷ Indonesia Green Taxonomy: <u>https://ojk.go.id/id/berita-dan-kegiatan/info-terkini/Documents/Pages/Taksonomi-Hijau-Indonesia-Edisi-1---2022/Taksonomi%20Hijau%20Edisi%201.0%20-%202022.pdf</u>.

⁸ The table of the Indonesian banking industry indicators compared with other peers is presented in the Institutional Setting section.

& Saini, 2023).⁹ This poses challenges for Indonesian banks in shifting their loan portfolios toward environmentally friendly activities.

Our results show that the mandatory sustainability reporting regulation increases treatment banks' green loan portfolios, supporting the hypothesis. This suggests that the incentives from the mandatory environmental disclosures, which are increasing stakeholders' attention on banks' green loan portfolios, influence banks' green loan portfolios. The findings are consistent when we use matching control groups using Propensity Score Matching (PSM) and entropy balancing, and are further supported by the parallel trend assumption. The results at the bank level show that, on average, the treatment banks increase the portion of their green loans by 0.7 percent to 0.8 percent after the mandatory sustainability report regulation. Consistent with the results at the bank level, our results at the loan level show that treatment banks increase the amount of their green loans after the mandatory sustainability report regulation. On average, the treatment banks provide a higher amount of green loans between 13.2 percent and 14.3 percent after the mandatory sustainability report regulation became effective.

Further analysis shows that as the regulation only requires banks to disclose green loan amounts in their sustainability reports, it only influences banks' green loan portfolios, not the other types of portfolios. These results are consistent at the bank and loan level. Moreover, our results exhibit that the mandatory sustainable report regulation decreases the difference between banks' non-green and green loans, indicating that banks move their loan portfolios towards environmental activities at the expense of their non-green loans. At the loan level, we also show that the regulation does not influence loan interest rate, period, and collateral, as banks are not required to disclose their green loan features other than the loan amount. These findings suggest that specific transparency on green loan amounts only incentivizes banks to increase the amount of their green loans, while not providing more incentive to make those loans more inclusive in terms of lower interest rate, longer period, or smaller collateral amount requirement.

Next, we also show that after the mandatory sustainability reports, banks with higher creditors' exposures, adopting international sustainability standards, and providing sustainability assurance have higher green loans. First, the results indicate that as creditors

⁹ Indonesia's ESG index ranks 128 out of 183 countries surveyed by the Global Risk Profile. Accessed on November 11, 2023. <u>https://risk-indexes.com/esg-index/</u>.

care about banks' performance, banks improve green loan portfolios after the mandatory sustainability reports to mitigate pressure from their creditors, such as tighter financing access or higher interest burdens. Next, these results indicate that banks recognize their stakeholders' concern for the credibility of sustainability reports and, consequently, improve their green loan portfolios alongside the quality of their sustainability disclosures.

The most similar study with this study is Wang (2023), which employs the same assumption that mandatory ESG disclosures increase pressure on banks' ESG performances. However, beyond the unique loan portfolio and regulatory setting, this study differs from Wang (2023) in two key aspects. First, our study focuses on banks' lending decision captured by their loan portfolios and individual loan amount, while Wang (2023) examines banks and their borrowers' environmental and social ratings. Next, our study uses overall portfolios of green and non-green loans as a direct indicator of environmental performance, whereas Wang (2023) and other studies rely on ESG ratings. Since ESG ratings are derived from ESG disclosures subject to managerial discretion, they may face a higher risk of greenwashing or social washing. For example, Basu, Vitanza, Wang, and Zhu (2022) show that banks with higher ESG and social ratings are more likely to limit their mortgages to poor and disaster-affected areas. Similarly, Giannetti, Jasova, Loumioti, and Mendicino (2023) demonstrate that banks emphasizing sustainability in their disclosures extend a higher volume of brown loans.

Our analysis also has limitations, as we cannot identify a specific loan borrower history throughout the observation period. Consequently, we cannot track the impact of the bank's mandatory sustainability regulation on its borrowers' environmental performance. However, while our study specifically focuses on examining the impact of the mandatory sustainability regulation on banks' lending decisions, in our additional analysis, we show that our results are not affected by the loan demand side, when borrowers are likely to be eligible for more green loans after the mandatory sustainability reporting regulation.

This study contributes to the literature through four main channels. First, this study expands the literature on the outcomes of mandatory ESG disclosures. Prior studies have demonstrated that mandatory ESG disclosures influence information quality (e.g., Fiechter, Hitz, & Lehmann, 2022; Krueger, Sautner, Tang, & Zhong, 2024), financial performances (e.g., Christensen, Floyd, Liu, & Maffett, 2017; Chen, Hung, & Wang, 2018), and ESG performances (Wang, 2023; Zhang & Park, 2024). Unlike those studies, this study examines

the influence of mandatory ESG disclosures on banks' green loans, as the impact of the banking industry on the environment is mainly through its intermediary function of allocating funds to green and non-green activities.

Next, this study adds to the studies of determinant factors of ESG disclosure and access to credit financing. While other studies demonstrate a direct relationship between ESG disclosure and the cost of debt (e.g., Chava, 2014; Degryse, Goncharenko, Theunisz, & Vadasz, 2023), our study show that banks with higher creditor exposure have stronger incentives to improve their green loan portfolios following mandatory sustainability reports. This indicates that banks recognize that creditors may exert greater pressure on those with weaker environmental performance. As prior studies have shown that the adoption of GRI standards and assurance moderates the influence of ESG disclosures on financial outcomes (e.g., Simnet, Vanstraelen, & Chua, 2009; Dhaliwal, Li, Tsang, & Yang, 2011; Dhaliwal, Li, Tsang, & Yang, 2014), our study fills the gap by providing evidence that creditor exposures, the adoption of GRI standards, and sustainability assurance moderates the association between mandatory sustainability report and banks' green loan portfolios.

Furthermore, this study relates to studies on the determinant of green loans. Previous research demonstrates that risk mitigation (e.g., Herbohn, Gao, & Clarkson, 2019; An, Ding, & Wang, 2023), green loan guidelines (e.g., Huang, Gao, & Jia, 2023; Neagu, Tatarici, Dragu, & Stamate, 2024), environmental regulations (e.g., Ambec & Lanoie, 2008; Wu, Luo, & You, 2023), and public pressure through ESG disclosures (Wang, 2023; Zhang & Park, 2024) increase bank loans to environmentally friendly firms. In this context, this study contributes by demonstrating that green loan portfolio disclosures in mandatory sustainability reports incentivize banks to expand their green loans.

Finally, this study adds to the literature on the association between ESG disclosures and bank lending. Wang (2023) and Zhang and Park (2024) report a positive association between ESG disclosures and bank loans to activities with lower environmental risk. In contrast, Basu, Vitanza, Wang, and Zhu (2022) and Giannetti, Jasova, Loumioti, and Mendicino (2023) highlight a disconnect between ESG disclosures and banks' social and environmentally friendly lending. This study contributes to the discussion between these two perspectives, demonstrating that increased transparency in green loan portfolios positively influences banks' strategies to allocate more assets to green activities.

The remainder of this study is as follows: Section 2 discusses the literature review, followed by Section 3: institutional setting, and Section 4: hypothesis development. Next, Sections 5 and 6 present the methodology and analysis, respectively. Section 7 highlights the conclusion of this study.

2. Literature Review

Green Loan

The studies of firm stakeholders' interests that lead to stakeholder theory explain that firms with more stakeholder focus have better reputations, risk management, and sustainability practices (e.g., Freeman, 1984; Freeman, 1999). Studies in this field support that environmentally friendly firms are considered to have lower reputation, regulation, and litigation risks (e.g., Ambec & Lanoie, 2008; Wu, Luo, & You, 2023). In the banking industry, prior studies showed and discussed that banks are considered liable for their borrowers' environmental problems (e.g., Boyer & Laffont, 1997; Balkenborg, 2001; Aintablian, Mcgraw, & Roberts, 2007). To mitigate this litigation risk, banks then put more interest in their borrowers' environmental issues, adopted the Equator principle (Conley & Williams, 2011),¹⁰ and recruiting more environmental experts (Ambec & Lanoie, 2008).

Hence, banks then move their loan portfolios toward environmentally friendly borrowers (e.g., Xing, Zhang, & Tripe, 2021; Houston & Shan, 2021) as they have a lower risk (e.g., Guan, Zheng, Hu, Fang, & Ren, 2017; Giraudet, Petronevich, & Faucheux, 2021). Banks also avoid loans to environmentally unfriendly firms (e.g., Herbohn, Gao, & Clarkson, 2019), charge them with higher loan rates (e.g., Chava, 2014; Degryse, Goncharenko, Theunisz, & Vadasz, 2023; Neagu, Tatarici, Dragu, & Stamate, 2024), and use environmental covenants (e.g., Wang, 2023; Choy, Jiang, Liao, & Wang, 2024). In addition to mitigate litigation and loan risks, prior studies also show that green loan guidelines (e.g., Huang, Gao, & Jia, 2023; Neagu, Tatarici, Dragu, & Stamate, 2024), environmental regulations (e.g., Ambec & Lanoie, 2008; Wu, Luo, & You, 2023), and public pressure through ESG disclosures (Wang, 2023; Zhang & Park, 2024) increase bank loans to environmentally friendly firms.

Environmental Disclosure

¹⁰ Financial institutions adopt the Equator Principles in order to ensure that the projects they finance and advise on are developed in a manner that is socially responsible and reflects sound environmental management practices.

The classical perspective of the agency theory from Jensen and Meckling (1976) and the studies after explaining that information disclosure can further reduce the information asymmetry between the manager and shareholder, decreasing agency costs, and hence further aligning managers' and shareholders' interests. However, as shareholders are concerned with firms' market values, ¹¹ most of the prior studies are then based on the stakeholder theory (Freeman, 1984) to explain why firms meet their environmental obligations, including environmental disclosures to satisfy their stakeholder expectations. Consequently, firms that fail to meet their stakeholder' environmental expectations can face higher sustainable reputation risk. As firms care about their reputation risk, they will eventually increase their environmental performance in response to mandatory ESG disclosure.

Amid the mixed evidence of the association between non-financial activities and economic outcomes (e.g., Al-Tuwaijri, Christensen, & Hughes II, 2004; El Ghoul, Guedhami, Kwok, & Mishra, 2011; Chan, Chen, Chen, & Nguyen, 2015; Ng & Rezaee, 2015; Truong, Nguyen, & Huynh, 2021; Bartov, Marra, & Momente, 2021), including in the banking industry (e.g., Simpson & Kohers, 2002; Wu & Shen, 2013; Chiaramonte, Dreassi, Girardone, & Pisera, 2022), most of the studies show the positive association between ESG disclosures, increasing information quality (e.g., Al-Tuwaijri, Christensen, & Hughes II, 2004; Hummel & Schlick, 2016), and financial performances (e.g., Dhaliwal, Li, Tsang, & Yang, 2011; Dhaliwal, Radhakrishnan, Tsang, & Yang, 2012; Buchanan, Cao, & Chen, 2018).

Using mandatory disclosure settings, several studies developed the causality inference of non-financial disclosures on information quality (e.g., Fiechter, Hitz, & Lehmann, 2022; Kruger, Sautner, Tang, & Zhong, 2024), financial performances (Chen, Hung, & Wang, 2018), and economic outcomes (Christensen, Floyd, Liu, & Maffett, 2017). However, there are only a few studies that show ESG disclosures have an influence on the firms' environmental performances (Jouvenot & Krueger, 2024). In the banking industry, Wang (2023) shows the transmission from mandatory ESG disclosure in the banking industry to borrowers' environmental and social performances, while Zhang and Park (2024) show that banks with better ESG quality tend to decrease loans to borrowers with higher climate risk.

Sustainability reporting Standards and Assurance Services

¹¹ The shareholder theory or the Friedman doctrine (Friedman, 1970). Empirical evidences also show the in-line goals of shareholders and other stakeholders as financial performances increase hand-in-hand with firms' ESG performances (e.g., Simpson & Kohers, 2002; Wu & Shen, 2013)

Mandatory ESG disclosures expose firms' environmental performance. As firms care about their environmental performance and disclosure reputations, mandatory ESG disclosure would give more incentives to firms to not only increase their ESG performance but also their environmental disclosure credibility. The higher credibility of firms' environmental disclosures would further confirm the credibility of their environmental performances. Moreover, firms with more competitive environmental performances tend to disclose their ESG activities and provide higher-quality environmental information (e.g., Al-Tuwaijri, Christensen, & Hughes II, 2004; Hummel & Schlick, 2016). Two ways that can increase the credibility of ESG disclosure are adopting international sustainable standards and providing assurance services.

Most of the prior studies showed that the voluntary adoption of international accounting standards or international financial reporting standards increases information quality (e.g., Ashbaugh & Pincus, 2001; Barth, Landsman, & Lang, 2008) and has economic consequences (e.g., Li, Siciliano, & Venkatachalam, 2021). Consistent with the voluntary disclosure theory, prior studies discussed that firms may have incentives to adopt certain reporting standards (e.g., Beyer, Cohen, Lys, & Walther, 2010). Regarding international sustainability reporting standards, most global firms adopt GRI standards, hence, many studies use GRI standards as indicators of sustainability report quality and comparability (e.g., Skouloundis, Evangelinos, & Kourmousis, 2010; Hahn & Lülfs, 2013; Braam, Weerd, Hauck, & Huijbregts, 2016; Yadava & Sinha, 2016; Fiechter, Hitz, & Lehmann, 2022). Several studies also documented the evidence of the association between GRI standards adoption and economic outputs, including analyst coverage and accuracy (e.g., Sánchez, Gómez-Miranda, David, & Rodríguez-Ariza, 2019; Pizzi, Caputo, & Nuccio, 2024) and financial performances (e.g., Kuzey & Uyar, 2017; Khan, Bose, Mollik, & Harun, 2021).

Consistent with the assurance services for the financial reports, sustainable assurance is expected to influence firms and external stakeholders. First, prior studies showed that sustainable assurance services increase information quality (Zorio, Garcia-Benau, & Sierra, 2013) which eventually influences firms' performance (Thompson, Ashimwe, Buertey, & Kim, 2022), cost of capital (Dhaliwal, Li, Tsang, & Yang, 2011; Dhaliwal, Li, Tsang, & Yang, 2014), and analyst forecast errors (Dhaliwal, Radhakrishnan, Tsang, & Yang, 2012; Casey, & Grenier, 2015; Cuadrado-Ballesteros, Martínez-Ferrero, & García-Sánchez, 2017). Next, sustainable assurance is expected to increase the credibility of the disclosure. Experiment studies show that sustainable assurance increases the perception of

environmental disclosure, provides a signaling role, and hence improves investors' willingness to invest (e.g., Hodge, Subramaniam, & Stewart, 2009; Cheng, Green, & Ko, 2015; Peters & Romi, 2015; Dilla, Janvrin, Perkins, & Raschske, 2019). Amid the lack of studies showing the adoption of international sustainable standards and assurance influence on firms' environmental performances, the prior studies above showed that the adoption of international sustainable standards and assurance disclosure credibility, which eventually would give more incentives to banks' environmental performances.

3. Institutional Setting

Several years after the Asian financial crisis at the end of the 1990s, the Indonesian banking industry had robust growth and stable conditions, indicated by higher capital and profitability. However, green financing is still a big challenge for the domestic banking industry, in line with the lower ESG ratings of Indonesian firms compared to peer countries.

Table 1

To promote sustainable financing in Indonesia, the Indonesia Financial Services Authority (Otoritas Jasa Keuangan/OJK) issued Regulation No.51/POJK.03/2017 concerning the Implementation of Sustainable Finance for Financial Services Institutions, Security Issuers, and Public Companies in 2017 (Sustainability regulation). The regulation requires banks to support sustainable growth, which balances economic, social, and environmental interests, and to disclose their sustainable performance and impact in the sustainability report for the first time in 2019. In the mandatory sustainability report, banks need to disclose their non-green loan portfolios, but it does not necessarily require banks to disclose their non-green loans or their overall loan portfolios (green and non-green). Furthermore, the sustainability regulation does not mandate banks to increase their green loan or decrease non-green loans, respectively.

Before the sustainability regulation, there was no regulation or green financing framework to incentivize sustainable financing in Indonesia. Nevertheless, several banks have voluntarily provided ESG information to their stakeholders. Most banks use the sustainability report as their primary media to disclose their ESG activities with GRI standards as the framework. In addition, despite it is not mandatory by the regulation, several banks provide assurance services for their sustainability reports. In addition to the sustainability regulation that mandates sustainability report disclosure, OJK released the Indonesian Green Taxonomy in 2022. The taxonomy provides green and non-green classifications for real and financial activities in Indonesia. In 2024, OJK releases a new Indonesian Sustainable Finance Taxonomy that focuses on the energy sector. The two taxonomies provide green and non-green activity classifications that could be used by stakeholders, including commercial banks in Indonesia, to classify their activities in their loan portfolio classifications. However, the taxonomy does not mandate or provide incentives or disincentives for banks to increase or decrease their green and non-green loans, respectively.¹²

4. Hypothesis Development

According to the legitimacy theory, the mandatory sustainability reporting regulation would increase the transparency of banks' environmental performance. As environmental transparency increases, stakeholders are likely to pay more attention to and exert greater pressure on banks' environmental performance. As bank concerned about their reputation, they will seek to align their environmental performance and disclosures with their stakeholder interests, Therefore, prior studies suggest that mandatory ESG disclosure influences banks' ESG performance and their borrowers' behaviors (Wang, 2023). However, some empirical studies indicate that bank ESG disclosures may not always align with their actual loan disbursements to social and environmentally friendly activities (Basu, Vitanza, Wang, & Zhu, 2022; Giannetti, Jasova, Loumioti, & Mendicino, 2023). Building on these theoretical frameworks and prior studies, we assume that the benefits of mandatory sustainability reporting incentives will outweigh the transition costs for banks to increase their green loans. Thus, the hypothesis is as follows:

H1. Mandatory sustainability reports with green loan portfolio disclosures increase banks' green loan portfolios.

¹² The green and non-green classifications in this study are based on the Indonesian green taxonomy released in 2022. The discussion of green and non-green loan identification is in the methodology section. This study also tests whether the Indonesian green taxonomy released in 2022 provides incentives for banks to increase their green loans that may deter the mandatory sustainability report influence on green loans. The results of the observations that exclude 2022 and 2023 are consistent with the main results, implying that the higher increase of green loans in treatment banks is influenced by their green loan disclosures.

5. Methodology

5.1. Data

We use data at the bank and loan levels. At the bank level, the data of sustainability reports and their characteristics of green loan portfolio disclosure, international sustainability report standards adoption, and sustainable assurances between 2015 and 2023 are collected manually from commercial banks in Indonesia. Next, this study uses the Indonesian Green Taxonomy to classify green, transition, and unqualified loan portfolios. Since the Indonesian Green Taxonomy was issued in 2022,¹³ this study runs ex-post identification and matches activities classified in the taxonomy to banks' loan reports submitted to OJK.¹⁴ In addition to the loan data, the other indicators to control bank characteristics are from OJK, while the macroeconomic indicators are from Statistics Indonesia (Badan Pusat Statistik). For the final sample, we exclude Islamic banks and banks with mergers and acquisitions. We also drop banks that do not report their green loan portfolios in their sustainability report to isolate that only the green loan disclosure influences banks' green loan portfolios. The final sample consists of 64 commercial banks with a share of 81.77% of the industry's total assets. There are 46 treatment banks or banks that disclose their green loan for the first time after the mandatory sustainability report, and 18 control banks or banks that voluntarily disclose their green loan before the mandatory sustainability report regulation.

At the loan level data, we identify 17,186,366 new loans that were individually reported by the 64 banks to OJK. For the homogeneity of the loans, we only use loans in the domestic currency, Indonesian Rupiah, and exclude loans in other currencies. All the banks and loans variables are winorizing at 1 and 99 percentiles.

For the additional analysis, we identify government banks as banks owned by central and provincial governments. There are 28 government banks in Indonesia with a market share of around 50% of the industry's total assets. We also classify big banks as banks in BUKU

¹³ OJK has published a new Indonesian Sustainability Finance Taxonomy in 2024; however, the new taxonomy does not overrule the previous taxonomy as it only focusses on the energy sector.

¹⁴ Despite OJK issuing the Indonesian Green Taxonomy in 2022, this study assumes that before the taxonomy, banks already considered environmental issues in their lending assessments. The similar ex-post identification strategy is used by Neagu, Tatarici, Dragu, and Stamate (2024). However, different from them, this study identifies the green and non-green loans reported and hence mitigates the selection bias if the identification is done by the banks and ensuring the comparability of the green and non-green portfolios among the banks.

IV and III, and small banks are banks in BUKU II and I. BUKU is a commercial bank classification in Indonesia based on the capital amount.¹⁵ Finally, this study removes the observations in the year 2019, when the regulation was effective, to account for regulator enforcement and bank preparation for the regulation.

5.2. Empirical Model

This study employs panel data regression in Equation 1 to examine the influence of mandatory sustainability reporting regulation on banks' green loan portfolios at the bank level.

$$\begin{split} GREEN_{b,q} &= \alpha_0 + \beta_1 TREAT_b \; x \; POST_q + \beta_2 GRI_{b,q} + \beta_3 ASSURANCE_{b,q} + \beta_4 SIZE_{b,q} \\ &+ \beta_5 EQUITY_{b,q} + \beta_6 LIQUIDITY_{b,q} + \beta_7 LOAN_{b,q} + \beta_8 NPL_{b,q} + \beta_9 ROA_{b,q} \\ &+ \beta_{10} GDP_q + \beta_{11} INFLATION_q + Bank \; FE + Year \; FE + \; \varepsilon_{b,q} \end{split}$$

In Equation 1, GREEN *b*, *q* is the total green loan to total loans in bank *b* and quarter *q*. TREAT is a dummy variable, one for banks without green loan portfolio disclosure in their sustainability report before the mandatory sustainability report regulation. POST is a dummy variable, one after the mandatory sustainability report regulation's effective date. ¹⁶ The main variable of interest, TREAT x POST, captures the treatment banks' condition after the mandatory sustainability report the hypothesis, β_1 is expected to be positive and significant. GRI is a dummy variable, one for banks that adopt GRI standards in their sustainability reports. ASSURANCE is a dummy variable, one for banks that provide sustainable assurance services for their sustainability reports.

This study includes several bank-level characteristics that can influence bank lending decisions. SIZE is the natural logarithm of the total assets. EQUITY is total equities to the total assets to control solvability. LIQUIDITY is the total cash and bank-to-total assets to

¹⁵ BUKU 4 is a classification for a bank with capital > IDR30 trillion. BUKU 3 is a classification for a bank with capital \leq IDR30 trillion and > IDR5 trillion Rupiah. BUKU 2 is a classification for a bank with capital \leq IDR5 trillion and > IDR1 trillion. BUKU 1 is a classification for a bank with capital \leq IDR1 trillion. IDR30 trillion equals USD2 billion in 2023.

¹⁶ Since 2019, for big and foreign banks, and since 2020, for small banks.

control bank liquidity. LOAN is total loans to total loans to control loan amount. NPL is a non-performing loan to control loan risk. ROA is the return on assets to control bank profitability. Banks with ample equity and liquidity and higher profitability are expected to have higher flexibility to increase their green loans, while banks with higher loan risk are more careful to increase their green loans. To control macroeconomic conditions, this study uses GDP and INFLATION to control gross domestic product year-on-year growth and customer price index year-on-year growth, respectively. To control bank and year invariant variables, this study uses bank and year fixed effects.

Next, we employ Equation 2 to examine the mandatory sustainability reporting regulation influence on banks' green loans at loan level data.

LOAN_AMOUNT_{l,b,q}

 $= \alpha_{0}$ $+ \beta_{1}GR_LOAN_{l} \times TREAT_{b} \times POST_{q} + \beta_{2}GR_LOAN_{l} + \beta_{3}TREAT_{b} + \beta_{4}POST_{q}$ $+ \beta_{5}LOAN_INTEREST_{l} + \beta_{6}LOAN_PERIOD_{l} + \beta_{5}GRI_{b,q}$ $+ \beta_{6}ASSURANCE_{b,q} + \beta_{7}SIZE_{b,q} + \beta_{8}EQUITY_{b,q} + \beta_{9}LIQUIDITY_{b,q}$ $+ \beta_{10}LOAN_{b,q} + \beta_{11}NPL_{b,q} + \beta_{12}ROA_{b,q} + \beta_{13}GDP_{q} + \beta_{14}INFLATION_{q}$ $+ Bank FE + Year FE + \varepsilon_{l,b,q}$

(2)

In addition to the variables in Equation 1, LOAN_AMOUNT is the amount of loan l, in bank b, at the end of quarter q. GR_LOAN is a dummy variable, one if the loan is classified as green loan. LOAN_INTEREST and LOAN_PERIOD are the loan interest rate and the loan period, respectively. The main variable of interest, GR_LOAN x TREAT x POST, captures the amount of green loan in treatment banks after the mandatory sustainability regulation is effective. To support the hypothesis, β_l is expected to be positive and significant. Appendix A provides the variables definitions.

6. Analysis

6.1. Descriptive Statistics

Table 2, Panel A, shows that the average of green loans is still low at 0.014 ¹⁷ compared to the 0.593 average for transition loans and 0.364 for unqualified loans.¹⁸ Treatment banks have a higher portion of green loans, while control banks have higher creditors' exposure. More control banks adopted GRI standards and provide assurance services for their sustainability reports. Treatment banks have higher equity, liquidity, and lower loan risk, while control banks have higher assets and profitability. The average gross domestic product growth of 0.041 is in line with the average inflation of 0.036. Panel B shows that the average loan amount is 17.943 or IDR62 million, with relatively higher interest rates, medium loan periods, and an average collateral value of 18.989 or IDR177 million. ¹⁹ Treatment banks have lower loan amounts and collateral, while control banks have higher loan interest rates and periods.

Table 2

The correlation matrix in Table 3, Panel A, documents relatively low correlations among the variables, except between transition and unqualified loans. The table also shows that banks with greater EQUITY have higher green loan portfolios. The positive correlations among SIZE, GRI, and ASSURANCE variables indicate that big banks tend to adopt GRI standards and provide sustainable assurance. The correlation matrix shows the negative correlation between ROA and NPL, indicating the importance of loan risk on bank profitability, which is one of the main considerations for banks to increase their green loan portfolios. Panel B shows that as expected LOAN_AMOUNT has a positive and high correlation with LOAN COLLATERAL, while has a negative correlation with LOAN INTEREST.

Table 3

6.2. Empirical Results

Table 4, column 1, shows that the interaction between treatment banks and post-mandatory sustainability reporting regulation is positive and significant, indicating that treatment banks increased their green loan portfolios after the mandatory sustainability reporting regulation. This finding supports the hypothesis that environmental disclosure attracts stakeholders'

¹⁷ In the sample, the total green loan portfolio amounted to IDR 103 trillion (approximately USD 6.8 billion) as of the end of 2023.

¹⁸ So far only prior studies using the banking industry in China published the green loans portion, which was around 0.03 (Cui, Geobey, Weber, & Lin, 2018; Lian, Gao, & Ye, 2022).

¹⁹ From the total 17,186,366 of loan observations only 4,234,694 loans are backup by valued collateral.

attention and pressures banks to improve their environmental performance. As banks concern about their reputation, they expand their green loan portfolios to meet stakeholders' expectations. To mitigate the heterogeneity between the treatment and control groups, we employ PSM and entropy balancing to match the control group with the treatment group.²⁰ The differences in variables between the control and treatment groups decrease with PSM, while no significant differences are observed with entropy balancing (Appendix B, Panel A). The results in Table 4, columns 2 and 3, support the hypothesis, showing that, on average, the treatment banks increase their green loan portfolios by 0.7 percent to 0.8 percent after the mandatory sustainability reporting regulation. Our results align with Wang's (2023) findings that mandatory ESG disclosures enhance banks' ESG performance.

Table 4

Table 5 presents the results for the parallel trend assumption. The findings support this assumption, showing no differences in green loan portfolios between treatment and control banks up to two quarters before the mandatory sustainability report regulation took effect. However, three quarters before the regulation's effective date, control banks had higher green loan portfolios than treatment banks. Four quarters prior, there was again no difference between the two groups. Although there is no evidence of a positive trend in green loan portfolios for treatment banks before the regulation's implementation, the results indicate that treatment banks' green loan portfolios decreased relative to control banks during the three quarters preceding the regulation. In this context, control banks had more incentives to increase their green loan portfolios before the regulation became effective, as they were already disclosing sustainability reports.

Table 5

Next, as the mandatory sustainability regulation does not require banks to disclose their other type of loans, it is also interesting to test the mandatory sustainability regulation influence on other types of loans as an increase of other types of loans after the regulation may indicate the ineffectiveness of the regulation. In Table 6, the dependent variables in the first, second, and third columns are green, transition, and unqualified loans, respectively. The dependent variable in the fourth column represents the difference between transition and green loans, while the fifth column shows the difference between unqualified and green

²⁰ The PSM uses the single nearest-neighbor approach, while the entropy balancing method matches the first two moments of the control variables between the control and treatment groups.

loans. The results indicate that green loans increased after the mandatory sustainability report regulation. First, the findings reveal that since the mandatory regulation requires only the disclosure of loans to environmentally friendly activities, banks increased their green loan portfolios exclusively. Next, while the regulation does not require banks to disclose their non-green loan portfolios, it provides no disincentive for banks to increase their unqualified loans. These findings suggest that the disclosure of green loan portfolios and the non-disclosure of non-green loan portfolios are important factors in attracting stakeholders' attention and exerting pressure on banks' green (and non-green) loan portfolios. However, the results in the fifth column show that the difference between unqualified and green loans decreases after the mandatory sustainability report regulation, implying that banks increase their green loans at the expense of their non-green loan disbursements.

Table 6

Furthermore, we also test the mechanism whether higher environmental transparency increases stakeholders' attention, which eventually pressures banks to increase their green loan portfolios. Prior studies have shown that creditors incorporate their borrowers' ESG performance into their credit decisions (e.g., Chava, 2014; Degryse, Goncharenko, Theunisz, & Vadasz, 2023). Table 7, column 2, shows that treatment banks with higher creditors' exposure have larger green loan portfolios after the regulation took effect. Since creditors monitor banks' performance, these results suggest that banks increase their green loan portfolios because they are concerned about their reputation, which can influence their access to financing from creditors.

Table 7, column 3, shows that adopting GRI standards moderates the effect of mandatory sustainability reports on green loan portfolios. Adopting international sustainability standards enhances the comparability of sustainability reports, which, in turn, increases attention and pressure on banks' environmental performance, particularly from foreign stakeholders. This results in stronger incentives for banks to increase their green loan portfolios. Regarding sustainable assurance, Table 7, column 4 reveals that assurance moderates the impact of mandatory sustainability reports on green loan portfolios. In addition to enhancing the credibility of the reports, the results are consistent with the idea that assurance services provide banks with more guidance, giving them an advantage in increasing their green loan portfolios following the mandatory sustainability report regulation. As prior studies have shown that GRI standards (e.g., Dhaliwal, Li, Tsang, &

Yang, 2011; Thompson, Ashimwe, Buertey, & Kim, 2022) and sustainable assurance (e.g., Turkey, Kuzey & Uyar, 2017; Khan, Bose, Mollik, & Harus, 2021) moderate the effect of non-financial disclosures on financial performance, this study provides evidence that both GRI standards and sustainable assurance moderate the relationship between non-financial disclosures and banks' green loans.

Table 7

Lastly, at the bank level, we run Equation 1 on subsamples of government and nongovernment banks, as well as large and small banks to test the consistency of the main results and mitigate potential heterogeneity in the observations. Government and non-government banks may have different incentives to increase their green loans. Government-owned banks may face greater pressure to expand green lending as part of their mandate to support environmental protection policies. However, they may also be tasked with financing specific industries that are not necessarily environmentally friendly, given their role in economic development. Similarly, large and small banks are subject to different levels of stakeholder pressure, which may influence their green loan expansion. Larger banks typically have greater exposure to international investors and regulators, which may encourage them to adopt greener lending practices. In contrast, smaller banks, which primarily operate in domestic markets with potentially weaker regulatory oversight, may experience less external pressure to expand their green loan portfolios. The results in Table 8 demonstrate that treatment banks increase their green loan portfolios after the mandatory sustainability reporting regulation, both in government and non-government banks, as well as in big and small banks.

Table 8

Loan-Level

Table 9, column 1, shows that treatment banks increase their green loan amount after the mandatory sustainability report regulation, supporting the hypothesis. Table 8, columns 2 and 3 show that our results at the loan level are also consistent with matching sample using PSM and entropy balancing. ²¹ On average, treatment banks provide a higher amount of green loans between 13.2 percent and 14.3 percent after the regulation. The negative sign in

²¹ The PSM uses the single nearest-neighbor approach, while the entropy balancing method matches the first three moments of the loan control variables between the control and treatment groups. The results of the PSM and entropy balancing at loan level are in Appendix B, Panel B.

GR_LOAN exhibits that green loans have lower amount compare to the other loans, while the positive sign in LOAN_PERIOD indicates that loan with longer period has higher amount.

Table 9

Table 10 shows that the mandatory sustainability report regulation only influences the amount of green loans and not the other types of loans, consistent with the results at the bank level. As the mandatory sustainability report regulation only requires banks to disclose their green loans, treatment banks do not have a direct incentive to decrease their other type of loans. Table 10 also documents that transition loans (TR_LOAN) have a greater amount compared to the other types of loans.

Table 10

Next, we examine the impact of the mandatory sustainability report regulation on other loan characteristics, by including the variable of interest rate, periods, and collateral. First, table 11, column 2, shows that including the collateral amount does not influence our results. The reason we exclude loan collateral in our main model is because less than 25% of our loan observations have collateral. Next, columns 3, 4, and 5 exhibit that the mandatory sustainability report regulation does not influence the loan interest rate, period, and collateral. The results are in line with the regulation that only requires banks to disclose their green loan amount.

Table 11

Finally, we examine whether an increase in the demand for green loans following the mandatory sustainability reporting regulation influences our results. The regulation also requires public companies in Indonesia to publish sustainability reports. Consequently, these companies have a stronger incentive to improve their ESG performance, potentially increasing the number of firms that qualify for green loans. Table 12 shows that the interaction term between green loans and the mandatory sustainability reporting regulation is negative and significant, indicating that bank green loans decreased after the regulation came into effect. Since our main findings show that the regulation only affects green loans of treatment banks, the results in Table 12 suggest that our main findings, which reflect the loan supply side, are not driven by changes in the demand for green loans.

7. Conclusion

Green financing is crucial for emerging countries, as they are more vulnerable to climate change risks. However, green loan portfolios remain underdeveloped in these markets because banks face fewer incentives to allocate loans to more sustainable activities. Unlike banks in developed countries, which are exposed to higher litigation risks related to their borrowers' environmental issues, banks in emerging countries generally face lower risks associated with non-environmentally friendly loans. Therefore, this study investigates whether mandatory sustainability reporting regulations offer stronger incentives for banks to increase their green loans.

Using a unique dataset at the bank and loan level within the context of Indonesia's mandatory sustainability report regulation, this study provides causal inferences regarding the impact of green loan portfolio disclosures on banks' green loan portfolios. Our results reveal that banks affected by the mandatory sustainability reporting regulation experienced a greater increase in green loans compared to those not impacted by the regulation. These findings support the hypothesis that enhanced environmental disclosure in sustainability reports attracts stakeholder attention and increases pressure on banks to improve their environmental performance. Since banks are concerned with their reputational risk, they respond by expanding their green loan portfolios. Additionally, our results exhibit that this increased transparency in green loan portfolios specifically influences green loan portfolios, without significantly affecting non-green loans or other loan features.

Different from Wang (2023) and Park and Zhang (2024), which also found a positive association between ESG disclosures and bank lending, we focus specifically on green loan portfolio disclosures rather than relying on ESG or environmental ratings derived from ESG disclosures. By concentrating directly on banks' green loan portfolio information, this study aims to mitigate the risk of misleading sustainability information inherent in sustainability reports.

Furthermore, this study examines whether creditors' exposure, the adoption of international sustainability standards, and sustainable assurance influence the relationship between mandatory sustainability reports and banks' green loan portfolios. Consistent with the increased transparency mechanism that would attract more creditors' attention and pressure, we find that banks with higher creditors' exposure, those adopting GRI standards, and those

providing sustainable assurance have stronger incentives to increase their green loan portfolios following the mandatory sustainability report regulation. Finally, we also show at the loan level that after the mandatory sustainability reporting regulation, all bank green loans decreased, suggesting the higher green loans in treatment banks are not also influenced by the demand side and that more borrowers are qualified for green loans.

Our findings have implications for policymakers and regulators. First, the results support the policy direction of financial authorities that mandates banks to disclose their environmental performance, including through sustainability reports. Second, we find that the current mandatory sustainability reporting regulations, which require banks to disclose only their green loans, do not influence other types of loans. Therefore, to discourage banks from extending credit to activities that harm the natural environment, regulators could consider requiring the disclosure of brown loan portfolios in sustainability reports. Lastly, our findings support efforts to enhance the transparency of sustainability reporting, particularly for banks with greater stakeholder exposure, through the adoption of international standards and the provision of sustainability assurance.

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Appendix A

Variable Definition

Variable	Definition
Bank Level	
GREEN	Total green loans to total loans.
TRANSITION	Total transition loans to total loans.
UNQUALIFIED	Total unqualified loans to total loans.
TREAT	= 1 for the banks that publish sustainability report for the first
	time after the mandatory sustainability report regulation and 0
	otherwise.
POST	= 1 for periods after the effective date of the mandatory
	sustainability report regulation and 0 otherwise.
GRI	= 1 for banks that voluntarily adopt GRI standards for their
	sustainability report in the current year and 0 otherwise.
ASSURANCE	= 1 for banks that voluntarily provide assurance services for their
	sustainability report in the current year and 0 otherwise.
CREDITOR	= 1 for banks with total creditors' exposure (total non-deposits)
	to total assets equal or more than the median of the observations
	and 0 otherwise.
SIZE	The natural logarithm of total assets.
EQUITY	Total equities to total assets.
LIQUIDITY	Total cash and bank to total assets.
LOAN	Total loans to total assets.
NPL	Total non-performing loans to total loans.
ROA	Net income to total assets.
Loan Level	
LOAN_AMOUNT	Loan amount.
LOAN_INTEREST	Loan interest rate.
LOAN_PERIOD	Loan period.
LOAN_COLLATERAL	Loan collateral.
GR_LOAN	= 1 for a loan that classified as a green loan and 0 otherwise.
TR_LOAN	= 1 for loans that classified as a transition loan and 0 otherwise.
UN_LOAN	= 1 for loans that classified as a unqualified loan and 0 otherwise.
Macroeconomic Variables	
GDP	Gross domestic product year-on-year growth.
INFLATION	Customer price index year-on-year growth.

Appendix B

Covariate Balance After Propensity	y Score Matching	(PSM) and Entropy	/ Balancing
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Panel A Bank Level

	Before PSM			After PSM		
	Treatment	Control	Difference	Treatment	Control	Difference
GRI	0.484	0.345	-0.139***	0.484	0.434	-0.050
ASSURANCE	0.072	0.117	0.045***	0.072	0.111	0.039**
SIZE	30.818	31.219	0.400***	30.818	31.103	0.285***
EQUITY	0.169	0.141	-0.029***	0.169	0.145	-0.024***
LIQUIDITY	0.160	0.177	0.016***	0.160	0.174	0.014***
LOAN	0.589	0.629	0.040***	0.589	0.610	0.021***
NPL	0.028	0.032	0.003***	0.028	0.027	-0.001
ROA	0.011	0.013	0.002***	0.011	0.013	0.002**

	В	efore Entrop	ру	After Entropy		
	Treatment	Control	Difference	Treatment	Control	Difference
GRI	0.484	0.345	-0.139***	0.484	0.484	0.000
ASSURANCE	0.072	0.117	0.045***	0.072	0.072	0.000
SIZE	30.818	31.219	0.400***	30.820	30.780	0.038
EQUITY	0.169	0.141	-0.029***	0.170	0.169	0.000
LIQUIDITY	0.160	0.177	0.016***	0.160	0.160	0.000
LOAN	0.589	0.629	0.040***	0.589	0.589	0.001
NPL	0.028	0.032	0.003***	0.028	0.028	0.000
ROA	0.011	0.013	0.002***	0.011	0.011	0.000

Panel B Loan Level

	Before PSM			After PSM		
	Treatment	Control	Difference	Treatment	Control	Difference
LOAN_AMOUNT	17.679	18.017	0.338***	17.679	17.874	-0.195***
LOAN_INTEREST	0.200	0.121	-0.079***	0.200	0.193	0.007***
LOAN_PERIOD	4.949	3.338	-1.611***	4.949	5.342	0.386***

	В	efore Entrop	ру	1	After Entrop	у
	Treatment	Control	Difference	Treatment	Control	Difference
LOAN_AMOUNT	17.679	18.017	0.338***	17.679	17.679	0.000
LOAN_INTEREST	0.200	0.121	-0.079***	0.200	0.199	-0.001***
LOAN_PERIOD	4.949	3.338	-1.611***	4.949	4.950	0.001***

The amounts in the treatment and control columns represent the mean values of the variables. The variable descriptions are available in Appendix A. * p < .10, ** p < .05, *** p < .01.

Bank Indicators of G20 Developing Countries

No.	Country	Regulatory	ROA	NPL	Net Interest
		Capital			Margin
1.	China	14.64%	0.81%	1.86%	2.26%
2.	India	15.42%	0.21%	9.23%	2.71%
3.	Mexico	19.33%	0.73%	2.09%	3.92%
4.	Turkey	18.40%	1.31%	5.02%	4.09%
5.	Indonesia	23.31%	0.91%	2.43%	4.12%

This table shows bank indicators in the Indonesian banking industry compared to the other bank industries in G20 emerging countries²².

Regulatory capital is the ratio of regulatory capital to risk-weighted assets. ROA is the ratio of the income to the average of total assets. NPL is the ratio of non-performing loans to total loans. Net interest margin is the ratio of net interest income to the average of total earnings assets.

²² The data are from the Federal Reserve St. Louis, accessed on 11 November 2023. Regulatory capital and NPL data are from 2019, while ROA and Net Interest Margin data are from 2020.

Descriptive Statistics

	(1)	(2)	(3)	(4)	
	Full sample	Treatment	Control	Difference	
	mean	mean	mean	(3)-(2)	p-value
GREEN	0.014	0.015	0.010	-0.005	0.0000
TRANSITION	0.593	0.577	0.632	0.055	0.0001
UNQUALIFIED	0.393	0.408	0.357	-0.051	0.0004
CREDITOR	0.500	0.437	0.657	0.221	0.0000
GRI	0.393	0.259	0.726	0.467	0.0000
ASSURANCE	0.101	0.035	0.265	0.230	0.0000
SIZE	31.080	30.562	32.367	1.805	0.0000
EQUITY	0.151	0.156	0.139	-0.017	0.0000
LIQUIDITY	0.171	0.178	0.153	-0.025	0.0000
LOAN	0.615	0.616	0.614	-0.002	0.6498
NPL	0.031	0.029	0.035	0.006	0.0000
ROA	0.012	0.012	0.013	0.001	0.2312
GDP	0.041	0.040	0.041	0.000	0.7572
INFLATION	0.036	0.036	0.037	0.000	0.7501
Obs.	1891	1348	543	1891	

Panel A: Bank Level and Macroeconomics Variables

Panel B: Loan Level

	(1)	(2)	(3)	(4)	
	Full sample	Treatment	Control	Difference	
	mean	mean	mean	(3)-(2)	p-value
LOAN_AMOUNT	17.943	17.679	18.017	0.338	0.0000
LOAN_INTEREST	0.138	0.200	0.121	-0.079	0.0000
LOAN_PERIOD	3.689	4.949	3.338	-1.611	0.0000
LOAN_COLLATERAL	18.989	18.560	19.092	0.532	0.0000
Obs.	17,186,366	3,753,508	13,432,858	17,186,366	

The variable descriptions are available in Appendix A.

Correlation Matrix

Panel A: Bank Level and Macroeconomics Variables

	CDEEN		INTOTAL	CDI		aran	FOUTER	LIOUDITY	LOAN	NIDI	DOL	GDD	TA TEX A
	GREEN	TRANSI-	UNQUALI-	GRI	ASSU-	SIZE	EQUITY	LIQUIDITY	LOAN	NPL	ROA	GDP	INFLA-
		TION	FIED		RANCE								TION
GREEN	1												
TRANSITION	0.161^{***}	1											
UNQUALIFIED	-0.227***	-0.998***	1										
GRI	-0.0215	-0.132***	0.131***	1									
ASSURANCE	-0.0135	0.0109	-0.009	0.42^{***}	1								
SIZE	-0.0892***	0.0735**	-0.0675**	0.50^{***}	0.563^{***}	1							
EQUITY	0.266^{***}	0.240^{***}	-0.254***	-0.09***	-0.0749**	-0.28***	1						
LIQUIDITY	-0.219***	-0.288***	0.299^{***}	-0.21***	-0.183***	-0.31***	-0.0740^{**}	1					
LOAN	-0.120***	-0.107***	0.116^{***}	0.036	0.0905^{***}	0.097^{***}	-0.271***	-0.393***	1				
NPL	-0.0380	0.125***	-0.120***	-0.04	-0.0482^{*}	-0.086***	-0.0508^{*}	-0.0196	-0.0293	1			
ROA	-0.0282	-0.379***	0.375***	0.15^{***}	0.126***	0.211***	-0.168***	0.145^{***}	0.109***	-0.423***	1		
GDP	-0.0410	0.0112	-0.00772	-0.09***	-0.0650**	-0.019	0.0137	0.0956^{***}	0.0121	-0.0638**	0.064^{**}	1	
INFLATION	-0.0233	0.0134	-0.0111	-0.19***	-0.0979***	-0.08***	-0.0681**	0.161***	0.0950^{***}	-0.0476^{*}	0.049^{*}	0.38***	1

Panel B: Loan Level

	LOAN_AMOUNT	LOAN_INTEREST	LOAN_PERIOD	LOAN_COLLATERAL
LOAN_AMOUNT	1			
LOAN_INTEREST	-0.497***	1		
LOAN_PERIOD	0.217***	-0.254***	1	
LOAN_COLLATERAL	0.729***	-0.393***	0.196^{***}	1

The variable descriptions are available in Appendix A. * p < .10, ** p < .05, *** p < .01.

Table	4
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	1	2	3
	Without	With	With
	Matching Sample	PSM	Entropy
TREAT x POST	0.008^{***}	0.008^{**}	0.007^{**}
	(2.94)	(2.42)	(2.41)
GRI	-0.002	-0.001	-0.004
	(-0.80)	(-0.23)	(-1.45)
ASSURANCE	0.003	0.002	-0.000
	(0.94)	(0.51)	(-0.07)
SIZE	-0.007	-0.004	0.003
	(-1.58)	(-0.96)	(1.57)
EQUITY	-0.015	-0.013	0.031***
	(-0.59)	(-0.49)	(3.17)
LIQUIDITY	-0.032**	-0.036**	-0.027**
	(-2.54)	(-2.55)	(-2.62)
LOAN	-0.009	-0.018	-0.008
	(-0.80)	(-1.67)	(-1.00)
NPL	-0.081	-0.043	-0.027
	(-1.39)	(-0.57)	(-0.61)
ROA	-0.102	-0.156**	-0.145**
	(-1.52)	(-2.52)	(-2.06)
GDP	0.009	0.014	0.004
	(1.21)	(1.55)	(0.44)
INFLATION	0.020	0.016	0.012
	(1.21)	(0.60)	(0.66)
CONSTANT	0.266^{*}	0.174	-0.078
	(1.85)	(1.28)	(-1.05)
Bank FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Adj.R2	0.762	0.765	0.868
Obs.	1891	1035	1891

Mandatory Sustainability Report and Green Loans

This table presents the results for testing the influence of mandatory sustainability reports on banks' green loan portfolios. The dependent variable is green loan portfolios (GREEN) and the interaction between TREAT x POST as the main variable of interest in the independent variables. Standard errors are clustered at the bank level. The variable descriptions are available in Appendix A. * p < .10, ** p < .05, *** p < .01.

Table :	5
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	1	2	3	4	5
	GREEN	TRANSTION	UNQUALIFIED	DELTA	DELTA
				2-1	3-1
TREAT x POST	0.008^{***}	0.028	-0.037	0.021	-0.045*
	(2.94)	(1.27)	(-1.58)	(0.95)	(-1.81)
Constant & Controls	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effect	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
Adj.R2	0.762	0.964	0.962	0.965	0.957
Obs.	1891	1891	1891	1891	1891

Mandatory Sustainability Report and Other Loans

This table presents the results for testing the influence of mandatory sustainability reports on banks' green, transition, and unqualified loan portfolios. The dependent variables are the three types of loans and the loan differences. The main variable of interest is the interaction between TREAT x POST in the independent variables. Standard errors are clustered at the bank level. The variable descriptions are available in Appendix A. * p < .10, ** p < .05, *** p < .01.

Table	6
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	(1)	(2)	(3)	(4)	(5)
	Four	Three	Two	One	All
	Quarters	Quarters	Quarters	Quarter	Indicators
	Before	Before	Before	Before	
BEF_4Q	-0.001				-0.000
	(-1.28)				(005)
BEF_3Q		-0.003***			-0.001*
		(-3.21)			(-1.76)
BEF_2Q			-0.000		0.001
			(-0.41)		(0.94)
BEF_1Q				0.001	0.002
				(0.75)	(1.20)
TREAT x POST					0.008***
					(2.81)
Constant & Controls	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effect	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
Adj.R2	0.7547	0.7552	0.7546	0.7547	0.7628
Obs.	1891	1891	1891	1891	1891

Parallel Trend Assumption

This table presents the results for testing the treatment banks position of green loan portfolios before the mandatory sustainability report. Green loan portfolios (GREEN) is the dependent variable with the main variables of interest in the independent variables are treatment banks position four (BEF_4Q), three (BEF_3Q), two (BEF_2Q), and one (BEF_1q) quarter/s before the mandatory sustainable report. Standard errors are clustered at the bank level. The variable descriptions are available in Appendix A. * p < .10, ** p < .05, *** p < .01.

Mandatory Sustainability Report, Creditors, GRI Standards,

	1	(2)	3	4
	Baseline	Creditors	International	Assurance
			Standards	Services
TREAT x POST	0.008^{***}	0.007^{**}	0.006^*	0.008^{***}
	(2.94)	(2.12)	(1.92)	(2.82)
TREAT x POST x CREDITOR		0.009***		
		(3.00)		
TREAT x POST x GRI			0.005^*	
			(1.76)	
TREAT x POST x ASSURANCE				0.010^{**}
				(2.02)
Constant & Controls	Yes	Yes	Yes	Yes
Bank Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Adj.R2	0.752	0.763	0.753	0.752
Obs.	1891	1891	1891	1891

and Sustainable Assurance

This table presents the results for testing the influence of Creditors, GRI standards and sustainable assurance on the positive association between mandatory sustainability report and green loan portfolios. The dependent variable is green loan portfolios (GREEN) with the main variables of interest are the interaction between TREAT x POST, TREAT x POST x CREDITOR, TREAT x POST x GRI, and TREAT x POST x ASSURANCE in the independent variables. Standard errors are clustered at the bank level. The variable descriptions are available in Appendix A. * p < .10, ** p < .05, *** p < .01.

Cross-Sectional Analysis						
	1	4				
	Government	Non-Government	Big	Small		
	Banks	Banks	Banks	Banks		
TREAT x POST	0.008^{**}	0.008^{*}	0.007^*	0.008^{**}		
	(2.30)	(2.02)	(1.72)	(2.20)		
Constant & controls	Yes	Yes	Yes	Yes		
Bank Fixed Effect	Yes	Yes	Yes	Yes		
Year Fixed Effect	Yes	Yes	Yes	Yes		
P-value of coefficient	0.9870 0.928		283			
difference test						
Adj.R2	0.715	0.751	0.827	0.678		
Obs.	877	1014	749	1142		

Mandatory Sustainability report and Green Loans:

This table presents the results for testing the influence of mandatory sustainability report on green loan portfolios in different type of samples, government, non-government, big, and small banks. The dependent variable is GREEN with the main variable of interest is the interaction between TREAT x POST in the independent variables. Standard errors are clustered at the bank level. The variable descriptions are available in Appendix A. * p < .10, ** p < .05, *** p < .01.

	(1)	(2)	(3)
	Without	With	With
	Matching	PSM	Entropy
	Sample		
GR_LOAN x	0.372***	0.362^{***}	0.367***
TREAT x POST	(5.40)	(4.51)	(4.13)
			~ /
GR_LOAN	-0.232***	-0.230***	-0.224***
	(-10.18)	(-3.91)	(-2.96)
TREAT	-0.185	0.625	0.719
	(-1.12)	(0.75)	(0.91)
POST	-0.531***	-1.254**	-1.047**
	(-2.82)	(-2.15)	(-2.43)
LOAN INTEREST	-2.506	-5.530***	-4 946***
	(-1.12)	(-3, 32)	(-3.01)
LOAN PERIOD	0 109***	0.070^{***}	0 101***
	(4 33)	(3.55)	(4.81)
GRI	-0.073	-0.006	-0.079
ond	(-0.45)	(-0.03)	(-0.47)
ASSURANCE	0 357***	0 294	0 330
	(2.99)	(1.15)	(1.63)
SIZE	-0.284*	-0.168	-0 204
	(-1, 70)	(-0.77)	(-1.06)
FOUITY	-2 645**	-1 029	-1 099
LQUIII	(-2.13)	(-0.79)	(-0.87)
LIQUIDITY	-1 09/	-1 858	-2 124
LIQUIDITI	(-1, 41)	(_1.09)	(-1.49)
IOAN	_0.028	-0.856	-1.150
LOAN	(-1, 20)	-0.050	(-1.18)
NDI	(-1.27)	(-0.79)	(-1.10) 0.472
	(-0.56)	(0.238)	(0.472)
POA	(-0.50) 8 478**	(0.07)	(0.17) 2 740
KOA	(2.50)	(0.88)	(0.70)
CDP	(2.39) 2 745**	(0.88)	(0.70)
ODF	(2.743)	(1.52)	(1, 42)
INEL ATION	(2.37) 5 216***	(1.32) 11 408	(1.42)
INFLATION	-3.210	-11.400	-10.000
CONSTANT	(-2.90) 28 757***	(-1.20)	(-1.00)
CONSTANT	28.737	20.273	27.108
Bank Fixed Effect	(4.94 <i>)</i> Vac	(3.19) Vac	(5.75)
Vear Fixed Effect	1 CS Ves	I CS Vec	I CS Ves
Adi R2	0 300	0 507	0 508
Obs.	17 137 528	5 576 494	17 137 528

Loan Level: Mandatory Sustainability Report and Green Loans

This table presents the results for testing the influence of mandatory sustainability reports on banks' green loans at the loan level. The dependent variable is loan amount and the interaction between GR_LOAN x TREAT x POST as the main variable of interest in the independent

variables. Standard errors are clustered at the bank level. The variable descriptions are available in Appendix A. * p < .10, ** p < .05, *** p < .01.

T_{ol}	hla	1	n
1 a	ble	1	υ

	(1)	(2)	(3)
	Green	Transition	Unqualified
GR_LOAN x TREAT x POST	0.372^{***}		
	(5.40)		
TR_LOAN x TREAT x POST		0.287	
		(0.81)	
UN_LOAN x TREAT x POST			-0.270
			(-0.84)

GR_LOAN	-0.232***		
	(-10.18)		
TR_LOAN		0.701^{**}	
		(2.61)	
UN_LOAN			-0.868***
			(-2.83)
Constant & Controls	Yes	Yes	Yes
Bank Fixed Effect	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes
Adj.R2	0.309	0.338	0.341
Obs.	17,137,528	17,137,528	17,137,528

Loan Level: Mandatory Sustainability Report and Type of Loans

This table presents the results for testing the influence of mandatory sustainability reports on banks' green, transition, and unqualified loans at the loan level. The dependent variable is loan amount and the interaction between GR_LOAN x TREAT x POST, TR_LOAN x TREAT x POST, and UQ_LOAN x TREAT x POST as the main variables of interest in the independent variables. Standard errors are clustered at the bank level. The variable descriptions are available in Appendix A. * p < .10, ** p < .05, *** p < .01.

	(1)	(2)	(3)	(4)	(5)
	Green	Green	Green	Green	Green
	Amount	Amount	Interest Rate	Period	Collateral
GR_LOAN x	0.372^{***}	0.161***	0.001	0.078	-0.063
TREAT x POST	(5.40)	(3.22)	(0.08)	(0.16)	(-0.84)
LOAN_AMOUNT			-0.005	0.510***	0.728***
		de de de	(-1.21)	(10.00)	(6.76)
LOAN_INTEREST	-2.506	-7.566***		-1.884^{*}	4.254^{***}
	(-1.12)	(-6.35)		(-1.94)	(6.62)
LOAN_PERIOD	0.109^{***}	0.006	-0.001**		0.019
	(4.33)	(0.98)	(-2.48)		(1.23)
LOAN_COLLATERAL		0.592***			
		(6.54)			
Constant & Controls	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effect	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
Adj.R2	0.309	0.6460	0.552	0.284	0.637
Obs.	17,137,528	4,203,919	17,137,528	17,137,528	4,203,919

Loan Level: Mandatory Sustainability Report and Loan Features

This table presents the results for testing the influence of mandatory sustainability reports on banks' green loan amounts, interest rate, period, and collateral. The dependent variable is loan amount and the interaction between GR_LOAN x TREAT x POST as the main variable of interest in the independent variables. Standard errors are clustered at the bank level. The variable descriptions are available in Appendix A. * p < .10, ** p < .05, *** p < .01.

	(1)	(2)	(3)	(4)
	Without Bank	With Bank	With Year	With Bank &
	& Year FE	FE	FE	Year FE
POST	-0.267**	-0.260***	0.247^{***}	0.147^{***}
	(-2.50)	(-3.31)	(3.54)	(4.71)
GR_LOAN	-0.486***	-0.322***	-0.481***	-0.326**
	(-5.55)	(-2.66)	(-5.51)	(-2.64)
GR_LOAN x POST	-0.513***	-0.409***	0.000	0.000
	(-3.50)	(-4.55)	(.)	(.)
Constant & Controls	Yes	Yes	Yes	Yes
Bank Fixed Effect	No	Yes	No	Yes
Year Fixed Effect	No	No	Yes	Yes
Adj.R2	0.233	0.295	0.233	0.296
Obs.	17,137,528	17,137,528	17,137,528	17,137,528

Loan Level: Green Loans after Mandatory Sustainability Report Regulation

This table presents the results for testing the influence of mandatory sustainability reports on all banks' green loan amounts. The dependent variable is loan amount and the main variable of interest in the independent variables is the interaction between GR_LOAN x POST. The positive sign of GR_LOAN x POST coefficients indicate that higher green loans after the mandatory sustainability reporting regulation can be influenced by the higher increase of green loan demand, as public companies also need to publish their sustainability report. The negative sign indicates that green loan amount decreases after the mandatory sustainability reporting regulation. Standard errors are clustered at the bank level. The variable descriptions are available in Appendix A. * p < .10, ** p < .05, *** p < .01.