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## Article

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# Impacts of ESG Performance on the Profitability of ASEAN-6 Commercial Banks in the Context of Digital Transformation

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## ABSTRACT

**Purpose:** This study's primary goal is to examine the relationship between Environmental, Social, and Governance (ESG) performance and profitability in ASEAN-6 commercial banks amid digital transformation.

**Design/methodology/approach:** To reach this purpose, the paper uses linear regressions to explore the three research questions: "What are impacts of ESG performance on banks' profitability?", "What are impacts of digital transformation on bank's ESG performance?", "How is moderate effect of digital transformation to impacts of ESG performance on banks' profitability?". The paper employs data available for 39 ASEAN-6 banks in 2023.

**Findings:** The main findings are: (i) enhancing ESG performance is likely to boost the bank's profitability; (ii) while banks can bolster their ESG metrics through increased spending on digital transformation, there's a risk that excessive investment in this area could negatively impact Return on Assets (ROA); (iii) the beneficial influence of ESG on ROA tends to decrease as the investment in digital transformation grows.

**Research limitations/implications:** The findings offer insightful viewpoints for bank managers and policymakers regarding the significance of ESG and digital transformation in influencing banking profitability

**Originality/value:** The study contributes to the current literature in emphasize the role of sustainable development in improving bank's performance, especially in the context of digital transformation..

*Keywords: ESG performance, ROA, Digital transformation, ASEAN-6 banks*

## I. Introduction

The ASEAN 6 - Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam - collectively represent a vibrant and rapidly evolving banking sector. With a diverse range of economic developments and financial landscapes, these countries are at the forefront of significant changes in the global banking

industry. Two key factors driving this transformation are the integration of Environmental, Social, and Governance (ESG) considerations and the rapid adoption of digital technology. ESG factors have become increasingly relevant as stakeholders demand more responsible banking practices (Tommaso & Thornton, 2020), while digital transformation is reshaping how banking services are delivered and experienced (Kitsios et al., 2021). The interplay of these elements not only defines the current state of banking but also sets the trajectory for future developments. Understanding the dynamics of factors in the ASEAN-6 banking sector provides valuable

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insights into the broader trends shaping global finance. Contributing to that, this study is aiming at determining roles of ESG implementation and digital transformation in improving the ASEAN-6 bank's profitability.

The impact of ESG performance on the profitability of banking institutions can be delineated through several mechanisms. Firstly, adherence to ESG standards assists banks in mitigating the risks associated with asset expansion. This risk mitigation, partly attributed to the enhanced reputation garnered through ESG compliance, facilitates cost reduction and, consequently, augments profitability (Shakil et al., 2019). Secondly, the well-established internal frameworks and robust management systems prevalent in banks contribute to effective cost management, thereby bolstering their profit (Koo & Kim, 2023). Thirdly, the disclosure of ESG metrics by enterprises plays a crucial role in mitigating issues of information asymmetry and principal-agent dilemmas. This transparency in ESG information elevates the perceived integrity of a firm, thereby reducing its financing costs (Kumawat & Patel, 2022). Furthermore, research by Goss & Roberts (2016) underscores that ESG disclosures not only bolster a bank's reputation and brand awareness but also cultivate trust, which in turn translates into increased profitability.

Theoretical frameworks delineating the influence of financial technology on ESG performance within enterprises are multifaceted. The forefront of this discourse is the innovative advancement and integration of digital information technologies are instrumental in augmenting the ESG capabilities of corporations (Chen, et al., 2022). Such digital transitions are instrumental in reducing the expenditures associated with social responsibility endeavors and in enhancing the efficiency of accountability mechanisms, thereby laying the groundwork for improved ESG performance (Bhandari, Ranta, and Salo, 2022). Consequently, it is plausible to posit that digital transformation represents a critical aspect necessitating further examination in its role as a mediating factor in the interplay between ESG initiatives and financial performance.

In considering the moderating influence of financial digitization on the correlation between ESG performance and the profitability of banking institutions, several theoretical constructs emerge. Initially, digital technologies enable banks to efficiently gather, analyze, and monitor environmental data. This capability is crucial for identifying and mitigating environmental risks, enhancing energy efficiency, and curtailing emissions and waste (Mbama & Ezepue, 2018). Additionally, according to Yang (2023), digital technologies have the potential to boost firms' innovation capacity, enhance production efficiency and increase market value, thereby contributing to improved ESG performance and profitability. Hence, it is tenable to assert that digital transformation plays a pivotal role in the dynamics between ESG performance and the banks' profitability.

The contribution of this study in current literatures is defining the role of ESG factors in fostering the bank's profitability, also the role of digital transformation to banks' sustainable development and profitability among ASEAN 6 countries - the region is experiencing a rapid digital transformation impacting banking sector, which has not been investigated in any studies before.

## II. Literature Review

### A. Impacts of ESG Performance on Banks' Profitability

ESG factors have been a subject of extensive research in the banking sector, with various studies examining their impact on bank profitability. Brogi & Lagasio (2018) identified a significant and positive association between ESG and environmental awareness in banks, highlighting a strong relationship between ESG and profitability. Similarly, Tommaso & Thornton (2020) found a positive indirect link between ESG scores and bank's value through their impact on risk-taking, which suggests that higher ESG scores may influence risk-taking behavior, which in turn

affects bank's value and bank's profit. Besides, Broadstock et al. (2021) found evidence that U.S. banks' financial performance during the global financial crisis was positively related to their ESG score, indicating a flight to quality during times of crisis. Furthermore, Maama (2021) demonstrated a significant positive impact of combined ESG reporting on the value and financial performance of banks. Further support this by demonstrating the positive effect of ESG disclosure on the financial performance of the Italian banking sector (Menicucci and Paolucci, 2022).

However, the relationship between ESG and bank's profitability is not universally consistent. Yuen et al. (2022) found that ESG activities may reduce bank profitability, supporting the trade-off hypothesis that adopting ESG standards could increase bank costs while lowering profitability. Moreover, the impact of ESG on bank's profitability is demonstrated to be influenced by various factors. Ademi & Klungseth (2022) found a significant positive correlation between Corporate Social Responsibility (S factor) and operating expenses, suggesting that ESG activities may negatively impact a firm's profits. In addition to that, Yuzvovich (2023) reported that while social factors directly influence the performance of the banking sector, environmental factors have an inverse effect, and there is no relationship with governance factors. Using the different data base of 333 banks from Europe, America and Asia for different time range around the Covid-19 pandemic, Dragomir et al. (2023) indicate that the bank environmental performance (E factor) in 2019 has a negative influence on the bank's profit during 2020, and no other ESG factors are significant. In neutral view, Lamanda and Vőneki (2023) used the data from 26 banks located in four Central European countries and demonstrate that there is no connection between ESG index and banks' financial performance. These conflicting findings indicate the complexity of the relationship between ESG performance and bank's profitability.

In summary, the impact of ESG performance on bank's profitability is multifaceted, with studies

showing both positive and negative effects. In this study, the assuming the hypothesis about the relationship between ESG implementation and bank's profitability needed testing as following:

**H1:** ESG well performance can increase the banks' profits

## B. Impacts of Digital Transformation on Bank's ESG Performance

Several studies have explored the impact of digital transformation on the performance of ESG practices in banks, providing valuable insights. Buallay (2019) found a significant positive impact of ESG on the performance of European banks. In addition, the study by Kumar et al. (2021) emphasized the value-enhancing nature of governance and social initiatives in the banking sector, underscoring the significance of ESG initiatives as value-creating mechanisms. Similarly, Menicucci & Paolucci (2022) found that ESG disclosure positively affects the financial performance of the Italian banking sector, aligning with the broader positive impact of ESG on firm's performance. Additionally, the study by Wang et al. (2023) revealed that the impact of digital transformation on ESG is stronger among firms in polluting and competitive industries, as well as among non-state-owned enterprises. This suggests that digital transformation may have a differential impact on ESG based on firm's characteristics.

From findings of current literature, the impact of digital transformation on ESG performance in banks is consistent, which indicating positive impacts of digital transformation on bank's ESG performance. Therefore, the paper chooses the below hypothesis for the testing:

**H2:** Embracing digital transformation can help banks improve their ESG performance

### C. Moderate Effect of Digital Transformation to Impacts of ESG Performance on Banks' Profitability

To investigate the impact of digital transformation on the relationship between ESG factors and bank profitability, there are only several relevant references can be considered. Li et al. (2022) examined the influence of digital transformation on corporate total factor productivity and found that digital transformation has a positive effect on productivity, particularly when firms have higher ESG performance. Additionally, Rastogi & Singh (2022) highlighted the influence of information and communications technology (ICT) expenses on the ESG's impact on bank valuation. The recent research of Fu and Li (2023) revealed the similar result that digital transformation has a significant positive moderating effect between ESG and financial performance to ensure sustainable growth for companies. The synthesis of these references suggests that digital transformation may positively affect bank profitability, especially when combined with higher ESG performance. Therefore, the paper addresses the following hypothesis for further practical evidences:

**H3:** The effect of ESG performance on banks' profitability is more prominent when the degree of digital transformation is higher in banks

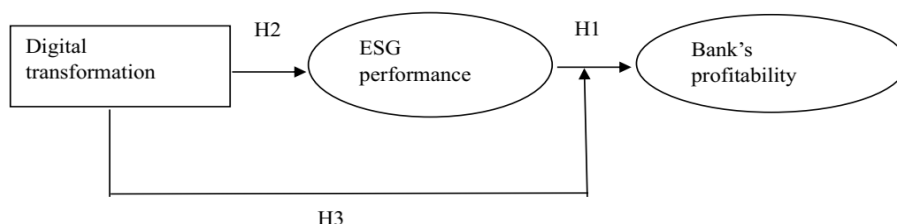
## III. Data and Methodology

### A. Data Collection

First, for ESG performance by ESG score, there are many authorities and financial institutions have been publicizing their calculations. In general, all scores are based on publicly available information released by the companies through their websites, exchange filings, annual reports, investor presentations, sustainability reports, etc. It also takes into account factors in other material ESG information available in the public domain through reliable sources. The assessment of ESG score is based on quantitative as well as qualitative disclosures. In this research, the ESG scores issued by Morningstar Sustainalytics available at their own website are used (<http://www.sustainalytics.com>). On this website, the ESG score of 39 ASEAN-6 banks <sup>1)</sup>are collected for 2023 as of data availability.

Second, for ROA, Bank's size and then the natural logarithm (LogTA), Loans to total deposits (LD) and Capital adequacy ratio (CAR), the data is obtained from The Wallstreet Journal data base site (<https://www.wsj.com>) for each bank. The data for Gross Domestic Product is collected from World economics database (<https://www.worldeconomics.com>) and from that the natural logarithm is calculated (LogGDP).

Third, for digital transformation, the paper



Source: Author

Figure 1. Research conceptual framework

1) It includes 18 banks in Indonesia, 8 banks in Malaysia, 5 banks in Philippines, 1 banks in Singapore, 6 banks in Thailand and 1 bank in Vietnam.

collected bank's operating expense related to digital and technology renovation from the financial statement set of each bank and then calculated the natural logarithm of them (LogDT).

## B. Variables

### 1. ESG Performance

The ESG score to measure the level of ESG performance in an organization is mostly used in recent literatures. Many scholars have utilized ESG disclosure scores and ratings as a means to measure a company's ESG performance such as Ademi and Klungseth (2022), Wang et al. (2023). Moreover, the influence of ESG on firm performance has been investigated, with research exploring the impact of ESG risk scores firm's return on assets and return on equity (Shobhwani, 2023). The literature also highlights the efficiency of ESG indices compared to traditional ones (Caporale et al., 2022; Plastun et al., 2023). Based on the literature above, the paper employed ESG score as the proxy of ESG performance in a bank.

### 2. Bank's Profitability

In this study, Return on Total Assets (ROA) is chosen as proxy for bank's profits because many studies provide substantial evidence supporting the use of ROA as a proxy for bank profitability. For example, Grosse & Gart (2001) has emphasized the significance of ROA as a measure of bank management's ability to earn profits. Moreover, Sufian & Noor (2012) have highlighted the importance of ROA as a reliable measure of bank profitability, emphasizing its superiority over other ratios. In line with current literatures, the paper also uses ROA as proxy for bank's profit in this research.

### 3. Digital Transformation

In banking sector, for measuring the digital transformation of banks, some proxies normally used

in studies include the number of mobile subscriptions, the use of cash-less payment, account ownership percentages, etc. Besides, in research of Hinnings et al. (2018), they employ operating expenses related to digital transformation such as IT infrastructure investment and outsourcing digital services cost, as well as human resources including tech talent expenses. To fit with the data available for banks in ASEAN-6 countries, operating expenses related to digital transformation are chosen as the proxy for bank's digital transformation (LogDT).

### 4. Control Variables

Many studies have revised various factors affect bank's ability to earn profits. Athanasoglou et al. (2008) and Lee & Hsieh (2013) have investigated bank-specific, country-specific, and macroeconomic determinants of bank profitability, shedding light on the multifaceted nature of factors affecting ROA. Similarly, Parvin et al. (2019) have identified the significant effect of bank size, capital strength, and other factors on profitability, as measured by ROA. In addition, Lin & Yi (2003), Rahman & Reja (2015)

**Table 1.** Description on control variables

Variable	Description
Bank size (LogTA)	A bank-size indicator calculated by the natural logarithm of total assets
Loans to total deposits (LD)	A bank-specific indicator that shows the proportion of loans that are funded by deposits. It is computed as net loans divided by total deposits
Capital adequacy ratio (CAR)	A bank's capital strength indicator that shows how capital base of a banks can use to cover all potential risks. This ratio is own-estimation ratio of banks and should follow with the regulatory framework of each national central bank
Ownership structure (StateOwned)	A bank's ownership structure shows how the government takes stake in equity of a bank
Gross Domestic product (LogGDP)	A country-specific indicator that is calculated as the natural logarithm of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies

proved that government ownership could significantly affect bank performance, as indicated by ROA and Return on Equity (ROE). From these studies, the paper chooses bank's size (LogTA), Loans to Deposits (LD), Capital adequacy ratio (CAR), country's specific (LogGDP) and State-ownership structure (StateOwned) as control variables, which are proxies delegating for bank-size, bank-specific, capital strength, ownership structure and country-specific, which are factors may affect bank's ROA.

The description for control variables are shown in Table 1.

### C. Methods

As dependent and control variables that change over time within each country and the countries - specific factors are important in analysing the impact of ESG performance and banks' profits in each country, then the regression with fixed effect is most suitable. The R 4.3.2 software is used to regress all equations below:

Firstly, to explore the impacts of ESG performance on bank's profitability, the following equation is employed:

$$ROA_i = \beta_0 + \beta_1 \times ESG_i + \beta_2 \times LogTA_i + \beta_3 \times LD_i + \beta_4 \times CAR_i + \beta_5 \times LogGDP_i + \beta_6 \times StateOwned_i + u_i \quad (H1)$$

Where:

ROA<sub>i</sub> is the Return on Assets for bank *i*.

ESG<sub>i</sub> represents the ESG performance score for bank *i*.

LogTA<sub>i</sub>, LD<sub>i</sub>, CAR<sub>i</sub>, and LogGDP<sub>i</sub> are the logarithm of Total Assets, Loans to Deposits ratio, Capital Adequacy Ratio, and natural logarithm of country's GDP respectively for bank *i*.

StateOwned<sub>i</sub> is a dummy variable indicating if the bank is state-owned, which equals 1 if there is proportion of Government's stake in the bank's equity and equals 0 in other cases.

β<sub>0</sub> and β<sub>6</sub> are the coefficients to be estimated.  
u<sub>i</sub> is the error term.

Secondly, to test the effects of banks' digital transformation on their ESG performance, the equation following is applied:

$$ESG_i = \alpha_0 + \alpha_1 \times LogDT_i + \alpha_2 \times LogTA_i + \alpha_3 \times LD_i + \alpha_4 \times CAR_i + \alpha_5 \times LogGDP_i + \alpha_6 \times StateOwned_i + \varepsilon_i \quad (H2)$$

Where:

LogDT<sub>i</sub> is the level of digital transformation for bank *i*.

α<sub>0</sub> to α<sub>6</sub> are the coefficients to be estimated.

ε<sub>i</sub> is the error term.

Thirdly, the equation used to analyse whether digital transformation influences impacts of ESG on banks' profits is as following:

$$ROA_i = \gamma_0 + \gamma_1 \times ESG_i + \gamma_2 \times LogDT_i + \gamma_3 \times ESG_i \times LogDT_i + \gamma_4 \times LogTA_i + \gamma_5 \times LD_i + \gamma_6 \times CAR_i + \gamma_7 \times LogGDP_i + \gamma_8 \times StateOwned_i + \mu_i \quad (H3)$$

Where:

The term ESG<sub>i</sub> × LogDT<sub>i</sub> represents the interaction effect between ESG performance and digital transformation of bank *i*.

γ<sub>0</sub> to γ<sub>8</sub> are coefficients to be estimated.

μ<sub>i</sub> is the error term.

## IV. Results

### A. Descriptive Statistics

Table 2 provides an expansive view by incorporating a range of variables in this research. The ESG scores exhibit a range between 15.9 and 34. This variation highlights the differing levels of emphasis placed on sustainable practices across the banks, with an average score of 25.856 and a median of 25.6, pointing towards a moderate level of commitment across the board. The standard deviation of 4.367 suggests a relatively wide dispersion, indicating varying degrees of ESG integration into banking operations.

**Table 2.** Descriptive statistics of variables

Variable	Min.	Max.	Mean	Median	S.D.
ESG	15.9	34	25.856	25.6	4.367
ROA	0.07	6.3	1.007	1.3	2.406
LogDT	0.67	3.689	2.16	2.2208	0.647
LogTA	2.478	5.59	4.293	4.3101	0.756
LD	0.466	4.988	1.04	0.8953	0.697
CAR	0.115	0.795	0.255	0.211	0.151
LogGDP	5.834	6.708	6.394	6.279	0.31

Source: Author

ROA spans a broad spectrum from 0.07 to 6.3, revealing significant differences in operational efficiency and financial performance. The mean ROA is 1.007, with a median slightly higher at 1.3, indicating a skew towards more profitable banks. However, the standard deviation of 2.406 reflects considerable variability in profitability among the banks.

In terms of bank' specific factors, LogDT ranges from 0.67 to 3.689 with a relatively close mean and median, suggesting a balanced debt distribution. LogTA shows a tighter range with a mean of 4.293 and a median of 4.3101, demonstrating a general consistency in asset size, yet with a standard deviation of 0.756, indicating some level of variability. Another bank's specific is the LD ratio shows a wide range from 0.466 to 4.988. This wide range, coupled with a mean of 1.04 and a median of 0.8953, highlights diverse strategies in managing loans and deposits.

The CAR, essential for assessing a bank's capital strength, ranges from 0.115 to 0.795, with a mean of 0.255 and a median of 0.211. This narrow dispersion, as indicated by a standard deviation of 0.151, suggests a generally stable capital adequacy across the banks.

Lastly, the country's specific factor is LogGDP, which reflects the economic backdrop against which these banks operate, ranges from 5.834 to 6.708. The mean of 6.394 and a median of 6.279, along with a standard deviation of 0.31, depict a relatively homogeneous economic environment across the ASEAN-6 countries.

**Figure 2.** Regression result for impacts of ESG performance on bank's profitability

```

Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) -16.96127    4.88719   -3.471  0.00165 **
ESG          0.04565    0.01767    2.586  0.01345 *
LogTA        0.95619    0.35392    2.702  0.01140 *
LD           1.23521    0.21079    5.860  2.34e-06 ***
CAR          0.34411    1.39296    0.247  0.80662
LogGDP       1.89215    0.60085    3.149  0.00378 **
StateOwned   0.10977    0.36156    0.304  0.76360

Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.7955 on 29 degrees of freedom
Multiple R-squared:  0.6409, Adjusted R-squared:  0.5666
F-statistic: 8.628 on 6 and 29 DF, p-value: 2.003e-05

```

Source: Author

## B. Result Discussion and Implications

### 1. Result for Impacts of ESG Performance on Bank's Profitability

The regression result from Figure 2 shows the coefficient for the ESG variable is 0.04565, with a standard error of 0.01767. This result is statistically significant at the 5% level (p-value = 0.01345), suggesting that there is a positive relationship between a bank's ESG performance and its profitability. The Multiple R-squared value indicates that approximately 64.09% of the variability in banks' profitability can be explained by the model, which is a strong fit. The Adjusted R-squared of 0.5666 takes into account the number of predictors in the model and suggests that after adjustment for the number of variables, the model still explains a significant portion of the variability in profitability. The F-statistic is 8.628 with a very low p-value (2.003e-05), indicating that the overall regression model is statistically significant. This means that there is strong evidence to suggest that ESG score has a significantly positive impact on the bank's profitability.

### 2. Result for Effects of Banks' Digital Transformation on their ESG Performance

The results in Figure 3 provides insightful evidence on the impact of banks' digital transformation (measured by LogDT) on their ESG performance. The coefficient for LogDT, at 2.37131, is statistically significant with a p-value of 0.009, indicating that



**Figure 3.** Regression result for effects of banks' digital transformation on their ESG performance

Coefficients:				
	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	58.20879	25.33102	2.298	0.029 *
LogDT	2.37131	0.86233	2.749	0.009 **
LogTA	-4.48183	2.86512	-1.564	0.129
LD	0.50067	1.03511	0.484	0.632
CAR	-7.73855	7.18927	-1.076	0.291
LogGDP	-1.84747	3.14927	-0.587	0.562
StateOwned	1.15943	1.77285	0.654	0.518
--- Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				
Residual standard error: 3.921 on 29 degrees of freedom Multiple R-squared: 0.4835, Adjusted R-squared: 0.3352 F-statistic: 3.912 on 6 and 29 DF, p-value: 0.0064				

Source: Author

an increase in banks' digital transformation efforts is associated with an improvement in their ESG performance. This significant positive relationship underscores the pivotal role of digital transformation in enhancing banks' ESG outcomes.

It is essential to note that all control variables, including LogTA, LD, CAR, LogGDP and StateOwned, show no statistically significant impact on ESG performance at conventional significance levels. This observation highlights the specificity of digital transformation's influence over ESG performance relative to other considered factors.

The Adjusted R-squared, which accounts for the number of predictors in the model, is 0.3352, further affirming that a substantial portion of the variance in ESG scores is captured by the model. The overall model's significance is supported by an F-statistic of 3.912 and a p-value of 0.0064, suggesting that the model predictors, as a group, significantly influence ESG performance.

### 3. Result for Influences of Digital Transformation towards Impacts of ESG on Banks' Profits

The Figure 4 reaffirms the statistically significant positive effect of ESG on banks' ROA at the 1% significance level. LogDT has a coefficient of 4.15372 with a standard error of 1.51079, indicating a significant positive impact (p-value = 0.01052) on banks' ROA at the 5% level. This implies that digital transformation efforts positively correlate with higher bank profitability. However, The interaction term of ESG and Digital Transformation I(ESG \* LogDT)

**Figure 4.** Regression result for influences of digital transformation towards impacts of ESG on banks' profits

Coefficients:				
	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	-27.58123	6.67045	-4.135	0.00031 ***
ESG	0.44709	0.15437	2.896	0.00740 **
LogDT	4.15372	1.51079	2.749	0.01052 *
I(ESG * LogDT)	-0.16832	0.06157	-2.734	0.01092 *
LogTA	0.85307	0.55470	1.538	0.13571
LD	1.18232	0.19387	6.099	1.63e-06 ***
CAR	-0.89179	1.41095	-0.632	0.53267
LogGDP	2.05714	0.59529	3.456	0.00183 **
StateOwned	0.11438	0.33136	0.345	0.73264
--- Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				
Residual standard error: 0.7276 on 27 degrees of freedom Multiple R-squared: 0.7204, Adjusted R-squared: 0.6375 F-statistic: 8.695 on 8 and 27 DF, p-value: 8.467e-06				

Source: Author

has a coefficient of -0.16832 with a standard error of 0.06157, significant at the 5% level (p-value = 0.01092). This negative coefficient suggests that the positive impact of ESG on banks' profitability diminishes as digital transformation increases. This interaction term is crucial as it indicates the combined effect of ESG and digital transformation is not merely additive but complex and context-dependent.

### 4. Result for Robustness Checking and Heterogeneity Analysis

#### 1) Robustness checking

The paper employs the following equations to check for potential quadratic relationships rather than the linear relationships as shown in equation H1, H2, H3. The relationships between ESG performance and ROA in equation H4, Digital transformation and ESG performance in equation H5, Digital transformation's influence on ESG impact on bank's profits in equation H6 are illustrated below in that order:

$$\begin{aligned} ROA_i = & \beta_0 + \beta_1 \times ESG_i + \beta_2 \times LogTA_i + \beta_3 \times LD_i + \beta_4 \times CAR_i \\ & + \beta_5 \times LogGDP_i + \beta_6 \times StateOwned_i + \beta_7 \times ESG_i^2 \\ & + u_i \end{aligned} \quad (H4)$$

$$\begin{aligned} ESG_i = & \alpha_0 + \alpha_1 \times LogDT_i + \alpha_2 \times LogTA_i + \alpha_3 \times LD_i + \alpha_4 \\ & \times CAR_i + \alpha_5 \times LogGDP_i + \alpha_6 \times StateOwned_i \\ & + \alpha_7 \times LogDT_i^2 + \varepsilon_i \end{aligned} \quad (H5)$$

$$\begin{aligned} ROA_i = & \gamma_0 + \gamma_1 \times ESG_i + \gamma_2 \times LogDT_i + \gamma_3 \times ESG_i \times LogDT_i \\ & + \gamma_4 \times LogTA_i + \gamma_5 \times LD_i + \gamma_6 \times CAR_i + \gamma_7 \times LogGDP_i \\ & + \gamma_8 \times StateOwned_i + \gamma_9 \times ESG_i^2 + \gamma_{10} \times LogDT_i^2 \\ & + \mu_i \end{aligned} \quad (H6)$$

The regression results are summarized below:

**Figure 5.** Results for (H4)

```

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept) -11.325935   5.827348  -1.944   0.06206
ESG           0.585757   0.115214   5.083   0.00003 ***
LogTA         0.841874   0.350360   2.403   0.02314 *
LD            1.236146   0.204626   6.041   1.64e-06 ***
CAR           0.053200   1.363457   0.039   0.96915
LogGDP        2.115643   0.598517   3.535   0.00144 **
StateOwned    0.063631   0.352078   0.181   0.85788
ESG2          0.020221   0.006137   3.295   0.00251 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.7723 on 28 degrees of freedom
Multiple R-squared:  0.6733, Adjusted R-squared:  0.5916
F-statistic: 8.244 on 7 and 28 DF, p-value: 1.882e-05

```

Source: Author

**Figure 6.** Results for (H5)

```

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  50.4407    23.5481   2.142   0.0410 *
LogDT        13.8279     5.9751   2.314   0.0282 *
LogTA        -5.8152     2.6939  -2.159   0.0396 *
LD           0.2710     0.9582   0.283   0.7794
CAR          -6.9414     6.6317  -1.047   0.3042
LogGDP       -2.1187     2.9037  -0.730   0.4717
StateOwned   1.6718     1.6464   1.015   0.3186
LogDT2       2.9311     1.1809  -2.482   0.0193 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.613 on 28 degrees of freedom
Multiple R-squared:  0.4127, Adjusted R-squared:  0.2659
F-statistic: 2.811 on 7 and 28 DF, p-value: 0.02386

```

Source: Author

The results above show ESG<sup>2</sup> term is positive and significant, suggesting a potentially accelerating positive effect of ESG on ROA as ESG performance improves. Thus, the results for H1 are robust.

The negative coefficient on LogDT2 indicates that digital transformation progresses beyond a certain point, its positive impact on ESG performance begins to decrease. However, the positive coefficient for LogDT indicates a positive relationship between digital transformation and ESG performance at certain level. This is rather robust with results for equation H2.

The analysis shows insignificant of ESG2 and LogDT2 in the equation, which provides strong evidence for the claim in equation H1 and the linear regression is robust.

## 2) Heterogeneity analysis

In order to check the variability in effects across

observations in the regression equations of H1, H2 and H3, the paper employs the White test. The testing results are as following:

**Figure 7.** Results for (H6)

```

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept) -24.853946  11.863104  -2.095   0.04646 *
ESG           0.309527   0.630834   0.491   0.61794 **
LogDT         2.641146   4.159240   0.635   0.02519 *
I(ESG * LogDT) -0.136235   0.111606  -1.221   0.00360 **
LogTA         0.952492   0.623231   1.528   0.13899
LD            1.200113   0.205912   5.828  4.45e-06 ***
CAR          -0.683012   1.557883  -0.438   0.66484
LogGDP        2.078440   0.634719   3.275   0.00309 **
StateOwned    0.069938   0.361452   0.193   0.84814
ESG2          0.001348   0.008351   0.161   0.87310
LogDT2        0.155924   0.378361   0.412   0.68378
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.7536 on 25 degrees of freedom
Multiple R-squared:  0.7223, Adjusted R-squared:  0.6112
F-statistic: 6.501 on 10 and 25 DF, p-value: 7.081e-05

```

Source: Author

**Figure 8.** Heterogeneity analysis for H1

```

t test of coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept) -16.961267   4.181779  -4.0560 0.0003436 ***
ESG           0.035654   0.033422   1.0668 0.0048675 **
LogTA         0.956187   0.329398   2.9028 0.0069973 **
LD            1.235212   0.142287   8.6811 1.474e-09 ***
CAR           0.344112   2.227010   0.1545 0.8782721
LogGDP        1.892148   0.507481   3.7285 0.0008317 ***
StateOwned    0.109771   0.395649   0.2774 0.7834060
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

Source: Author

**Figure 9.** Heterogeneity analysis for H2

```

t test of coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  58.208790  27.023543   2.1540 0.03968 *
LogDT        2.071313   0.728195   2.8313 0.00524 **
LogTA       -4.481833   3.129779  -1.4320 0.16284
LD           0.500669   0.681002   0.7352 0.46813
CAR          -7.738550   6.059522  -1.2771 0.21170
LogGDP       -1.847466   3.130156  -0.5902 0.55962
StateOwned   1.159429   2.064411   0.5616 0.57869
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

Source: Author

**Figure 10.** Heterogeneity analysis for H3

```

t test of coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept) -27.581232   7.755193  -3.5565 0.001412 **
ESG           0.447093   0.186924   2.3918 0.023993 *
LogDT         4.153721   1.938042   2.1433 0.041259 *
I(ESG * LogDT) -0.168317   0.075912  -2.2173 0.035213 *
LogTA         0.853074   0.573395   1.4878 0.148402
LD            1.182318   0.122834   9.6253 3.201e-10 ***
CAR          -0.891791   2.005563  -0.4447 0.660111
LogGDP        2.057139   0.562358   3.6581 0.001086 **
StateOwned    0.114376   0.301449   0.3794 0.707343
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

Source: Author

The significant p-values for ESG, LogTA, LD, and LogGDP in the result from Figures 8, 9 and 10 suggest that these variables are important predictors of ROA. The model also demonstrates a clear positive relationship between ESG performance and ROA in equation H1, highlighting the financial benefits of ESG practices for banks in ASEAN-6 countries.

The key takeaway from the result above is the positive and statistically significant relationship between digital transformation (LogDT) and ESG performance (ESG) in selected banks, which reinforces the regression results of equation H2.

The interaction between ESG and digital transformation shown in the result above suggests a diminishing return on the positive impact of ESG on bank's profitability as digital transformation advances. This result is also adequate with testing result for equation H3.

### C. Implications

The analysis of equation H1 (Figure 2) shows positive and statistically significant relationships between ESG performance and bank profitability. This suggests that banks with higher ESG scores tend to be more profitable, supporting the idea that sustainable business practices can contribute to financial success of banks in ASEAN-6 countries. This finding is in line with range of researches before, which strengthens the role of ESG implementation in increasing banks' profits and suggest that banks should continue to improve their sustainable development.

The analysis of equation H2 (Figure 3) indicates a positive relationship between digital transformation and ESG performance in banks. Specifically, banks that invest more in digital transformation are likely to see improvements in their ESG performance, suggesting that technology and digital initiatives may enable better environmental, social, and governance practices. However, the lack of significance in other control variables and the moderate explanatory power

of the model suggest that there may be other factors not captured in this analysis that influence ESG performance. Moreover, the regression result indicates that banks can enhance their ESG performance through digital transformation, but they should also be aware of the potential for diminishing returns at higher levels of transformation. This finding notice banks' regulators about implementing digital transformation effectively.

The regression analysis of equation H3 (Figure 4) demonstrates the significant influence of ESG and digital transformation on ASEAN-6 banks' profitability, with the interaction between these factors suggesting a nuanced relationship. Specifically, while both ESG and digital transformation individually contribute positively to profitability, the combined effect may not be straightforwardly additive, highlighting the importance of strategic implementation of ESG practices in the context of digital transformation efforts. This could imply that while digital transformation generally enhances bank performance, it may require a reevaluation of how ESG factors are integrated into the bank's strategy in highly digital environments. These findings are not found in any similar researches before.

### V. Conclusions

The key findings from the regression results above are: first, the improvement in ESG performance will enhance the bank's profit; second, banks can increase the ESG performance by enlarge expenses on digital transformation, however banks can may suffer the advert affect in ROA with the certain high level of digital transformation expending; third, the positive impact of ESG on ROA diminishes as the level of digital transformation increases. These results provide valuable perspectives for bank's managers and policymakers on the importance of ESG and digital transformation in shaping bank profitability. It suggests that while both are independently beneficial,

their interplay is complex and warrants careful strategic consideration to maximize their combined benefits on financial performance.

This study also has some drawbacks: first, the study investigates the facts among ASEAN-6 banks in 2023 only due to less availability of ESG data; second, the regression results for equation H5 suggest further research could explore additional variables or interactions that might better explain the variation in ESG performance among banks in this region.

## References

- Ademi, B., & Klungseth, N. J. (2022). Does it pay to deliver superior ESG performance? Evidence from US S&P 500 companies. *Journal of Global Responsibility*, 13(4), 421-449. doi:10.1108/jgr-01-2022-0006
- Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money*, 18(2), 121-136. doi:10.1016/j.intfin.2006.07.001
- Bhandari, K. R., Ranta, M., & Salo, J. (2022). The resource-based view, stakeholder capitalism, ESG, and sustainable competitive advantage: The firm's embeddedness into ecology, society, and governance. *Business Strategy and the Environment*, 31(4), 1525-1537. doi:10.1002/bse.2967
- Broadstock, D. C., Chan, K., Cheng, L. T. W., & Wang, X. (2021). The role of esg performance during times of financial crisis: evidence from covid-19 in China. *Finance Research Letters*, 38, 101716. doi:10.1016/j.fl.2020.101716
- Brogi, M., & Lagasio, V. (2018). Environmental, social, and governance and company profitability: are financial intermediaries different? *Corporate Social Responsibility and Environmental Management*, 26(3), 576-587. doi: 10.1002/csr.1704
- Buallay, A. (2019). Is sustainability reporting (ESG) associated with performance? evidence from the European banking sector. *Management of Environmental Quality: An International Journal*, 30(1), 98-115. doi:10.1108/meq-12-2017-0149
- Caporale, G. M., Gil-Alana, L. A., Plastun, A., & Makarenko, I. (2022). Persistence in ESG and conventional stock market indices. *Journal of Economics and Finance*, 46(4), 678-703. doi:10.1007/s12197-022-09580-0
- Chen, G., Han, J., & Yuan, H. (2022). Urban digital economy development, enterprise innovation, and ESG performance in China. *Frontiers in Environmental Science*, 10, 955055. doi:10.3389/fenvs.2022.955055
- Fu, T., & Li, J. (2023). An empirical analysis of the impact of ESG on financial performance: the moderating role of digital transformation. *Environmental Economics and Management*, 11. doi:10.3389/fenvs.2023.1256052
- Grosse, R., & Gart, A. (2001). International banks performance: A five-countries comparison. *Global Business & Finance Review*, 6(2), 1-15
- Goss, A., & Roberts, G. (2016). The impact of corporate social responsibility on the cost of bank loans. *Journal of Banking & Finance*, 35(7), 1794-1810. doi:10.1016/j.jbankfin.2010.12.002
- Hinings, B., Gegenhuber, T., & Greenwood, R. (2018). Digital innovation and transformation: An institutional perspective. *Information and Organization*, 28(1), 52-61. doi:10.1016/j.infoandorg.2018.02.004
- Kitsios, F., Giatsidis, I., & Kamariotou, M. (2021). Digital transformation and strategy in the banking sector: evaluating the acceptance rate of e-services. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(3), 204. doi:10.3390/joitmc7030204
- Koo, J., & Kim, S. (2023). The Joint Effects of ESG Ratings and R&D on Value Relevance. *Global Business & Finance Review*, 28(2), 53-68. doi:10.17549/gbfr.2023.28.2.53
- Kumar, R., Sujit, K., & Mongia, S. (2021). Linkage between performance and sustainability initiatives in banking sector- An empirical examination. *International Journal of Productivity and Performance Management*, 72(1), 200-225. doi:10.1108/ijppm-07-2020-0385
- Kumawat, R., & Patel, N. (2022). Are ESG disclosures value relevant? a panel-corrected standard error (PCSE) approach. *Global Business Review*, 23(6), 1558-1573. doi:10.1177/09721509221128637
- Lamanda, G., & Vöneki, Z. (2023). Is ESG disclosure associated with bank performance? Evidence from the Visegrad Four countries. *Management of Environmental Quality*, 35(1), 201-219. doi:10.1108/MEQ-02-2023-0064
- Lee, C., & Hsieh, M. (2013). The impact of bank capital on profitability and risk in Asian banking. *Journal of International Money and Finance*, 32, 251-281. doi: 10.1016/j.jimonfin.2012.04.013
- Li, N., Wang, X., Wang, Z., & Luan, X. (2022). The impact of digital transformation on corporate total factor productivity. *Frontiers in Psychology*, 13. doi:10.3389/fpsyg.2022.1071986
- Lin, J., & Li, B. (2003). Size effect in the relationship between equity ownership structure and corporate performance. *Global Business & Finance Review*, 8(1), 49-60.
- Lian, Y., Li, Y., & Cao, H. (2023). How does corporate ESG performance affect sustainable development: A green innovation perspective. *Frontiers in Environmental Science*, 11, 430. doi:10.3389/fenvs.2023.1170582
- Maama, H. (2021). Achieving financial sustainability in Ghana's banking sector: is environmental, social and governance reporting contributive? *Global Business Review*. doi:10.1177/09721509211044300
- Mbama, C. I., & Ezepe, P. O. (2018). Digital banking, customer experience and bank financial performance.

- International Journal of Bank Marketing*, 36(2), 230-255. doi:10.1108/ijbm-11-2016-0181
- Menicucci, E., & Paolucci, G. (2022). ESG dimensions and bank performance: an empirical investigation in Italy. *Corporate Governance: The International Journal of Business in Society*, 23(3), 563-586. doi:10.1108/cg-03-2022-0094
- Parvin, S. M. R., Chowdhury, A. N. M. M. H., Siddiqua, A., & Ferdous, J. (2019). Effect of liquidity and bank size on the profitability of commercial banks in Bangladesh. *Asian Business Review, Asian Business Consortium*, 9(1), 7-10. doi:10.31219/osf.io/5g2q4
- Plastun, A., Makarenko, I., Huliaieva, L., Guzenko, T., & Shalyhina, I. (2023). ESG vs conventional indices: comparing efficiency in the Ukrainian stock market. *Investment Management and Financial Innovations*, 20(2), 1-15. doi:10.21511/imfi.20(2).2023.01
- Rahman, A. N. A. A., & Reja, B. (2015). Ownership structure and bank performance. *Journal of Economics, Business and Management*, 3(5), 483-488. doi:10.7763/joebm.2015.v3.232
- Rastogi, S., & Singh, K. (2022). The impact of ESG on the bank valuation: evidence of moderation by ICT. *Journal of Global Responsibility*, 14(2), 273-288. doi:10.1108/jgr-07-2022-0075
- Shakil, M. H., Mahmood, N., Tasnia, M., & Munim, Z. H. (2019). Do environmental, social and governance performance affect the financial performance of banks? A cross-country study of emerging market banks. *Management of Environmental Quality: An International Journal*, 30(6), 1331-1344. doi:10.1108/meq-08-2018-0155
- Shobhwani, K., & Lodha, S. (2023). Impact of ESG risk scores on firm performance: an empirical analysis of NSE-100 companies. *Asia-Pacific Journal of Management Research and Innovation*. doi:10.1177/2319510x231170910
- Sufian, F., & Noor, M. A. N. M. (2012). Determinants of bank performance in a developing economy. *Global Business Review*, 13(1), 1-23. doi:10.1177/097215091101300101
- Tommaso, C. D., & Thornton, J. (2020). Do ESG scores effect bank risk taking and value? evidence from european banks. *Corporate Social Responsibility and Environmental Management*, 27(5), 2286-2298. doi:10.1002/csr.1964
- Wang, L., Fan, X., & Zhuang, H. (2023). ESG disclosure facilitator: how do the multiple large shareholders affect firms' ESG disclosure? evidence from China. *Frontiers in Environmental Science*, 11. doi:fenvs.2023.1063501
- Wang, Q., Wang, H., Guo, F., & Chang, C. (2023). Impact of digital transformation on performance of environment, social, and governance: empirical evidence from China. *Business Ethics, the Environment & Amp; Responsibility*, 32(4), 1373-1388. doi:10.1111/beer.12573
- Yang, P., Hao, X., Wang, L., Zhang, S., & Yang, L. (2023). Moving toward sustainable development: the influence of digital transformation on corporate ESG performance. *Kybernetes*, 53(2), 669-687. doi:10.1108/k-03-2023-0521
- Yuen, M. K., Ngo, T., Le, T., & Ho, T. H. (2022). The environment, social and governance (ESG) activities and profitability under covid-19: evidence from the global banking sector. *Journal of Economics and Development*, 24(4), 345-364. doi:10.1108/jed-08-2022-0136
- Yuzvovich, L. I., Maramygin, M. S., & Lvova, M. I. (2023). The impact of esg factors on russia's banking sector. *Journal of New Economy*, 24(3), 74-90. doi:10.29141/2658-5081-2023-24-3-4