

CSR role crafting: Is the commitment of banks to self-regulation for ESG development a greenwashing or CSR Practice?

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Abstract

The commitment to self-regulation for sustainable development has attracted significant attention as organizations, particularly in sectors like banking and finance, work to align their practices with global sustainability goals. However, concerns have emerged about whether these commitments are genuine corporate social responsibility (CSR) efforts or simply greenwashing, where companies present themselves as environmentally or socially responsible without making real, impactful changes. The empirical results, derived from data on Taiwanese commercial banks between 2018 and 2023, indicate that Taiwan's commercial banks' commitment to self-regulation for sustainable development reflects a genuine CSR effort, rather than greenwashing.

Key Words: Commercial banks, self-regulation, sustainable development, CSR, greenwashing, BoD approach, truncated panel regression model

JEL Classification: G21, G28

1. Introduction

Financial institutions serve as a bridge between the supply and demand of funds in modern society, and the efficiency of the financial sector often directly impacts the development of the overall economy and economic growth. In recent years, issues such as sustainable development and low-carbon transformation have not only become core policy concerns in many countries but are increasingly becoming key focuses for global financial institutions and banking management strategies. The Paris Agreement declares the need to align financial flows with low-emissions development pathways, guiding financial markets to directly engage in promoting sustainable development. Self-regulation in the financial sector refers to the voluntary adoption of ethical, social, and environmental standards by financial institutions to ensure responsible business practices. Some studies apply signaling theory, suggesting that voluntary self-regulation of responsible behavior signals a company's commitment to sustainable development, with the aim of gaining reputational benefits (Finger 2018; Uyar et al. 2020; Manos et al. 2024). In contrast, other research draws on greenwashing theory, arguing that such actions may convey misleading or false impressions about a company's environmental sustainability efforts (Delmas and Burbano 2011; Caby et al. 2020; Liu et al. 2024; Yin and Yang 2024). Empirical research is crucial to assess whether commercial banks' self-regulation for sustainable development reflects genuine corporate social responsibility (CSR) or mere greenwashing, thereby enhancing our understanding of its role in sustainability.

Since the 1970s, the international community has advocated for the green and circular economy, urging businesses to actively fulfill their CSR to drive sustainable development. As environmental protection, resource allocation, and sustainable development have gained increasing attention, CSR has become a key measure of a company's success. Some multinational corporations even use CSR performance as a criterion for business partnerships. However, without absolute standards or regulations, CSR is prone to cognitive biases. To address this, frameworks such as ESG (Environmental, Social, and Governance) and SDGs (Sustainable Development Goals) have emerged to provide clearer guidelines for assessing sustainability. The United Nations Global Compact first introduced the ESG concept in its 2004 report, *Who Cares Wins*, highlighting the importance of environmental protection, social responsibility, and corporate governance in business practices. Meanwhile, the United Nations' 2030 Sustainable Development Goals (SDGs), introduced in 2015, serve as a global roadmap for addressing critical challenges such as climate change, economic inequality, and social justice. The SDGs outline 17 key goals, 169 specific targets, and 230 measurable

indicators to guide collective action toward a more sustainable future. In essence, CSR represents a broad commitment to sustainability, ESG provides a structured approach to evaluating corporate sustainability efforts, and SDGs define specific global objectives, urging collective action for long-term environmental and social well-being.

In the process of advancing sustainable development, financial institutions play a crucial intermediary role. Through tools like lending restrictions and financing, financial institutions can help businesses that impact the environment with their planning or direct funds to companies that prioritize sustainability, thereby influencing supply chains, consumers, employees, and communities to collectively drive sustainable development. Many studies also indicate that banks have the potential to become key participants in sustainable development, especially by allocating investment funds to areas such as health, education, entrepreneurship, and poverty reduction, thereby further promoting positive social and environmental outcomes (Contreras et al. 2019; Úbeda et al. 2022b; Úbeda 2023). Some scholars argue that the most effective way to encourage banks' participation in sustainable development is through public-private partnerships and self-regulation, rather than relying solely on government-imposed regulations (Pitkänen et al. 2016; Folke et al. 2019; Kolcava et al. 2021)), emphasizing the importance of cross-corporate collaboration, voluntary self-regulation, and joint public-private regulation as effective tools for managing sustainability (Contreras et al. 2019).

Self-regulation in the financial sector refers to the voluntary adoption of ethical, social, and environmental standards by financial institutions to ensure responsible business practices. Instead of relying solely on government regulations, banks and financial organizations establish internal frameworks and industry-driven guidelines to promote sustainability, transparency, and risk management. Two key frameworks that embody self-regulation in banking and finance are the Equator Principles (EPs) and the Principles for Responsible Banking (PRB). The EPs, first established in 2003 and most recently updated with EP4 in 2020, align with the International Finance Corporation Performance Standards and the World Bank Environmental and Social Framework. Their primary goal is to ensure that banks and financial institutions finance projects that uphold sustainability, environmental responsibility, and human rights standards. The PRB, launched in 2019 by the United Nations Environment Programme Finance Initiative (UNEP FI), provide a framework for aligning banking practices with the SDGs and the Paris Agreement. The PRB require banks to integrate sustainability

into their core strategies, assess their environmental and social impacts, and engage in transparent reporting.

Some studies use signaling theory to suggest that voluntary self-regulation serves as a signal of commitment to sustainable development, thereby gaining reputational benefits (Finger 2018; Uyar et al. 2020; Manos et al. 2024), while other studies, based on greenwashing theory, argue that it represents a process of conveying misleading or false impressions about the environmental friendliness of a company's products (Delmas and Burbano 2011; Caby et al. 2020; Liu et al. 2024; Yin and Yang 2024). Uyar et al. (2020) found that companies in the logistics industry with better CSR performance are more willing to report their achievements, which aligns with signaling theory rather than greenwashing theory. Brandon et al. (2022) found that non-U.S. institutional investors who sign the Principles for Responsible Investment (PRI) not only exhibit better ESG scores in their investment portfolios but also see improvements in these scores after adopting the principles. However, Finger et al. (2018) found that in developing countries, adopting the EPs is a strategic decision that demands commitment and investment to create value, in line with signaling theory, while in developed countries, it often requires no additional commitment, thus serving merely as a form of greenwashing. The study aims to verify whether Taiwanese commercial banks' self-regulation in commitment to sustainable development aligns with signaling theory or greenwashing theory.

The rest of the paper runs as follows. Section II surveys the relevant literature. Section III establishes research hypotheses and the conceptual framework. Section IV explains the methodology. Section V provides the empirical analysis. The final section presents concluding remarks.

2. Literature Review

Since the 1970s, the international community has urged corporations to take on social responsibilities and contribute to sustainable economic and social development. The concept of sustainable development was first introduced in the 1972 *United Nations Declaration of the Human Environment*, also known as the *Stockholm Declaration* (United Nations 1972). Later, the *World Commission on Environment and Development* (1987) defined sustainable development as meeting the needs of the present without compromising the ability of future generations to meet their own needs, emphasizing the importance of harmony between humanity and nature.

The literature on CSR is extensive, with early research emphasizing the integration of social responsibility into a firm's strategic planning and management systems to align with shareholder expectations. According to externality theory, firms lack incentives to invest in CSR or ESG initiatives, a notion empirically supported by Mackey et al. (2007) and Zivin and Small (2005). Friedman (1970) contends that the primary objective of private enterprises is to maximize profits while adhering to legal and ethical standards. He further argues that corporate expenditures on charitable activities effectively limit shareholders' autonomy in deciding how their money is used.

Recurring economic downturns and escalating environmental challenges underscore the need for enterprises to go beyond job creation and wealth generation by actively contributing to sustainable development. Freeman (1984) proposed that firms should consider not only the interests of their shareholders but also the interests of other operating participants (e.g., employees, customers, local communities, etc.) Moreover, some scholars argue that firms engaging in social initiatives can enhance their reputation, fostering a sustainable competitive advantage (Galbreath and Shum 2012; Saeidi et al. 2015; Park 2017). Consequently, CSR and/or ESG activities are positively associated with firm performance (Friede et al. 2015; Sherwood and Pollard 2018; Porter et al. 2019; Buallay et al. 2020).

In recent years, bank customers have become more focused on social and environmental issues (Polychronidou et al. 2014; Tran 2014), and banks with strong ESG practices can leverage their reputation to build valuable strategic resources (Chih et al. 2010; San-Jose et al. 2011; Lii and Lee 2012). These resources help maintain positive stakeholder relationships, improve risk management, and enhance operational efficiency. Reputation, in particular, is a vital asset for the service industry, enabling banks to attract high-quality employees and strengthen their sense of identity (Bravo et al. 2010; Hsu 2012), empowering them to perform effectively during crises, reduce operational risks, and increase productivity and competitiveness (Ashforth et al. 2008; Alsayegh et al. 2020).

As ESG has gained widespread attention, the influence of ESG rating agencies has gradually increased. Most investors and academic research rely on these agencies to quantitatively assess corporate ESG performance (Berg et al. 2022). However, ESG rating studies generally point out significant discrepancies between ratings provided by different agencies. Berg et al. (2022) identified several key factors that contribute to these rating discrepancies, including differences in the categories and items selected by each agency for assessment, the use of different quantitative indicators by agencies to evaluate the same ESG

categories, and the fact that scoring weights are often subjectively assigned by experts within the agencies. Additionally, agencies may have differing views on the relative importance of subcategories, which results in variations in the weighting of scores. Subsequent studies have empirically highlighted the issue of low correlation between the databases of different ESG rating agencies (Billio et al. 2021; Brandon et al. 2021; Zumente and Lace 2021). These studies also point out that discrepancies in rating results may reduce companies' willingness to invest in ESG initiatives and could impact investment decisions and academic research analyses (Brandon et al. 2021).

A composite index (CI) refers to the process of aggregating multiple-dimensional phenomena into a single evaluation standard (OECD 2008). By constructing a CI, complex social phenomena can be explained and multi-faceted concepts can be simplified for easier assessment, analysis, and decision-making (Martínez et al. 2020; Oliveira et al. 2020). This approach has been widely applied across various fields, often used to illustrate the development of a country or region, such as the Human Development Index (UNDP 2016), Environmental Performance Indicators (Zhou et al. 2007), and the Sustainable Society Index (Kerk and Manuel 2008). When constructing CI, it is essential to consider the objectivity and credibility of the indicator, which includes the selection of sub-indicator items, handling of irregular data, and the setting of sub-indicator weights (Booyesen 2002; Nardo et al. 2005).

The literature generally emphasizes that weights are crucial for constructing CIs (Fusco et al. 2022; Laura et al. 2022). As a result, the Benefit-of-the-Doubt (BoD) model, where weights are endogenously determined by the model, has become a popular choice in research for constructing composite indicators (Verbunt and Rogge 2018; Smirlis 2020). However, some studies suggest that the BoD model may overlook the effects of underperforming sub-indicators, which could lead to unfair scores and rankings among firms, thereby reducing the discriminative power of the composite indicator (Despotis 2005; Zhou et al. 2007). To address this issue, Cherchye et al. (2007, 2008) introduced a proportion constraint method in the model. This approach sets upper and lower bounds for the weight of each sub-indicator within the CI, thus avoiding the potential overestimation of CI scores that may arise from the BoD model.

Self-regulation in sustainable development for banks refers to voluntary initiatives taken by financial institutions to promote sustainability beyond government mandates. This commitment is viewed as a mechanism to build trust and create opportunities for advancing the sustainable development of the banking sector, addressing societal and environmental

challenges (Úbeda et al. 2022b). Some studies adopt two alternative theories to explain why companies voluntarily commit to sustainability reporting: signaling theory (Spence 1973) and greenwashing theory (Mahoney et al. 2013; Caby et al. 2020; Uyar et al. 2020). Signaling theory posits that voluntary responsible actions by firms serve as signals of their commitment to sustainable development, while greenwashing theory emphasizes that such actions are intended to position a company as sustainable and responsible, even though the company's claims are not supported by actual actions, leading to a disconnect between words and deeds (Teti et al. 2024).

Uyar et al. (2020) point out that logistics companies with better CSR performance are more willing to report their performance, which is consistent with signaling theory and not applicable to greenwashing theory. However, Finger et al. (2018) found that adopting EPs is a strategic decision for banks in developing countries, requiring commitment and investment to create value, thus aligning with signaling theory. In contrast, banks in developed countries do not require additional commitment when adopting the EPs, and it may merely be an attempt at greenwashing. Scholtens and Dam (2007) highlight that banks adopting EPs show significant differences in their ESG policies compared to those that do not, suggesting that signing EPs serves as a signal of responsible behavior. Contreras et al. (2019) propose that a bank's commitment to self-regulation in sustainable management can be explained by peer pressure, with their research showing that banks collaborating with EPs signatories are more likely to adopt this voluntary self-regulation. Brandon et al. (2022) found that non-U.S. institutional investors who sign the Principles for Responsible Investment (PRI) not only achieve better ESG scores in their portfolios but also see improvements in these scores after adopting the principles. These findings reinforce the idea that significant differences exist between banks engaged in self-regulated sustainable practices and those that are not, aligning with signaling theory.

3. Research Hypotheses and Conceptual Framework

Financial institutions serve as key intermediaries in promoting sustainable development, as they are the primary providers of investment, financing, insurance, and asset management services. With their gatekeeping and leadership roles, they can utilize tools such as lending restrictions and financing mechanisms to help environmentally impactful businesses improve their planning or direct capital toward companies committed to sustainability. In doing so, financial institutions can influence supply chains, consumers, employees, and communities,

fostering broader sustainable development. Many studies also recognize that banks have the potential to be key participants in sustainable development through their role in allocating funds that impact health, education, entrepreneurship, and poverty alleviation (Contreras et al. 2019; Úbeda et al. 2022b; Úbeda 2023).

How can we encourage banks to actively engage in sustainable development? It is widely recognized that the most effective way to achieve sustainability is through public-private collaboration and self-regulation, rather than relying solely on government-imposed regulations (Pitkänen et al. 2016; Folke et al. 2019; Kolcava et al. 2021). Some scholars emphasize the importance of interfirm collaboration, voluntary self-regulation, and co-regulation between the public and private sectors as crucial tools for effective sustainability governance (Contreras et al. 2019; Kolcava et al. 2021).

Self-regulation in the banking industry refers to the voluntary adoption of ESG standards by financial institutions to ensure responsible business practices. Committing to self-regulation for sustainable development generally enhances a financial institution's reputation by signaling responsible banking practices (Spence 1973; Scholtens and Dam 2007), improving stakeholder trust and investor confidence (Eccles et al. 2014), and navigating emerging sustainability regulations (Richardson 2009; Weber and Acheta 2016; Amel-Zadeh and Serafeim 2018; Schoenmaker and Schramade 2019). In contrast, greenwashing theory suggests that responsible banking self-regulation may serve as a means of conveying misleading or false impressions about the environmental friendliness of a company's products (Mahoney et al. 2013; Caby et al. 2020; Uyar et al. 2020). Finger et al. (2018) found that while banks in developing countries require commitment and investment to create value through self-regulation via the Equator Principles (EP), aligning with signaling theory, banks in developed countries adopt EP without additional commitment, making it merely an attempt at greenwashing. Hence, the ESG scores of banks committed to self-regulation for sustainable development are positively related with signaling theory and negatively correlated with greenwashing theory. Therefore, this study proposes two competing hypotheses as follows:

H1a: *Banks committed to self-regulation for sustainable development tend to have higher ESG scores compared to those without such commitment.*

H1b: *Banks committed to self-regulation for sustainable development tend to have lower ESG scores compared to those without such commitment.*

Economies of scale occur when the cost per unit decreases as the scale of production increases. In the case of commercial banks, as the bank's size grows, its asset diversification typically expands. This broader diversification enhances risk management by reducing non-systematic risks, thereby lowering the costs associated with managing these risks. Consequently, as a bank's scale increases, its average costs consistently decline. Furthermore, the larger the bank, the greater the public's trust in its stability, which improves its ability to raise funds in the capital markets.

ESG scores are increasingly recognized as crucial indicators for evaluating the long-term sustainability of financial institutions, as stakeholders, investors, and regulators place greater emphasis on corporate responsibility and sustainability. Large banks generally possess substantial resources that allow them to implement comprehensive environmental sustainability initiatives, carry out extensive social responsibility programs, and establish more advanced risk management frameworks, compliance teams, and internal controls. These advantages contribute to stronger ESG scores (Eccles and Klimenko 2019; Amel-Zadeh and Serafeim 2018). Conversely, the limited resources of smaller banks often restrict their ability to scale sustainability efforts, invest in costly green technologies, expand social programs, attract diverse boards, or maintain robust internal audit systems (Odonkor et al. 2024). Therefore, we propose hypotheses H2 as follows:

H2: *Economies of scale influence ESG practices in the banking industry.*

Return on Equity (ROE) is a key financial metric that measures a bank's profitability relative to its shareholders' equity. It reflects how efficiently a bank generates profits from its equity base. High ROE can support ESG investments, but Excessive focus on ROE may reduce ESG investments, prioritizing short-term financial performance. The Bank for International Settlements (BIS) ratios measure a bank's financial stability and risk exposure. They determine the bank's ability to invest in sustainable finance, manage ESG risks, and maintain responsible governance. Strong BIS ratios enhance ESG scores, mainly through financial stability, sustainable lending, and improved governance, whereas excessive capital reserves may reduce ESG investments due to risk-averse behavior. Bank leverage, defined as total assets divided by shareholders' equity, plays a crucial role in shaping its ESG score. While higher leverage can enhance governance transparency and stakeholder scrutiny, excessive leverage can lead to short-term financial pressures, reducing sustainability investments.

In summary, the impact of the three variables on bank ESG scores is uncertain and must be determined through empirical analysis. In addition, banks with different operational models may have varying incentives and constraints to engage in sustainable finance. Hence, we add ROE, BIS ratios, leverage, and operational types as control variables to evaluate whether commercial banks' self-regulation in sustainable development reflects signaling motives or greenwashing practices. Figure 1 illustrates the conceptual framework of this study.

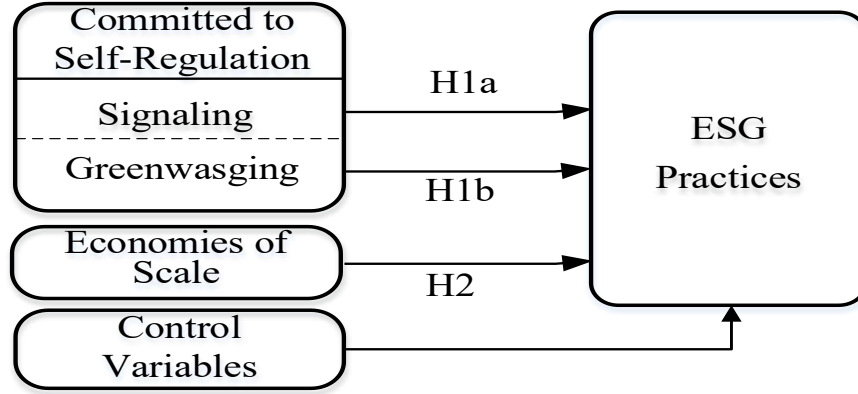


Figure 1. The conceptual framework.

4. Methodology

4.1 Benefit of the Doubt (BoD) approach

The selection of weights is crucial for constructing CIs (Fusco et al. 2022). The OECD (2008) Handbook on Constructing Composite Indicators provide various methods for calculating weights and compare their advantages and disadvantages. Using the European Social Inclusion Index as an example, it is challenging to use the same weights to assess all countries due to their different national contexts (Atkinson et al. 2002). The benefit-of-doubt (BoD) approach treats the weights as endogenous and seeks the most favorable weight for each decision-making unit (DMU) (Cherchye et al. 2008). It not only avoids the problem of subjective weight selection, but also takes into account the individual differences among firms. Therefore, the BoD approach is widely used to construct comprehensive indicators (Rogge 2018).

Suppose there are N DMUs, each with R non-negative sub-indicators $(v_1, \dots, v_R) \in \mathbb{R}_+^R$. The CI of the BoD model for DMU n , y_n , is defined as

$$\begin{aligned}
\max_{w_1, \dots, w_R} y_n &= \sum_{r=1}^R w_r v_{nr} \\
\sum_{r=1}^R w_r v_{ir} &\leq 1, \quad i = 1, 2, \dots, N \\
w_r &\geq 0, \quad r = 1, 2, \dots, R
\end{aligned} \tag{1}$$

where v_{nr} is the sub-indicator r of DMU n , w_r is the weight to be estimated, and the CI y_n will range between zero and one (the benchmark) (Nardo et al. 2005; Smirlis 2020).

Note that in the BoD model, all weights are determined endogenously without imposing exogenous constraints. Therefore, some sub-indicators may be ignored when aggregating (Zhou et al. 2007). This is definitely not what we expected, as all selected sub-indicators should be considered important and it may not be appropriate to ignore some of them. To overcome this problem, we restrict the flexibility of weights by incorporating proportion constraints such as setting upper limits (U_n) and lower limits (L_n), while still maintaining unit invariance (Cherchye et al. 2007; Zhou et al. 2007). Since our sub-indicators can be divided into three groups: E , S , and G , we set the following restrictions for each group:

$$\begin{aligned}
L_n &\leq (\sum_{j \in A} w_j v_{nj}) / (\sum_{r=1}^R w_r v_{nr}) \leq U_n, \quad A = E, S, G \\
0 &\leq L_n < U_n \leq 1
\end{aligned} \tag{2}$$

4.2 Truncated Panel Regression Models

It is convenient to investigate the relationship between environmental variables and the CI y , obtained from the BoD approach, by least squares method. However, the CI is right-truncation at 1, known as a limited (truncated) dependent variable. The corresponding least squares estimators are biased and inconsistent, so the maximum likelihood is generally used to estimate this nonlinear regression model (Hsiao 2014). Furthermore, when analyzing panel data, we commonly incorporate individual intercepts to control heterogeneity across firms; fixed effects models treat these intercepts as constants, whereas random effects models regard them as random variables. Since the fixed effects model has the incidental parameters problem, and we cannot eliminate the fixed effects by differencing or mean differencing when the data are truncated, this study applies the random effects model to estimate the unknown parameters of the truncated panel regression model.

The random effects model with truncated data is based on the following latent regression:

$$y_{nt}^* = \alpha + \beta_1 x_{1nt} + \dots + \beta_k x_{knt} + \omega_n + \varepsilon_{nt}, \quad n = 1, \dots, N, \quad t = 1, \dots, T_i \tag{3}$$

where ε_{nt} and ω_n are bivariate normal with means $(0,0)$, variances $(\sigma_\varepsilon^2, \sigma_\omega^2)$, and correlation 0. If we cannot directly observe y_{nt}^* and only obtain the information y_{nt} where

$y_{nt} = y_{nt}^*$ for all $y_{nt}^* \leq 1$, then the conditional density of the observed random variable y_{nt} given ω_n is

$$f(y_{nt}|\omega_n) = \Phi\left(\frac{1 - \boldsymbol{\beta}'\mathbf{X}_{nt} - \omega_n}{\sigma_\varepsilon}\right)^{-1} \sigma_\varepsilon^{-1} \phi\left(\frac{y_{nt} - \boldsymbol{\beta}'\mathbf{X}_{nt} - \omega_n}{\sigma_\varepsilon}\right)$$

where $\boldsymbol{\beta} = (\alpha, \beta_1, \dots, \beta_k)'$, $\mathbf{X}_{nt} = (1, x_{1nt}, \dots, x_{knt})'$, and $\phi(\cdot)$ and $\Phi(\cdot)$ are the probability density function and cumulative distribution function of the standard normal distribution, respectively.

Since the observed random variables y_{nt} , conditioned on ω_n , are independent, the conditional joint density of the T_n observations for firm n is the product of the individual conditional densities

$$f(y_{n1}, \dots, y_{nT_n}|\omega_n) = \prod_{t=1}^{T_n} f(y_{nt}|\omega_n)$$

The unconditional joint density of the T_n observations for firm n is obtained by integrating ω_n out of the conditional joint density

$$f(y_{n1}, \dots, y_{nT_n}) = \int_{-\infty}^{\infty} \prod_{t=1}^{T_n} f(y_{nt}|\omega_n) \sigma_\omega^{-1} \phi\left(\frac{\omega_n}{\sigma_\omega}\right) d\omega_n$$

Hence, the likelihood function of the panel data with right-truncation at 1 is

$$\prod_{n=1}^N \left[\int_{-\infty}^{\infty} \prod_{t=1}^{T_n} \Phi\left(\frac{1 - \boldsymbol{\beta}'\mathbf{X}_{nt} - \omega_n}{\sigma_\varepsilon}\right)^{-1} \sigma_\varepsilon^{-1} \phi\left(\frac{y_{nt} - \boldsymbol{\beta}'\mathbf{X}_{nt} - \omega_n}{\sigma_\varepsilon}\right) \sigma_\omega^{-1} \phi\left(\frac{\omega_n}{\sigma_\omega}\right) d\omega_n \right]$$

Maximizing the above likelihood function with respect to unknown parameters yield consistent and asymptotically normally distributed estimators (Hsiao 2014).

5. Empirical Analysis

5.1 Data and ESG Sustainability

The data comes from the annual reports and “Sustainability Report” of Taiwanese commercial banks, and the TEJ Database. These data can best reflect the development status of Taiwan's commercial banks in ESG practices. After excluding incomplete data, the research sample includes 32 commercial banks from 2018 to 2023, with a total of 151 observations. All nominal variables are deflated by the GDP deflator with 2021 as the base year.

We use the BoD approach to construct ESG index (*ESG*) which consists of three dimensions: environmental sustainability, social sustainability, and governance sustainability. The environmental sustainability emphasizes lending and investment related to environmental protection, called responsible lending and responsible investment. The former consists of

responsible corporate lending ($E1$) and responsible personnel lending ($E2$), while latter includes responsible bond investment ($E3$) and responsible non-bond investment ($E4$). The social sustainability focuses on social responsibility, including small and medium-sized loans ($S1$), the proportion of female executives ($S2$), and the ratio of average non-management salary to average management salary ($S3$). The governance sustainability highlights corporate governance and systematic risks, consisting of the ratio of independent directors ($G1$), director attendance ($G2$), and Core BIS ratio ($G3$). We set the lower bound L_n for each sustainability to be 0.15 (the upper bound is automatically to be 0.7). Table 1 shows the definitions and sample means of the sub-indicators used in the BoD approach.

Table 1 Definitions and Sample Means of Sub-indicators Used in the BoD Approach

Sub-indicator	Definition	Mean
Environmental sustainability		
$E1$	Responsible corporate lending (NT\$ billion)	85.1045
$E2$	Responsible personnel lending (NT\$ billion)	6.7464
$E3$	Responsible bond investment (NT\$ billion)	13.2983
$E4$	Responsible non-bond investment (NT\$ billion)	7.2248
Social sustainability		
$S1$	Small- and medium-sized loans (NT\$ billion)	310.3019
$S2$	Proportion of female executives (%)	38.9459
$S3$	Ratio of average non-management salary to average management salary	0.2734
Governance sustainability		
$G1$	Ratio of independent directors (%)	28.4777
$G2$	Director attendance (%)	95.3246
$G3$	Core BIS ratio (%)	11.1775

Note: All nominal variables are deflated by the GDP deflator with 2021 as the base year.

5.2 Empirical Specifications and Results

This study applies the random effects model with right-truncation at 1 to investigate how commitment to self-regulation for sustainable development affect ESG sustainability (ESG) of commercial banks. Two key frameworks that embody self-regulation in banking and finance are Principles for Responsive Banking (PRB) and/or Equator Principles (EPs). We set the dummy variable $DPRB$ to be one if the bank commits to PRB and zero otherwise. Similarly, the dummy variable DEP is one if the bank commits to EPs and zero otherwise. Furthermore, we add size ($Size$) and its squared term ($Size2$) as proxies to capture the economies of scale in banks. This study also includes return on equity (ROE), BIS ratios (BIS), leverage (Lev), three types of dummy variables (FH , Old , and Pub) as control variables to more accurately identify the effect

of banks' self-regulation on sustainable development. Hence, the empirical model is specified as:

$$ESG_{nt} = \alpha + \beta_1 DPRB_{nt} + \beta_2 DEP_{nt} + \beta_3 Size_{nt} + \beta_4 Size2_{nt} + \beta_5 ROE_{nt} + \beta_6 BIS_{nt} + \beta_7 Lev_{nt} + \beta_8 FH_{nt} + \beta_9 Old_{nt} + \beta_{10} Pub_{nt} + \omega_n + \varepsilon_{nt} \quad (4)$$

where ε_{nt} and ω_n are bivariate normal with means $(0,0)$, variances $(\sigma_\varepsilon^2, \sigma_\omega^2)$, and correlation 0. Table 2 presents the definition and sample means of the variables used in the truncated panel regression model.

Table 2 Definitions and Sample Means of Variables Used in the Empirical Model

Regressors	Definition	Mean
<i>ESG</i>	ESG index, obtained from the BoD approach.	0.4799
<i>DPRB</i>	One if the bank commits to PRB; zero otherwise.	0.3113
<i>DEP</i>	One if the bank commits to EPs; zero otherwise.	0.4371
<i>Size</i>	Natural logarithm of total asset (NT\$ billion).	7.3234
<i>ROE</i>	Return on equity (%)	9.1074
<i>BIS</i>	BIS ratios (%).	14.5396
<i>Lev</i>	Tier 1 capital divided by total exposure.	7.0078
<i>FH</i>	One if the bank is a holding bank; zero otherwise.	0.5430
<i>Old</i>	One if the bank was established before 1991; zero otherwise.	0.5298
<i>Pub</i>	One if the bank was stated-owned; zero otherwise.	0.3046

Note: All nominal variables are deflated by the GDP deflator, with 2021 as the base year.

Table 3 exhibits the empirical results of the random effects model with right-truncation at one. The estimate of σ_ω , $\hat{\sigma}_\omega$, is significantly larger than zero at 1% level of significance, indicating that the random effects model is better than the pooled model for our data with right-truncation at 1. The empirical results show that the estimated coefficients of *DPRB*, *DEP*, *Size*, and *Size2* are significantly different from 0, among which *DEP* is at the 1% level of significance, and the others are at the 5% level significance. The coefficients in front of *DPRB* and *DEP* are significantly positive, supporting hypothesis H1a and not supporting H1b. Therefore, the commitment of Taiwan's commercial banks to self-regulation for sustainable development reflects a genuine CSR practice, not greenwashing. Furthermore, the estimated coefficients of *Size* and *Size2* are significantly negative and positive, respectively, indicating that the scale of operations must reach a certain level in order to achieve economies of scale, thus supporting hypothesis H2.

The estimated coefficients of all control variables are insignificantly differently from zero at the 10% level of significance. We may conclude that other things being equal, (1) the contributions and impacts of ROE, the BIS ratio, and leverage on banks' ESG practices nearly cancel each other out; (2) commercial banks implement similar sustainability initiatives, regardless of their operational types.

Table 3 Empirical Results of the Random Effects Model with Right-Truncation at 1

Covariate	Coefficient	Std. Error	<i>t</i> -ratio	<i>p</i> -value
Constant	2.4651**	1.1422	2.1580	0.0309
<i>DPRB</i>	0.1032**	0.0485	2.1290	0.0332
<i>DEP</i>	0.1202***	0.0433	2.7750	0.0055
<i>Size</i>	−0.7809**	0.3568	−2.1890	0.0286
<i>Size2</i>	0.0694**	0.0275	2.5210	0.0117
<i>ROE</i>	0.0030	0.0083	0.3640	0.7159
<i>BIS</i>	−0.0078	0.0207	−0.3790	0.7050
<i>Lev</i>	−0.0062	0.0261	−0.2360	0.8134
<i>FH</i>	−0.0198	0.0849	−0.2330	0.8157
<i>Old</i>	0.0058	0.0771	0.0750	0.9400
<i>Pub</i>	−0.0614	0.0978	−0.6270	0.5304
$\hat{\sigma}_\varepsilon$	0.1617***	0.0113	14.3020	< 0.0001
$\hat{\sigma}_\omega$	0.1261***	0.0247	5.1020	< 0.0001
Log-Likelihood		36.02116		

Note: *, **, and *** represent the 10%, 5%, and 1% levels of significance, respectively.

5.3 Discussion

This study employs the BoD approach to construct ESG sustainability indices. In order to limit the flexibility of the weight shown in equation (2), the lower limit is set to 0.15, while the upper bound is automatically set to 0.7. The environmental sustainability is comprised of responsible corporate lending, responsible personnel lending, responsible bond investments, and responsible non-bond investments. The social sustainability includes small- and medium-sized loans, the proportion of female executives, and the ratio of average non-management salary to average management salary. Governance sustainability focuses on corporate governance and systemic risks, incorporating the ratio of independent directors, director attendance, and the core

BIS ratio. Table 3 shows that the estimate $\hat{\sigma}_\omega$ is significantly larger than zero at 1% level of significance, indicating that the random effects model outperforms the pooled model in explaining our ESG scores, which are right-truncated at 1.

Self-regulation refers to the voluntary adherence of businesses to a set of rules or principles they establish themselves, rather than being compelled by external laws or regulatory bodies. Committing to self-regulation for sustainable development can enhance a financial institution's reputation (Eccles et al. 2014; Amel-Zadeh and Serafeim 2018; Schoenmaker and Schramade 2019); however, greenwashing theory suggests it may also be used to create misleading or deceptive perceptions of a company's environmental commitment (Mahoney et al. 2013; Caby et al. 2020; Uyar et al. 2020). The coefficients for *DPRB* and *DEP* are both significantly positive, providing support for hypothesis H1a, but not for H1b. In other words, Taiwan's commercial banks' commitment to self-regulation for sustainable development reflects a true ESG practice, as opposed to greenwashing.

Greenwashing refers to the practice of misleading stakeholders by exaggerating or fabricating a company's environmental or social responsibility to create a false impression of sustainability. This can involve vague claims, such as promoting eco-friendly products without credible evidence or making environmental commitments that lack meaningful action. For Taiwan's commercial banks, avoiding greenwashing means ensuring their sustainability efforts are supported by transparent actions and measurable results. This may include publishing regular sustainability reports, setting clear ESG targets, and demonstrating tangible environmental and social impacts. Such transparency is critical to confirming that their efforts are genuine, rather than just a marketing strategy aimed at attracting environmentally-conscious investors or customers.

The estimated coefficients of *Size* and *Size2* are respectively negative and positive, indicating a U-shape correlation between operating scale and ESG practices. Economies of scale play a crucial role in enhancing a bank's ESG score by enabling more cost-effective and efficient sustainability initiatives, improving governance structures, and providing access to capital for large-scale sustainable projects. Large banks often have dedicated ESG teams or committees that oversee the integration of sustainable practices throughout their operations. Furthermore, the size and market power of large banks provide them with significant reputation capital, allowing them to undertake large-scale sustainable initiatives, such as financing renewable energy projects or promoting financial inclusion for underserved communities, thereby enhancing their reputation and, consequently, their ESG scores.

Robustness checks are an essential part of empirical research to ensure that results are valid, reliable, and not dependent on specific assumptions or methodological choices. Our dependent variable is the ESG score, derived from the BoD model, where the weights are constrained by group proportions with a lower bound of 0.15. Table 4 presents the empirical results of random effects models with various lower bounds on ESG scores. Columns 2-5 of Table 4 correspond to lower bounds of 0.1, 0.13, 0.17, and 0.2, respectively. The estimates $\hat{\sigma}_\omega$ for all models are significantly larger than zero at 1% level of significance. Hence, we can confidently claim that the random effects model outperforms the pooled model for the ESG scores of Taiwan's commercial banks. Furthermore, the empirical results for lower bounds ranging from 0.1 to 0.2 are consistent. Specifically, the estimated coefficients for *DPRB*, *DEP*, *Size*, and *Size2* are significantly different from 0 and share the same signs, while other control variables are insignificantly different from 0. Therefore, we may conclude that our empirical findings are robust.

6. Conclusions

Self-regulation for sustainable development refers to the voluntary actions undertaken by organizations to ensure their operations contribute positively to society and the environment. In the banking sector, many institutions adopt frameworks such as the PRB and the EPs to integrate sustainability into their decision-making processes and minimize negative social and environmental effects. The effectiveness of self-regulation, however, depends on a bank's commitment to integrity, transparency, and measurable impact. When implemented sincerely, self-regulation serves as a form of CSR, fostering long-term, meaningful improvements for both businesses and society. Conversely, when banks engage in superficial sustainability efforts without genuine impact—commonly known as greenwashing—they mislead stakeholders through deceptive claims. This contrast underscores the need for accountability and transparency in self-regulatory initiatives to ensure they contribute to real sustainable development. Therefore, this study analyzes whether commercial banks' self-regulation for sustainable development is a genuine CSR effort or a form of greenwashing, highlighting its true impact on sustainability.

Table 4 Random Effects Models with Various Lower Bounds on ESG Scores

Covariate	LB = 0.1	LB = 0.13	LB = 0.17	LB = 0.2
Constant	2.2656 * (1.9260)	2.3062 ** (1.9880)	2.3983 ** (2.1750)	2.5570 ** (2.2120)
<i>DPRB</i>	0.0794 * (1.6480)	0.0857 * (1.7950)	0.1299 *** (2.7890)	0.1198 *** (2.5900)
<i>DEP</i>	0.1161 *** (2.6920)	0.1431 *** (3.3970)	0.1021 ** (2.4230)	0.1378 *** (3.2300)
<i>Size</i>	-0.7341 ** (-1.9980)	-0.7431 ** (-2.0540)	-0.7402 ** (-2.1620)	-0.8128 ** (-2.2480)
<i>Size2</i>	0.0684 ** (2.4150)	0.0667 ** (2.3980)	0.0652 ** (2.4760)	0.0708 ** (2.5380)
<i>ROE</i>	0.0009 (0.1050)	-0.0006 (-0.0680)	0.0029 (0.3570)	0.0002 (0.0200)
<i>BIS</i>	-0.0081 (-0.3910)	-0.0046 (-0.2210)	-0.0103 (-0.5120)	-0.0063 (-0.3060)
<i>Lev</i>	-0.0019 (-0.0710)	-0.0034 (-0.1300)	-0.0069 (-0.2710)	-0.0048 (-0.1830)
<i>FH</i>	-0.0245 (-0.2750)	-0.0126 (-0.1460)	-0.0075 (-0.0910)	-0.0286 (-0.3350)
<i>Old</i>	0.0177 (0.2160)	0.0274 (0.3440)	0.0135 (0.1790)	0.0071 (0.0920)
<i>Pub</i>	-0.1056 (-1.0260)	-0.0594 (-0.5960)	-0.0379 (-0.4040)	-0.0527 (-0.5430)
$\hat{\sigma}_\varepsilon$	0.1599 *** (14.3450)	0.1596 *** (14.4610)	0.1606 *** (14.4560)	0.1633 *** (14.6070)
$\hat{\sigma}_\omega$	0.1369 *** (5.4820)	0.1334 *** (5.4380)	0.1218 *** (5.1300)	0.1262 *** (5.0690)

Note: (1) *, **, and *** represent the 10%, 5%, and 1% levels of significance, respectively.

(2) The values in brackets are *t*-ratios.

Obtained from the annual reports and “Sustainability Report” of Taiwanese commercial banks, and the TEJ Database during 2018-2023, the dataset herein consists of 32 commercial banks with a total of 151 observations. The empirical results show that the commitment of Taiwan’s commercial banks to self-regulation for sustainable development reflects a sincere CSR effort, rather than greenwashing. Other findings are as follows. (1) Economies of scale can only be achieved when operations reach a sufficient scale. (2) Commercial banks pursue similar sustainability initiatives, irrespective of their operational types.

One limitation of this study is that the empirical analysis primarily examines the contemporaneous relationship between banks' commitments to the Principles for Responsible Banking (PRB) and the Equator Principles (EPs) and their ESG performance. However, banks' sustainability management and ESG practices may exhibit intertemporal persistence, with current ESG performance potentially influenced by past performance and other related factors. Therefore, focusing solely on contemporaneous relationships may not fully capture the intertemporal dynamics and long-term trends in ESG performance. Future research could employ distributed-lag models or dynamic panel models to incorporate the lagged effects of relevant variables and the dynamic characteristics of ESG performance, thereby providing a deeper understanding of its persistence, intertemporal changes, and long-term evolution.

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