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Sustainable Development Goals and bank profitability: International evidence

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Abstract: This article explores the impact of achieving the Sustainable Development Goals on bank profitability. The study considers multiple indicators of Sustainable Development Goals and bank profitability across 28 countries. The findings demonstrate that achieving specific Sustainable Development Goals leads to a significant improvement in bank profitability. More specifically, achieving good health and well-being leads to an increase in bank non-interest income. Providing clean water and sanitation for all also increases bank return on assets. On the other hand, taking strong action to combat climate change results in decreased bank return on assets. Additionally, attaining quality education and promoting affordable and clean energy sources lead to an increase in bank return on equity. The regional findings indicate that achieving the Sustainable Development Goals has varying impacts on bank profitability measures across banks in Europe, Asia, and Africa.

Keywords: bank profitability, sustainable development, SDGs, return on asset, return on equity, non-interest income.

1. Introduction

Achieving the Sustainable Development Goals is essential because it constrains current consumption to ensure that future generations will have a resource base that is no less than the resource base of the previous generation (Gautam et al., 2019). Studies indicate that achieving the Sustainable Development Goals (SDGs) has a positive impact on firms, as it grants them access to sustainable resources that can enhance their economic, social, and environmental performance (e.g., Buallay et al., 2020; Choudhury et al., 2021; Jawaad & Zafar, 2020; Lopez et al., 2007). Additional research has shown a correlation between finance and sustainable development, with studies such as Peeters (2005), La-Garde-Segot (2020), and Barua (2020) demonstrating that financial institutions can support the achievement of Sustainable Development Goals (SDGs) through the allocation of credit and donations to SDG-related activities (Peeters, 2005).

Bank profitability is also crucial because higher profit allows banks to expand their business and increase financial intermediation. Additionally, attaining Sustainable Development Goals could be a potential external determinant of bank profitability. Attaining Sustainable Development Goals would grant banks access to sustainable resources, bolstering their profitability. Therefore, bank managers are interested in whether SDG attainment improves or decreases bank profit. The academic literature does not provide much insight into this issue, and there is limited research or knowledge on whether achieving Sustainable Development Goals positively or negatively affects bank profitability. Although numerous scholars have examined the influence of sustainable development on various finance-related topics (see Al Lawati & Hussainey, 2022; Avrampou et al., 2019; Choudhury et al., 2021; Cosma et al., 2020; Weber, 2014), these studies did not focus on the Sustainable Development Goals (SDGs). Additionally, there needs to be more literature on the impact of SDG attainment on bank performance. Therefore, I aim to contribute to the literature by investigating whether achieving the SDGs will positively or adversely affect bank profitability.

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The present study examines the impact of SDG attainment on bank profitability. Several SDG proxy indicators were introduced to the analyses as external determinants of bank profitability. The data were analyzed using the fixed-effects panel regression methodology. The findings suggest that attaining specific Sustainable Development Goals positively and significantly affect bank profitability. More specifically, achieving good health and well-being heightens non-interest income for banks while ensuring universal access to clean water and sanitation increases bank return on assets. Implementing robust climate action, on the other hand, decreases bank return on assets, and promoting quality education and affordable and clean energy increases bank return on equity. Results at the regional level demonstrate distinct impacts of attaining each of the SDGs on the various metrics of bank profitability in European, Asian, and African banks. For instance, the regional results in Europe indicate that achieving decent work and economic growth increases the return on assets, return on equity, and non-interest income of European banks. Furthermore, attaining affordable and clean energy elevates the return on assets of European banks. Finally, providing clean water and sanitation alongside the pursuit of decent work and economic growth increases the return on assets and return on equity of African banks. Achieving affordable and clean energy and reducing inequalities enhances the return on assets of Asian banks.

This study contributes to the literature in several ways. The study contributes to the literature that examines the determinants of bank profitability (see. Molyneux & Thornton, 1992; Albertazzi & Gambacorta, 2009; Caby et al., 2022; Borio et al., 2017), but which has not considered SDG attainment as a potential external determinant of bank profitability. This study contributes to this literature by showing that SDGs attainment has some positive benefits for bank profitability depending on the profitability indicator used. The study also contributes to the literature linking finance to sustainable development (Peeters, 2005; Weber, 2014; Lagoarde-Segot, 2020; Barua, 2020), but which has not examined whether SDG attainment affects bank profitability.

The next section presents the literature review and hypothesis development. Section 3 presents the research methodology. Section 4 reports the empirical results. Section 5 concludes the study.

2. Literature review and hypothesis

2.1. Related literature

Theoretical studies such as Kharas et al. (2014) and Sergi et al. (2019) argue that sustainable development needs partnership with stakeholders, including financial institutions. Levine (2005) and Kharas et al. (2014) argue that the provision of financing for the realization of the SDGs is crucial, and banks are the most important stakeholders in financing the SDGs. Levine (2005) argues that banks play an important role in the process of development through their financial intermediation function. Banks allocate credit for developmental purposes, and their lending to development activities leads to better societal outcomes and generates substantial profit for banks. Although banks are essential in financing development, Cosma et al. (2020) and Bolton (2013) demonstrate that banks can only succeed if they operate in an environment that has sustainable human, natural, and economic resources that are conducive to banking activities. This implies that attaining sustainable development would enable banks to perform better, and it could lead to higher profits.

Much of the empirical literature focuses on how sustainability disclosures improve the performance of firms. These studies use sustainability disclosures as a proxy for the attainment of the SDGs. However, the literature has not examined whether SDG attainment improves or worsens the profitability of banks. For instance, existing studies such as Goyal and Rahman (2014) find a positive relationship between corporate sustainability performance and firm performance and argue that practitioners should contribute more towards sustainable development. Wolf (2013) examines the impact that organizational change for sustainability has on firm performance. The author uses data from 92 German

companies from the manufacturing and services sector and finds that the structural implementation of sustainability is positively related to firm performance. Chang and Kuo (2008) examine the relationship between 311 firms' sustainability scores and profitability and find that better sustainability performers experience higher profits. They also find a bi-directional causality between sustainability and profitability among the better sustainability performers, indicating that sustainability improves firm performance. Gupta and Gupta (2020) examine the impact of environmental sustainability on four dimensions of firm performance. The four dimensions of firm performance examined are financial performance, customer performance, internal business process performance, and learning and growth performance. They find that environmental sustainability has a positive and significant effect on the four dimensions of firm performance. Goyal et al. (2013) show that most of the research that examines the relationship between sustainability performance and firm performance is focused on developed countries; the result differs in various cultural and economic contexts, and there is no universally accepted direction of this relationship. Phan et al. (2020) examine the relationship between sustainable development practices and the financial performance of firms. They examine the effect of environmental practices, workplace social practices, and community on firm profitability and growth based on an analysis of 389 textile firms in Vietnam. They find that sustainable development practices positively affect financial performance. Bolanle et al. (2012) examine the effect of SDG-related corporate social responsibility expenditures on firm performance and find that SDG-related CSR expenditures have a positive impact on firm profitability. Hasan et al. (2023) and Hasan and Hossain (2022) link green finance and ESG to sustainable development, while Ramos et al. (2022) investigate whether the SDG coverage of international firms in six industries listed in the Corporate Knights' Index leads to better performance. They find that SDGs 5, 8, and 13 are the most widely adopted SDGs by companies from all industries, while SDGs 2, 6, and 14 are the least adopted of all the SDGs.

In the banking sector, Costa-Climent and Martínez-Climent (2018) argue that the primary objective of sustainable banks is to meet the needs of stakeholders and contribute to sustainable development, whereas conventional banks simply apply and execute corporate social responsibility (CSR) policies. Gangi et al. (2019) investigate the impact of corporate social responsibility pillars on the financial performance of banks. They analyze the factors that encourage banks to be more environmentally friendly. They analyzed 142 banks from 35 countries from 2011 to 2015 and found that banks that are more sensitive to environmental issues exhibit less risk. Avrampou et al. (2019) examine whether the reported performance of banks aligns with the endorsement of SDGs. They use Global Reporting Initiative (GRI) performance indicators to make a comparative assessment of the nonfinancial performance disclosed in the annual sustainability reports of leading European banks and find an overall low contribution to SDGs by leading European banks, and each bank's contribution remains particularly heterogeneous towards most individual SDG goals.

Al Lawati and Hussainey (2022) examine the impact of SDGs reporting on the corporate financial performance of listed financial institutions in Oman. They examine all financial companies listed on the Muscat Stock Exchange from 2016 to 2020 and find that SDGs reporting positively affects the corporate financial performance of financial institutions. Choudhury et al. (2021) examine the relationship between the share of renewable energy as a measure of SDG7 and bank risk. They analyzed 80 international banks from 20 countries during the 2006 to 2017 period. They find that increasing the share of renewable energy in a country significantly improves bank performance through a reduction in bank default risk. Similarly, Odetayo et al. (2014) investigate the effect of SDG-related corporate social responsibility on the profitability of Nigerian banks between 2003 and 2012. They found a significant relationship between CSR expenditures and bank profitability.

Buallay et al. (2020) examine the relationship between sustainability reporting and bank performance after the financial crisis in developed and developing countries. They analyzed 882 banks from developed and developing countries after the 2008 financial

crisis. They find that ESG improves banks' accounting and market-based performance in developed countries. Jan et al. (2023) explored the relationship between corporate sustainability practices and financial performance. They analyzed 16 Islamic banks in Malaysia and 12 Islamic banks in Indonesia over a 10-year period. They find that corporate sustainability practices have a significant positive impact on the financial performance of banks in Malaysia and Indonesia. Bahl et al. (2023) examine how banking performance influences the realization of specific Sustainable Development Goals. They analyzed data obtained from 402 employees from public, private, and foreign sector banks. They find a positive association between banking performance and the realization of specific SDGs.

There is little research or knowledge on how Sustainable Development Goals attainment may affect bank profitability. Existing studies did not address this topic. Therefore, this study fills this gap in the literature.

2.2. Hypothesis

Existing studies show that SDGs attainment has positive benefits for firms because it would give firms access to sustainable resources that they can use to conduct their business and improve their performance (e.g., Buallay et al., 2020; Choudhury et al., 2021; Jawaad & Zafar, 2020; Lopez et al., 2007). For instance, Choudhury et al. (2021) show that an increase in the share of renewable energy in a country significantly improves bank performance through a reduction in bank default risk. Buallay et al. (2020) also show that greater environmental, social, and governance (ESG) activities improve banks' accounting and market-based performance in developed countries. These two studies suggest that SDG attainment may improve firm performance. Following these studies, one hypothesis can be established, which is that Sustainable Development Goal attainment may significantly improve bank profitability because Sustainable Development Goal attainment would give banks access to sustainable resources that banks can use to improve their performance or profitability (Caby et al., 2022). It would give banks access to low-cost clean energy resources, healthy employees, well-educated employees, a decent workplace, good infrastructure, better equality, and a good climate to carry out banking operations in a sustainable way (Meena, 2013). Sustainable Development Goal attainment will also give banks access to new markets and new services, which banks can take advantage of by extending credit to new markets and offering fee-based services that will lead to greater profitability for banks (Ozili, 2021). This view suggests that Sustainable Development Goal attainment is beneficial for banks and can improve bank profitability.

H1: Sustainable Development Goal attainment has a significant effect on bank profitability.

3. Methodology

3.1. Data and sample

Country-level annual data were collected for 40 countries over the 2011 to 2018 period from the World Development Indicators (WDI) and the Global Financial Development Indicators (GFDI) in the World Bank database. The GFDI and WDI databases provide industry-level banking sector and SDG data for each country. The data are aggregated in the GFDI and WDI databases and are used to capture changes at the industry (or country) level. The data for each country are positioned in the cross-section of the panel dataset, while the sample period is also positioned in the time series section of the panel data, and taken together, it yields a panel dataset.

The data were filtered to exclude countries that have insufficient data for more than four consecutive years for the crucial variables. The final sample is an unbalanced panel data of 28 countries from 2011 to 2018 period. The selected sample period (2011 to 2018) avoids the potential effect of the 2007-2009 global financial crisis period and the COVID-19 pandemic so that these events won't contaminate or bias the estimation results. The variables are described in Table 1.

Table 2 presents the sample distribution by country and the descriptive statistics. On average, return on asset (ROA) was higher in Argentina, Kenya, and Ghana over the period, while countries like Japan and the United Kingdom had very low return on assets. Return on equity (ROE), on average, was higher in Argentina, Ghana, and Kenya, while ROE was lower in the United Kingdom and Congo. Non-interest income (NII), on average, was higher in Russia, Congo, and Cote d'Ivoire during the period, while NII was lower in Vietnam and Cambodia. On average, nonperforming loan (NPL) was higher in Ghana, Cameroun, and Pakistan, while NPL was very low in Korea and Singapore. The cost-to-income ratio (EFF), on average, was higher in Congo and Russia, while EFF was lower in Egypt and China. Capital adequacy ratio (CAR), on average, was higher in Cambodia and Indonesia, while CAR was lower in Cameroun and Vietnam. GDP per capita growth (GDPC) was higher in China, India, and Cambodia, while GDPC was lower and negative in Argentina and Brazil.

Table 1. Variable definitions

Symbol	Variables	Definitions & Measurement	Source
ROA	Return on asset	The ratio of commercial banks' net income to yearly averaged total assets (%)	GFDI
ROE	Return on equity	The ratio of commercial banks' after-tax net income to yearly average equity (%)	GFDI
NII	Non-interest income	Bank's income that has been generated by non-interest related activities as a percentage of total income (net-interest income plus non-interest income).	GFDI
SDG3	SDG: Good health and well-being	The proxy measure of SDG3 is current health expenditure as a percentage of GDP.	WGI
SDG4	SDG: Quality education	The proxy measure of SDG4 is current education expenditure as a percentage of total expenditure in public institutions.	WGI
SDG6	SDG: Clean water and sanitation for all	The proxy measure of SDG6 is the number of people using safely managed drinking water services as a percentage of the population.	WGI
SDG7	SDG: Affordable and clean energy	The proxy measure of SDG7 is renewable energy consumption as a percentage of total final energy consumption.	WGI
SDG8	SDG: Decent work and economic growth	The proxy measure of SDG8 is the average of the employment rate and GDP growth rate.	WGI
SDG10	SDG: Reduced inequalities	The proxy measure of SDG10 is the vulnerable employment ratio. It is measured as vulnerable employment as a percentage of total employment.	WGI
SDG13	SDG: Climate action	The proxy measure of SDG10 is CO2 emissions from gaseous fuel consumption (% of total)	WGI
EFF	Efficiency ratio	Operating expenses of a bank as a share of the sum of net-interest revenue and other operating income.	GFDI
CAR	Capital adequacy ratio	The capital adequacy of deposit takers. It is a ratio of total regulatory capital to its assets held, weighted according to the risk of those assets.	GFDI
NPL	Nonperforming loans ratio	The ratio of defaulting loans (payments of interest and principal past due by 90 days or more) to total gross loans (total value of loan portfolio).	GFDI
GDPC	GDP per capita growth	Annual change in GDP per capita (%)	WGI

Regarding the SDGs, the United States and Japan ranked high in the level of current health expenditure as a percentage of GDP, which measures SDG3, 'good health and well-being.' Cambodia and the United Kingdom ranked high in current education expenditure as a percentage of total expenditure in public institutions, which measures SDG4 'quality education.' Singapore and the Netherlands ranked high in the percentage of people using safely managed drinking water services in the population, which measures SDG6 'clean water and sanitation for all.' Nigeria and Tanzania ranked high in renewable energy consumption as a percentage of total final energy consumption, which measures SDG7, 'affordable and clean energy.' Tanzania and Cambodia ranked high in SDG8, 'decent work and economic growth.' Tanzania and Nigeria ranked high in vulnerable employment ratio as a percentage of total employment, which measures SDG10 'reduced inequalities.'

Russia and Argentina ranked high in CO2 emissions from gaseous fuel consumption as a percentage of total emissions, which measures SDG13 'climate action'.

Table 2. Descriptive statistics for the variables

Countries	ROA	ROE	NII	SDG3	SDG4	SDG6	SDG7	SDG8	SDG10	SDG13	NPL	EFF	CAR	GDPC
Argentina	3.16	26.45	44.19	9.75	92.45	-	9.47	54.94	20.27	52.86	1.92	54.45	15.31	-0.37
Brazil	1.08	11.23	41.29	8.61	95.03	81.63	44.37	57.85	26.95	14.43	3.31	63.10	16.89	-0.14
Cambodia	1.98	11.41	20.19	6.59	99.85	24.54	65.54	84.44	56.51	0	2.03	46.12	22.41	5.47
Cameroun	1.25	14.36	45.03	3.78	89.32	-	78.58	72.45	74.25	9.19	10.77	62.75	8.75	1.78
China	0.98	14.68	21.47	4.82	-	-	12.16	75.24	45.76	3.36	1.39	33.87	13.23	6.88
Congo D.R.	0.54	4.67	55.37	3.74	83.13	16.09	95.55	66.63	78.98	0.32	-	81.77	-	2.89
Cote D'Ivoire	1.47	20.01	56.99	3.65	92.28	34.88	69.21	67.43	74.35	44.12	-	66.84	-	3.75
Egypt	1.29	17.45	25.07	5.04	-	-	5.11	42.39	22.79	41.39	9.14	38.42	14.32	1.19
Georgia	2.44	14.78	25.91	7.68	-	65.11	29.56	60.46	52.91	49.19	3.23	50.66	17.12	4.89
Ghana	3.32	22.72	33.24	4.05	93.98	32.35	45.99	68.00	70.56	9.62	15.29	51.24	18.18	4.25
India	0.61	8.16	27.96	3.36	-	-	35.75	52.62	77.43	4.63	6.12	46.23	12.79	5.54
Indonesia	1.72	14.24	22.22	2.93	87.67	-	27.35	67.98	49.57	16.35	2.23	51.10	20.22	4.04
Japan	0.27	5.26	23.72	10.67	88.27	98.35	5.95	58.87	9.02	19.41	1.74	64.55	15.68	1.18
Kenya	3.39	21.08	31.64	5.15	94.14	-	74.28	74.07	54.25	0	6.96	48.86	19.98	2.04
Korea, Rep.	0.57	7.26	30.46	6.64	84.87	98.50	2.38	63.11	20.41	16.42	0.45	60.99	14.52	2.52
Malaysia	1.32	12.16	37.74	3.62	92.55	93.54	3.60	68.50	21.73	33.06	1.81	44.25	16.43	3.75
Mexico	0.75	8.46	45.48	5.58	96.61	42.21	9.32	58.66	27.79	29.83	2.44	62.08	15.54	1.43
Netherlands	0.39	7.69	31.92	10.34	88.49	99.97	5.64	61.61	12.36	46.21	2.69	64.27	18.42	0.94
Nigeria	1.26	11.39	31.01	3.44	-	19.66	82.39	64.03	81.35	28.26	7.49	61.72	16.26	0.58
Pakistan	1.27	13.37	28.14	2.71	75.44	36.28	45.34	52.19	59.06	49.66	11.72	56.67	15.93	2.45
Philippines	1.16	9.78	24.92	3.99	-	46.23	26.19	63.84	37.39	7.17	2.01	63.53	15.89	4.66
Russia	1.39	9.49	61.83	5.16	92.01	75.62	3.29	65.01	5.76	54.37	7.91	68.85	13.03	1.36
Singapore	0.97	10.84	43.02	3.88	91.23	100	0.61	67.52	9.17	43.74	1.07	47.48	16.57	2.88
Tanzania	1.19	9.95	33.09	4.32	-	-	84.47	83.33	83.71	16.87	7.89	68.62	18.05	3.24
Thailand	1.15	8.43	28.57	3.66	94.61	-	23.03	72.36	50.91	32.32	2.72	41.72	16.71	2.92
United Kingdom	0.25	2.93	49.54	9.89	96.95	99.87	7.58	60.29	12.52	35.40	2.01	66.38	19.01	1.33
United States	1.04	9.24	36.82	16.44	-	96.31	9.24	60.84	4.11	28.13	2.03	60.05	14.45	1.58
Vietnam	0.75	8.28	20.80	4.76	78.23	-	33.30	80.53	59.07	10.98	2.56	51.89	12.42	5.12
Aggregate Statistics:														
Mean	1.32	11.98	34.88	5.86	91.99	64.51	33.40	64.61	42.82	24.91	4.51	56.42	16.11	2.79
Median	1.07	11.24	31.79	4.71	92.88	70.62	27.05	63.18	47.35	22.62	2.71	57.69	15.94	2.65
Max	4.51	31.22	80.01	16.84	100	100	97.03	90.33	85.6	56.01	21.59	92.29	25.15	11.31
Min	-0.35	-5.10	11.76	2.34	75.43	14.38	0.48	41.68	3.97	0	0.25	28.51	5.47	-7.60
Std. Dev	0.96	6.82	13.24	3.13	4.80	31.61	29.75	9.66	26.09	17.76	4.13	12.54	3.16	2.49
Skewness	1.04	0.54	0.95	1.60	-0.98	-0.16	0.66	0.18	0.06	0.18	1.50	0.26	0.09	-0.38
Kurtosis	3.52	3.13	3.69	5.45	4.47	1.37	2.07	3.37	1.60	1.72	4.65	3.09	3.86	4.66
Observation	224	222	223	224	101	144	224	175	224	168	205	223	205	224

3.2. Estimation method

The baseline model used to estimate the impact of sustainable development goals attainment on bank profitability is a modified form of the models used by Huang (2020) and Ozili and Arun (2023). The regression estimation follows a stepwise regression

procedure to avoid spurious regression estimates that arise from overcrowding the model with many variables.

$$\pi_{i,t} = \beta_{0i,t} + \beta_1 NPL_{i,t} + \beta_2 EFF_{i,t} + \beta_3 CAR_{i,t} + \beta_4 GDPC_{i,t} + \beta_5 SDG3_{i,t} + \beta_6 SDG4_{i,t} + \beta_7 SDG6_{i,t} + \beta_8 SDG7_{i,t} + \beta_9 SDG8_{i,t} + \beta_{10} SDG10_{i,t} + \beta_{11} SDG13_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where i, t represents country and year. The π is the dependent variable and is a vector of the bank profitability variables, namely ROA, ROE, and NII. The SDG variables (SDG 3, 4, 6, 7, 8, 10, and 13) are the main explanatory variables and they represent selected Sustainable Development Goals. The NPL variable is the nonperforming loan ratio. The EFF variable is the efficiency ratio or the cost-to-income ratio. The CAR variable is the capital adequacy ratio. The GDPC variable is the GDP per capita growth ratio. εit is the error term.

Regarding the estimation method, the panel regression estimation method was used. The Hausman test was applied (available from the authors), and it was confirmed that the fixed-effects estimation model is the appropriate panel regression model to use for this study. The fixed-effects regression estimation also controls for unobserved country and year heterogeneity (Stock & Watson, 2008). The estimation uses both country and year-fixed-effects in the panel fixed-effects regression estimation.

3.3. Justification of the variables

The dependent variables are the return on asset (ROA) ratio, return on equity ratio (ROE), and non-interest income (NII) ratios. Many studies have used these variables as indicators of profitability in the banking literature (see, for example, Huang, 2020; Lee et al., 2014; Ozili & Arun, 2023). The individual SDG variables are the explanatory variables of interest in the analyses. Seven SDGs out of the 17 SDGs were analyzed. The seven SDGs are SDG3, SDG4, SDG6, SDG7, SDG8, SDG10 and SDG13. The reason for selecting the seven SDG variables is because proxy data are available to measure the seven SDG variables and there is sufficient data for the SDG proxy variables.

For example, regarding SDG3 'good health and well-being,' existing studies such as Sundararaman and Ranjan (2019) and Brollo et al. (2021) show that increasing healthcare expenditure is important to promote good health and well-being. These studies link healthcare expenditures to GDP and argue that greater healthcare expenditures relative to GDP lead to greater sustainable development in terms of good health and well-being.

Regarding SDG4 'quality education,' Vorisek and Yu (2020) identified education spending to be a proxy for quality education. Vorisek and Yu (2020) show that higher education spending is a necessary SDG-related expenditure for greater human capital development and greater sustainable development. Also, Sun et al. (2019) and Brollo et al. (2021) show that a decrease in education spending leads to lower human development and lower sustainable development. These two studies suggest that higher education spending is correlated with better sustainable development outcomes.

Regarding SDG6 'Clean Water and Sanitation for All,' Bain et al. (2018) and Hutton (2016) show that greater access and usage of safely managed drinking water services is associated with greater sustainable development because it prevents people from contracting water-borne diseases and allows them to live a healthy life; therefore, the number of people using safely managed drinking water services as a percentage of the population is considered to be a useful proxy indicator of SDG6.

Regarding SDG7 'clean and affordable energy,' existing studies such as Shahbaz et al. (2020) and Anton and Nucu (2020) show that clean and affordable energy can be measured by the share of renewable energy to final total energy consumption and that renewable energy does not pollute the environment, thereby promoting sustainable development.

Regarding SDG8, 'decent work and economic growth,' existing studies have shown that SDG8 can be assessed in terms of whether people have good work, not just any work, and they advocate that good work should be decent and should contribute to economic growth. Therefore, a rule-of-thumb proxy variable to capture SDG8 is the average of the employment rate and GDP growth rate (Littig, 2018; Heirman et al., 2021).

Regarding SDG10 'reduced inequalities', existing studies such as De Paz et al. (2020) and Lior et al. (2018) show that efforts to reduce inequality can be captured in the vulnerable employment ratio because the vulnerable employment ratio is an SDG-based proxy indicator of the extent to which vulnerable people are given equal opportunities in society, especially regarding employment. Therefore, vulnerable employment is a measure of reduced inequality.

Regarding SDG13 'climate action,' Omer (2008), Judkins et al. (1993), and Quadrelli and Peterson (2007) show that a reduction in CO2 emissions from gaseous fuel consumption is an important climate action because it helps to support the fight against climate change thereby leading to greater sustainable development. Therefore, a decrease in CO2 emissions from gaseous fuel consumption is a proxy indicator of SDG13's climate action.

I also control for bank-specific and macroeconomic determinants of bank profitability. The NPL variable represents nonperforming loans as a share of gross loans. Existing studies show that high NPLs decrease the interest income of banks and ultimately decrease bank profitability (Ozili, 2017). Therefore, a negative relationship between the NPL ratio and bank profitability is expected. The GDPC variable measures GDP per capita growth rate. Existing studies show that economic development (GDPC) has a complementary effect on bank profitability because economic development, reflected in increases in the standard of living, national output, and improved welfare, leads to better outcomes for businesses, including banks, thereby leading to better bank performance (Goddard et al., 2011). Therefore, a positive relationship between economic development and bank profitability is expected. The EFF variable measures bank efficiency. The literature shows that banks that can lower their cost relative to income perform better than banks that have high costs and low income (Olson & Zoubi, 2011). Therefore, a negative relationship between bank efficiency and bank profitability is expected. The CAR variable measures the capital that banks are required to hold to absorb unexpected losses that arise from bank risk-taking. A high CAR ratio can provide an additional layer of safety for banks and motivate them to take more risk, which may lead to higher profits. In this case, a high CAR ratio can lead to higher risks and higher profit. Conversely, a high CAR ratio can reduce banks' ability to lend from equity, thereby constraining bank lending and bank profitability. In this case, a high CAR ratio can lead to low profits (Ozili & Uadiale, 2017). Therefore, there is no definite prediction for the relationship between CAR and bank profitability.

4. Empirical results

4.1. The baseline results.

This section presents the baseline result for the impact of Sustainable Development Goals attainment on bank profitability. It also presents the regional results on the relationship between Sustainable Development Goals attainment and bank profitability. Regarding the control variables, the EFF variable is negatively associated with ROA and ROE in Tables 3 and 4, respectively. This indicates that a low cost-to-income ratio leads to greater bank profitability. The CAR variable reports mixed signs in relation to ROA and NII in Tables 3 and 5, respectively. This indicates that the capital adequacy ratio can increase or decrease bank profitability. The NPL variable is negatively associated with ROA, ROE, and NII in Tables 3, 4, and 5, respectively. This indicates that bank profit decreases when nonperforming loans are high. The GDPC variable is negatively associated with ROA, ROE, and NII in Tables 3, 4, and 5 respectively. The result for the GDPC variable is contrary to the expectation of a positive sign in the literature.

Table 3. Impact of Sustainable Development Goals attainment on bank return on asset (ROA). Panel fixed-effects regression estimation

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Variables	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
C	3.312*** (4.51)	2.293 (0.82)	-3.526 (-1.02)	2.828*** (4.42)	3.844*** (3.83)	2.599*** (3.53)	4.567*** (7.01)
NPL	-0.111*** (-5.08)	-0.202*** (-2.62)	-0.132*** (-4.22)	-0.109*** (-5.22)	-0.118*** (-4.35)	-0.112*** (-5.37)	-0.176*** (-5.37)
EFF	-0.027*** (-5.88)	-0.032*** (-4.28)	-0.026*** (-4.86)	-0.027*** (-5.92)	-0.025*** (5.51)	-0.027*** (-5.99)	-0.027*** (5.02)
CAR	0.007 (0.32)	0.026 (0.75)	0.045 (1.48)	0.001 (0.04)	0.003 (0.13)	0.0002 (0.01)	0.007 (0.28)
GDPC	-0.028 (-1.32)	-0.034 (-1.09)	-0.027 (-0.87)	-0.025 (-1.15)	-0.024 (-0.94)	-0.026 (-1.20)	-0.051** (-2.14)
SDG3	0.004 (0.05)						
SDG4		0.014 (0.45)					
SDG6			0.089* (1.77)				
SDG7				0.019 (1.14)			
SDG8					-0.013 (-0.94)		
SDG10						0.021 (1.28)	
SDG13							-0.035** (-2.19)
Adjusted R^2	81.74	87.72	77.24	81.88	79.73	81.92	82.62
SE of regression	0.42	0.39	0.45	0.42	0.38	0.42	0.43
F-statistic	25.56	23.42	16.84	25.79	18.55	25.85	21.78
***, **, * represent statistical significance at the 1%, 5% and 10% levels							

4.1.1. Impact of Sustainable Development Goals attainment on return on assets (ROA)

The baseline result for the impact of Sustainable Development Goals attainment on bank ROA is reported in Table 3. The SDG6 variable is positive and significantly associated with ROA in column 3 of Table 3. This result indicates that greater effort towards the provision and usage of clean water and sanitation has a significant positive effect on the return on assets of banks. This result supports the hypothesis (H1) that SDG attainment has a significant effect on bank profitability. In terms of economic significance, the SDG6 coefficient is economically significant. A unit increase in the SDG6 variable leads to an 8.9 percent increase in bank ROA. This result supports the findings of Phan et al. (2020), who show that undertaking SDG-related activities may increase bank profitability.

The SDG13 variable is negative and significantly associated with ROA in column 7 of Table 3. This result indicates that a decrease in CO2 emission from gaseous fuel consumption leads to an increase in bank ROA. This result supports the hypothesis (H1) that SDG attainment has a significant effect on bank profitability. In terms of economic significance, the SDG13 coefficient is economically significant. A unit decrease in the SDG13 variable leads to a 3.5 percent increase in bank ROA. This result supports the findings of Buallay et al. (2020) who show that undertaking SDG-related activities leads to better bank profitability.

In contrast, the SDG3, SDG4, SDG7, SDG8, and SDG10 variables are not statistically significant, and therefore, do not support the hypothesis (H1) that SDGs attainment has a significant effect on bank profitability. A possible reason for the insignificant result might be due to banks' low exposure to these SDG activities or due to the unprofitable nature of these SDG activities.

Table 4. Impact of Sustainable Development Goals attainment on bank return on equity (ROE). Panel fixed-effects regression estimation

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Variables	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
C	30.010*** (4.86)	-16.977 (-0.66)	5.504 (0.17)	23.973*** (4.54)	27.841*** (2.98)	26.451*** (4.30)	36.792*** (7.12)
NPL	-1.021*** (-5.55)	-1.513** (-2.26)	-0.866*** (-3.13)	-1.009*** (-5.79)	-1.084*** (-4.29)	-1.048*** (-5.97)	-1.618*** (-6.23)
EFF	-0.219*** (-5.56)	-0.214*** (-3.28)	-0.182*** (-3.84)	-0.214*** (-5.58)	-0.179*** (-4.39)	-0.218*** (-5.61)	-0.196*** (4.49)
CAR	-0.172 (-0.91)	0.143 (0.47)	0.195 (0.73)	-0.275 (-1.44)	-0.172 (-0.79)	-0.237 (-1.21)	-0.043 (-0.18)
GDPC	-0.272 (-1.50)	-0.182 (-0.67)	-0.213 (-0.78)	-0.219 (-1.22)	-0.238 (-1.03)	-0.258 (-1.43)	-0.432** (-2.27)
SDG3	0.338 (0.44)						
SDG4		0.482* (1.68)					
SDG6			0.238 (0.53)				
SDG7				0.314** (2.24)			
SDG8					0.006 (0.05)		
SDG10						0.166 (1.19)	
SDG13							-0.197 (-1.55)
Adjusted R^2	71.66	78.75	56.46	72.46	65.39	71.86	76.46
SE of regression	3.53	3.42	3.96	3.48	3.53	3.52	3.37
F-statistic	14.73	12.50	7.003	15.29	9.37	14.87	15.02
***, **, * represent statistical significance at the 1%, 5% and 10% levels							

4.1.2. Impact of Sustainable Development Goals attainment on return on equity (ROE)

The baseline result for the impact of Sustainable Development Goals attainment on bank ROE is reported in Table 4. The SDG4 variable is positive and significantly associated with ROE in column 2 of Table 4. This result indicates that greater effort towards quality education has a positive effect on the return on equity of banks. This result supports the hypothesis (H1) that SDG attainment has a significant effect on bank profitability. In terms of economic significance, the SDG4 coefficient is economically significant. A unit increase in the SDG4 variable leads to a 48.2 percent increase in bank ROE. This result supports the findings of Phan et al. (2020), who show that undertaking SDG-related activities may improve bank profitability. The SDG7 variable is positive and significantly associated with bank ROE in column 4 of Table 4. This result indicates that an increase in renewable energy consumption has a positive effect on the return on equity of banks. This result

supports the hypothesis (H1) that SDG attainment has a significant effect on bank profitability. In terms of economic significance, the SDG7 coefficient is economically significant. A unit increase in the SDG7 variable leads to a 31.4 percent increase in bank ROE. This result supports the findings of Choudhury et al. (2021), who show that banks' support for SDG7 can improve bank performance in terms of low default risk, which also increases profitability.

In contrast, the SDG3, SDG8, SDG10, and SDG13 variables are not statistically significant and, therefore, do not support the hypothesis (H1) that SDG attainment has a significant effect on bank profitability. A possible reason for this might be that banks are unwilling to finance SDG activities that do not add any value to shareholders' wealth.

Table 5. Impact of Sustainable Development Goals attainment on bank non-interest income (NII). Panel fixed-effects regression estimation

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Variables	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
C	-17.500* (-1.63)	-2.104 (-0.04)	-32.908 (-0.60)	0.610 (0.06)	2.314 (0.13)	6.548 (0.59)	15.916* (1.75)
NPL	-0.131 (-0.41)	-0.859 (-0.64)	-0.677 (-1.36)	-0.335 (-1.07)	-0.548 (-1.17)	-0.334 (-1.07)	-0.569 (-1.24)
EFF	0.528*** (7.73)	0.667*** (5.08)	0.587*** (6.89)	0.550*** (8.01)	0.560*** (7.28)	0.551*** (8.04)	0.535*** (6.99)
CAR	0.388 (1.17)	0.235 (0.38)	0.413 (0.86)	0.315 (0.92)	0.239 (0.59)	0.372 (1.08)	0.069 (0.17)
GDPC	-0.708** (-2.25)	-1.475*** (-2.72)	-1.208** (-2.46)	-0.762** (-2.37)	-1.076** (-2.48)	-0.786** (-2.46)	-0.852** (-2.54)
SDG3	2.951** (2.24)						
SDG4		0.035 (0.06)					
SDG6			0.475 (0.59)				
SDG7				0.026 (0.10)			
SDG8					0.015 (0.06)		
SDG10						-0.149 (-0.61)	
SDG13							-0.345 (-1.54)
Adjusted R^2	74.62	73.54	71.19	73.86	74.46	73.91	78.07
SE of regression	6.16	6.86	7.13	6.25	6.64	6.24	5.95
F-statistic	17.14	9.72	12.54	16.50	13.99	16.55	16.57

***, **, * represent statistical significance at the 1%, 5% and 10% levels

4.1.3. Impact of Sustainable Development Goals attainment on non-interest income (NII)

The baseline result for the impact of Sustainable Development Goals attainment on bank NII is reported in Table 5. The SDG3 variable is positive and significantly associated with NII in column 1 of Table 5. This result indicates that greater effort towards good health and well-being has a positive effect on the non-interest income of banks. This result supports the hypothesis (H1) that SDG attainment has a significant effect on bank profitability. In terms of economic significance, the SDG3 coefficient is economically significant.

A unit increase in the SDG3 variable leads to a 295.1 percent increase in bank NII. The result also supports the findings of Buallay et al. (2020), Phan et al. (2020), and Choudhury et al. (2021), who show that undertaking SDG-related activities may improve bank profitability.

In contrast, the SDG4, SDG6, SDG7, SDG8, SDG10, and SDG13 variables are statistically insignificant and, therefore, do not support the hypothesis (H1) that SDG attainment has a significant effect on bank profitability. A possible explanation for this might be that these SDGs do not generate any significant fee income for banks.

4.2. Regional effect: Interaction analysis

In this section, I perform an additional analysis to identify the effect of Sustainable Development Goals attainment on bank profitability in some regions. The analysis is important because regional differences may exert a considerable influence on the relationship between Sustainable Development Goals attainment and bank profitability. To perform the analysis, I introduce the AFR, ASN, and EUR binary (or dummy) variables into the model. The AFR variable takes the value of one if the country is an African country and zero otherwise. The ASN variable takes the value of one if the country is an Asian country and zero otherwise. The EUR variable takes the value of one if the country is a European country and zero otherwise. The three regional binary variables are interacted with each of the seven SDG variables to determine their joint effect on bank profitability in the African, Asian, and European regions.

4.2.1. Regional analysis for the impact of Sustainable Development Goals attainment on ROA

In the African region analysis, the SDG6*AFR variable is positive and significantly associated with ROA in column 3 of Table 6. This result indicates that greater effort towards the provision and usage of clean water and sanitation has a positive effect on the return on assets of African banks. The result supports the findings of Buallay et al. (2020), Phan et al. (2020), and Choudhury et al. (2021), who show that undertaking SDG-related activities may improve bank profitability. The SDG7*AFR variable is positive and significantly associated with ROA in column 4 of Table 6. This result indicates that an increase in renewable energy consumption has a positive effect on the ROA of African banks. The SDG8*AFR variable is positive and significantly associated with ROA in column 5 of Table 6. This result indicates that higher decent work and economic growth have a positive effect on the ROA of African banks. The result supports the findings of Odetayo et al. (2014), who show that undertaking SDG-related activities may increase bank profitability. The SDG10*AFR variable is positive and significantly associated with ROA in column 6 of Table 6. This result indicates that a higher vulnerable employment ratio has a positive effect on the ROA of African banks. The result supports the findings of Phan et al. (2020), who show that undertaking SDG-related activities may improve bank profitability. The SDG13*AFR variable is negative and significantly associated with ROA in column 7 of Table 6. The result indicates that a decrease in CO2 emission from gaseous fuel consumption leads to an increase in African banks' ROA. The result supports the findings of Caby et al. (2022) who show that banks' action towards climate change mitigation leads to improvement in bank profitability. Meanwhile, the SDG3*AFR and SDG4*AFR variables are statistically insignificant. This might be because African banks have very little exposure to SDG3 and SDG4-related activities, possibly because African banks have not started to diversify into SDG3 and SDG4-related activities.

In the European region analysis, the SDG3*EUR variable is negative and significantly associated with ROA in column 1 of Table 6. This result indicates that greater effort towards good health and well-being has a negative effect on the ROA of European banks. The result does not support the findings of Buallay et al. (2020) who show that undertaking SDG-related activities can improve bank profitability. The SDG6*EUR variable is negative and significantly associated with ROA in column 3 of Table 6. This result indicates

that greater effort towards the provision and usage of clean water and sanitation has a negative effect on the return on assets of European banks. The result does not support the findings of Odetayo et al. (2014) who show that undertaking SDG-related activities may improve bank profitability. The SDG7*EUR variable is positive and significantly associated with ROA in column 4 of Table 6. This result indicates that an increase in renewable energy consumption has a positive effect on the ROA of European banks. The result supports the findings of Choudhury et al. (2021), who show that banks' support for SDG7 helps to improve bank performance in terms of low default risk, which also increases profitability. The SDG8*EUR variable is positive and significantly associated with ROA in column 5 of Table 6. This result indicates that higher decent work and economic growth have a positive effect on the ROA of European banks. The result supports the findings of Choudhury et al. (2021), who show that undertaking SDG-related activities may increase bank profitability. The SDG10*EUR variable is positive and significantly associated with ROA in column 6 of Table 6. This result indicates that a higher vulnerable employment ratio has a positive effect on the ROA of European banks. The result supports the findings of Buallay et al. (2020), who show that undertaking SDG-related activities may increase bank profitability. The SDG13*EUR variable is negative and significantly associated with ROA in column 7 of Table 6. This result indicates that a decrease in CO2 emission from gaseous fuel consumption leads to an increase in European banks' ROA. The result supports the findings of Caby et al. (2022), who show that banks' action towards climate change mitigation leads to higher bank profitability. Meanwhile, the SDG4*EUR variable is not statistically significant. This indicates that efforts toward SDG4 attainment in European countries do not have a significant effect on European banks' ROA. This might be because European banks have very little exposure to SDG4-related activities since European governments already provide extensive funding for education in Europe, and such government funding for education crowds out European banks' funding for education expenditure in European countries.

In the Asian region analysis, the SDG6*ASN variable is also negative and significantly associated with ROA in column 3 of Table 6. The result indicates that greater effort towards the provision and usage of clean water and sanitation in the region has a negative effect on the return on assets of Asian banks. The result does not support the findings of Buallay et al. (2020), who show that undertaking SDG-related activities may increase bank profitability. The SDG7*ASN variable is positive and significantly associated with ROA in column 4 of Table 6. This result indicates that an increase in renewable energy consumption has a positive effect on the ROA of Asian banks. The result supports the findings of Choudhury et al. (2021), who show that banks' support for SDG7 can improve bank performance in terms of low default risk, which also increases profitability. The SDG8*ASN variable is also positive and significantly associated with ROA in column 5 of Table 6. This result indicates that higher decent work and economic growth have a positive effect on the ROA of Asian banks. The result supports the findings of Phan et al. (2020), who show that undertaking SDG-related activities may increase bank profitability. The SDG10*ASN variable is positive and significantly associated with ROA in column 6 of Table 6. This result indicates that a higher vulnerable employment ratio has a positive effect on the ROA of Asian banks. The result supports the findings of Buallay et al. (2020), who show that undertaking SDG-related activities may increase bank profitability. The SDG13*ASN variable is negative and significantly associated with ROA in column 7 of Table 6. This result indicates that a decrease in CO2 emission from gaseous fuel consumption leads to an increase in the ROA of Asian banks. The result supports the findings of Caby et al. (2022), who show that banks' actions towards climate change mitigation may improve bank profitability. Meanwhile, the SDG3*ASN and SDG4*ASN variables are not statistically significant. This is because Asian banks have very little exposure to SDG3 and SDG4-related activities because many Asian banks have not started to diversify into SDG3 and SDG4-related activities.

Table 6. Regional effect of Sustainable Development Goals attainment on bank return on asset (ROA). Panel fixed-effects regression estimation

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Variables	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
C	1.714*** (3.07)	4.521 (1.19)	1.825** (2.59)	2.357*** (4.81)	7.787*** (3.39)	2.336*** (4.57)	0.855 (1.55)
NPL	-0.011 (-0.52)	0.043 (0.87)	-0.015 (-0.72)	0.041* (1.82)	-0.007 (-0.30)	0.038 (1.61)	-0.053*** (-2.65)
EFF	-0.037*** (-6.96)	-0.042*** (-4.46)	-0.026*** (-5.43)	-0.034*** (-5.92)	-0.036*** (-5.94)	-0.035*** (-5.72)	-0.037*** (-7.17)
CAR	0.109*** (6.25)	0.043 (1.12)	0.047* (1.88)	0.092*** (4.81)	0.067*** (3.09)	0.094*** (5.13)	0.095*** (5.31)
GDPC	0.028 (1.11)	-0.039 (-0.77)	0.037 (1.38)	0.003 (0.12)	0.073** (2.25)	0.020 (0.67)	-0.009 (-0.34)
SDG3	0.029 (1.09)						
SDG4		-0.013 (-0.34)					
SDG6			0.001 (0.28)				
SDG7				-0.022*** (-2.79)			
SDG8					-0.093** (-2.48)		
SDG10						-0.017** (-2.03)	
SDG13							0.046*** (5.49)
AFR	0.268 (0.37)	1.955 (0.18)	-1.739** (-2.55)	-0.719 (-1.49)	-7.084*** (-3.23)	-0.590 (-1.01)	3.176*** (8.03)
SDG3*AFR	0.063 (0.39)						
SDG4*AFR		-0.008 (-0.07)					
SDG6*AFR			0.112*** (4.29)				
SDG7*AFR				0.028*** (2.86)			
SDG8*AFR					0.122*** (3.18)		
SDG10*AFR						0.021** (1.97)	
SDG13*AFR							-0.099*** (-8.46)
EUR	3.150*** (5.30)	-0.696 (-0.12)	4.507*** (7.05)	-1.338*** (-4.33)	-13.917*** (-3.41)	-1.262*** (-3.69)	-3.341*** (-3.74)
SDG3*EUR	-0.428*** (-6.22)						
SDG4*EUR		-0.0003 (-0.01)					
SDG6*EUR			-0.053***				

			(-6.77)				
SDG7*EUR				0.064***			
				(3.93)			
SDG8*EUR					0.227***		
					(3.36)		
SDG10*EUR						0.038***	
						(3.24)	
SDG13*EUR							-0.057***
							(-5.34)
ASN	-0.627*	-3.294	0.425	-1.299***	-5.704**	-1.149***	0.929**
	(-1.71)	(-0.72)	(1.17)	(-5.28)	(-2.52)	(-3.94)	(2.59)
SDG3*ASN	-0.037						
	(-0.80)						
SDG4*ASN		0.029					
		(0.58)					
SDG6*ASN			-0.010**				
			(-2.19)				
SDG7*ASN				0.026***			
				(3.04)			
SDG8*ASN					0.086**		
					(2.24)		
SDG10*ASN						0.015*	
						(1.71)	
SDG13*ASN							-0.057***
							(-5.34)
Adjusted R^2	47.81	51.08	71.27	42.04	31.45	40.04	61.06
SE of regression	0.71	0.78	0.50	0.75	0.71	0.76	0.64
F-statistic	11.33	6.28	18.36	9.18	5.21	8.53	15.99
***, **, * represent statistical significance at the 1%, 5% and 10% levels							

4.2.2. Regional analysis for the impact of Sustainable Development Goals attainment on ROE

In the African region analysis, the SDG6*AFR variable is positive and significantly associated with ROE in column 3 of Table 7. The result indicates that greater effort towards the provision and usage of clean water and sanitation has a positive effect on the ROE of African banks. The result supports the findings of Odetayo et al. (2014), who show that undertaking SDG-related activities may increase bank profitability. The SDG8*AFR variable is positive and significantly associated with ROE in column 5 of Table 7. The result indicates that higher decent work and economic growth have a positive effect on the ROE of African banks. The result supports the findings of Buallay et al. (2020), who show that undertaking SDG-related activities may lead to higher bank profitability. The SDG13*AFR variable is negative and significantly associated with ROE in column 7 of Table 7. This result indicates that a decrease in CO2 emission from gaseous fuel consumption leads to an increase in African banks' ROE. The result supports the findings of Caby et al. (2022), who show that banks' action towards climate change mitigation leads to higher bank profitability. Meanwhile, the SDG3*AFR, SDG4*AFR, SDG7*AFR, and SDG10*AFR variables are statistically insignificant. This might be because African banks have very little exposure to SDG3, SDG4, SDG7, and SDG10-related activities, possibly because African banks have not started to diversify into SDG3, SDG4, SDG7, and SDG10-related activities.

In the European region analysis, the SDG3*EUR variable is negative and significantly associated with ROE in column 1 of Table 7. This result indicates that greater effort

towards good health and well-being has a negative effect on the ROE of European banks. The result does not support the findings of Buallay et al. (2020), who show that undertaking SDG-related activities may lead to higher bank profitability. The SDG6*EUR variable is negative and significantly associated with ROE in column 3 of Table 7. This result indicates that greater effort towards the provision and usage of clean water and sanitation has a negative effect on the ROE of European banks. The result does not support the findings of Phan et al. (2020), who show that undertaking SDG-related activities may lead to higher bank profitability. The SDG8*EUR variable is positive and significantly associated with ROE in column 5 of Table 7. This result indicates that higher decent work and economic growth have a positive effect on the ROE of European banks. Meanwhile, the SDG4*EUR, SDG7*EUR, SDG10*EUR, and SDG13*EUR variables are statistically insignificant. A possible explanation for this is that European banks are selective of the SDG activities they finance, and they will focus only on SDG activities that will significantly increase the return on shareholders' equity and preserve shareholders' wealth.

In the Asian region analysis, the SDG8*ASN variable is positive and significantly associated with ROE in column 5 of Table 7. This result indicates that higher decent work and economic growth have a positive effect on the ROE of Asian banks. The result supports the findings of Odetayo et al. (2014), who show that undertaking SDG-related activities improves bank profitability. The SDG13*ASN variable is negative and significantly associated with ROE in column 7 of Table 7. This result indicates that a decrease in CO2 emission from gaseous fuel consumption leads to an increase in Asian banks' ROE. The result supports the findings of Caby et al. (2022), who show that banks' action towards climate change mitigation leads to higher bank profitability. Meanwhile, the SDG3*ASN, SDG4*ASN, SDG6*ASN, SDG7*ASN and SDG10*ASN variables are statistically insignificant. A possible explanation for this is that Asian banks have very little exposure to SDG3, SDG4, SDG6, SDG7, and SDG10 activities, possibly because some Asian banks have not started to diversify into these SDG activities.

Table 7. Regional effect of Sustainable Development Goals attainment on bank return on equity (ROE). Panel fixed-effects regression estimation

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Variables	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
C	29.123*** (7.27)	53.129* (1.94)	18.147*** (2.95)	28.312*** (8.26)	91.512*** (6.09)	28.833*** (8.18)	17.180*** (4.26)
NPL	-0.273* (-1.83)	0.025 (0.07)	0.0001 (0.01)	-0.046 (-0.29)	-0.499*** (-3.07)	-0.116 (-0.71)	-0.436*** (-2.97)
EFF	-0.028*** (-7.38)	-0.281*** (-4.14)	-0.178*** (-4.25)	-0.269*** (-6.75)	-0.282*** (-7.01)	-0.286*** (-6.84)	-0.281*** (-7.39)
CAR	0.223* (1.74)	0.084 (0.31)	0.215 (0.98)	0.182 (1.33)	0.101 (0.72)	0.138 (1.08)	0.166 (1.24)
GDPC	0.059 (0.32)	-0.333 (-0.89)	0.271 (1.14)	0.068 (0.34)	0.538** (2.55)	0.114 (0.55)	-0.081 (-0.42)
SDG3	-0.112 (-0.57)						
SDG4		-0.242 (-0.87)					
SDG6			-0.008 (-0.22)				
SDG7				-0.055 (-1.02)			
SDG8					-1.083*** (-4.39)		

SDG10						0.005	
						(0.09)	
SDG13							0.364***
							(5.99)
AFR	-0.047	-81.778	-7.686	0.532	-64.796***	0.965	20.749***
	(-0.01)	(-0.58)	(-1.25)	(0.16)	(-4.52)	(0.24)	(7.19)
SDG3*AFR	0.538						
	(0.45)						
SDG4*AFR		0.938					
		(0.62)					
SDG6*AFR			0.481**				
			(2.07)				
SDG7*AFR				0.051			
				(0.76)			
SDG8*AFR					1.184***		
					(4.70)		
SDG10*AFR						0.010	
						(0.14)	
SDG13*AFR							-0.608***
							(-7.07)
EUR	8.257*	7.723	13.936**	-6.989***	-143.609***	-5.176**	-14.324**
	(1.94)	(0.19)	(2.49)	(-3.24)	(-5.38)	(-2.19)	(-2.21)
SDG3*EUR	-1.553***						
	(-3.14)						
SDG4*EUR		-0.152					
		(-0.35)					
SDG6*EUR			-0.185***				
			(-2.71)				
SDG7*EUR				0.160			
				(1.41)			
SDG8*EUR					2.338***		
					(5.29)		
SDG10*EUR						0.037	
						(0.46)	
SDG13*EUR							0.123
							(0.86)
ASN	-7.575***	-22.713	-3.382	-7.629***	-61.406***	-5.898***	7.533***
	(-2.88)	(-0.69)	(-1.06)	(-4.44)	(-4.14)	(-2.94)	(2.89)
SDG3*ASN	0.004						
	(0.01)						
SDG4*ASN		0.178					
		(0.50)					
SDG6*ASN			0.006				
			(0.14)				
SDG7*ASN				0.044			
				(0.74)			
SDG8*ASN					0.961***		
					(3.83)		
SDG10*ASN						-0.028	
						(-0.48)	
SDG13*ASN							-0.449***
							(-5.79)

Adjusted R^2	41.04	41.98	46.29	37.52	40.61	37.31	55.69
SE of regression	5.09	5.65	4.39	5.25	4.63	5.26	4.63
F-statistic	8.77	4.62	6.99	7.71	7.23	7.65	12.86
***, **, * represent statistical significance at the 1%, 5% and 10% levels							

4.2.3. Regional analysis for the impact of Sustainable Development Goals attainment on non-interest income (NII)

In the African region analysis, the SDG7*AFR variable is positive and significantly associated with NII in column 4 of Table 8. This result indicates that an increase in renewable energy consumption has a positive effect on the NII of African banks. The result supports the findings of Choudhury et al. (2021), who show that banks' support for SDG7 improves bank performance in terms of low default risk, which also increases profitability. The SDG10*AFR variable is negative and significantly associated with NII in column 6 of Table 8. This result indicates that an increase in efforts to reduce inequality has a negative effect on the NII of African banks. The result does not support the findings of Choudhury et al. (2021), who show that undertaking SDG-related activities may lead to higher bank profitability. Meanwhile, the SDG3*AFR, SDG4*AFR, SDG6*AFR, SDG8*AFR and SDG13*AFR variables are statistically insignificant. A possible explanation for this is that African banks have very little exposure to SDG3, SDG4, SDG6, SDG8, and SDG13 activities, possibly because African banks have not started to diversify into these SDG activities. Therefore, they are unable to generate any significant fee income from their little exposure to these SDG activities.

In the European region analysis, the SDG3*EUR variable is negative and significantly associated with NII in column 1 of Table 8. This result indicates that greater effort towards good health and well-being has a negative effect on the NII of European banks. The result does not support the findings of Phan et al. (2020), who show that undertaking SDG-related activities may increase bank profitability. The SDG7*EUR variable is negative and significantly associated with NII in column 4 of Table 8. This result indicates that an increase in renewable energy consumption decreases the NII of European banks. The result does not support the findings of Choudhury et al. (2021), who show that banks' support for SDG7 can improve bank performance in terms of low default risk, which also increases profitability. The SDG8*EUR variable is positive and significantly associated with NII in column 5 of Table 8. This result indicates that higher decent work and economic growth have a positive effect on the NII of European banks. The result supports the findings of Choudhury et al. (2021), who show that undertaking SDG-related activities may lead to higher bank profitability. The SDG10*EUR variable is negative and significantly associated with NII in column 6 of Table 8. This result indicates that a higher vulnerable employment ratio has a negative effect on the NII of European banks. The result supports the findings of Odetayo et al. (2014), who show that undertaking SDG-related activities leads to higher bank profitability. Meanwhile, the SDG4*EUR, SDG6*EUR, and SDG13*EUR variables are statistically insignificant. A possible explanation for this is that European banks do not generate any significant fee income from their exposure to SDG4, SDG6, and SDG13 activities.

In the Asian region analysis, the SDG3*ASN variable is negative and significantly associated with NII in column 1 of Table 8. This result indicates that greater effort towards good health and well-being has a negative effect on the NII of Asian banks. The result does not support the findings of Buallay et al. (2020), who show that undertaking SDG-related activities may lead to better bank profitability. The SDG13*ASN variable is positive and significantly associated with NII in column 7 of Table 8. This result indicates that an increase in CO2 emission from gaseous fuel consumption leads to an increase in Asian banks' NII. The result, although interesting, contradicts the findings of Caby et al. (2022), who show that banks' action towards climate change mitigation leads to high bank profitability. Meanwhile, the SDG4*ASN, SDG6*ASN, SDG7*ASN, SDG8*ASN and

SDG10*ASN variables are statistically insignificant. A possible explanation for this is that Asian banks have very little exposure to SDG4, SDG6, SDG7, SDG8, and SDG10 activities, possibly because Asian banks have not started to diversify into these SDG activities. Therefore, they are unable to generate any significant fee income from their little exposure to these SDG activities.

Table 8. Regional effect of Sustainable Development Goals attainment on bank non-interest income (NII). Panel fixed-effects regression estimation

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Variables	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
C	21.367*** (2.99)	-45.627 (-0.93)	16.949 (1.04)	31.285*** (5.19)	33.978 (1.05)	37.983*** (6.09)	22.207*** (2.77)
NPL	-0.400 (-1.52)	0.086 (0.14)	-0.243 (-0.50)	0.246 (0.89)	-0.454 (-1.31)	0.157 (0.54)	-0.219 (-0.75)
EFF	0.417*** (6.12)	0.359*** (2.96)	0.418*** (3.77)	0.266*** (3.80)	0.209** (2.42)	0.225*** (3.05)	0.443*** (5.87)
CAR	-0.216 (-1.16)	-1.381*** (-2.79)	-0.120 (-0.21)	-0.174 (-0.74)	-0.367 (-1.21)	-0.434* (-1.95)	-0.526** (-2.03)
GDPC	-1.204*** (-3.68)	-0.485 (-0.74)	0.766 (-1.22)	-0.232 (-0.66)	-1.478*** (-3.26)	-0.114 (-0.31)	-0.439 (-1.14)
SDG3	0.008 (0.02)						
SDG4		0.943 (1.90)					
SDG6			-0.003 (-0.03)				
SDG7				-0.253*** (-2.63)			
SDG8					0.046 (0.09)		
SDG10						-0.214** (-2.14)	
SDG13							0.005 (0.04)
AFR	1.375 (0.15)	-38.838 (-0.28)	-21.343 (-1.35)	-16.966*** (-2.86)	-19.907 (-0.65)	-17.213** (-2.41)	1.318 (0.23)
SDG3*AFR	-0.546 (-0.26)						
SDG4*AFR		0.391 (0.26)					
SDG6*AFR			0.757 (1.25)				
SDG7*AFR				0.329*** (2.78)			
SDG8*AFR					0.224 (0.41)		
SDG10*AFR						0.298** (2.29)	
SDG13*AFR							-0.267 (-1.57)
EUR	36.127***	-65.944	11.156	5.286	-213.013***	6.735	-9.164

	(4.77)	(-0.92)	(0.75)	(1.39)	(-3.70)	(1.62)	(-0.71)
SDG3*EUR	-3.966***						
	(-4.52)						
SDG4*EUR		0.766					
		(0.99)					
SDG6*EUR			-0.083				
			(-0.46)				
SDG7*EUR				-0.479**			
				(-2.39)			
SDG8*EUR					3.503***		
					(3.68)		
SDG10*EUR						-0.243*	
						(-1.71)	
SDG13*EUR							0.278
							(0.98)
ASN	5.325	-19.793	-13.909	-10.287***	-9.724	-9.631***	-12.515**
	(1.14)	(-0.34)	(-1.65)	(-3.40)	(-0.31)	(-2.72)	(-2.41)
SDG3*ASN	-2.089***						
	(-3.58)						
SDG4*ASN		0.171					
		(0.27)					
SDG6*ASN			-0.003				
			(-0.03)				
SDG7*ASN				0.071			
				(0.67)			
SDG8*ASN					0.029		
					(0.05)		
SDG10*ASN						0.081	
						(0.76)	
SDG13*ASN							0.343**
							(2.21)
Adjusted R^2	44.61	42.43	23.02	42.97	42.57	42.17	46.94
SE of regression	9.09	10.12	11.65	9.23	9.96	9.29	9.26
F-statistic	10.08	4.73	3.09	9.49	7.79	9.22	9.46
***, **, * represent statistical significance at the 1%, 5% and 10% levels							

5. Conclusions

This study examined the effect of Sustainable Development Goals attainment on bank profitability. Data from 28 countries were analyzed. It was found that achieving certain Sustainable Development Goals leads to a significant improvement in bank profitability. More specifically, achieving good health and well-being leads to an increase in bank non-interest income. Providing clean water and sanitation for all also leads to an increase in bank return on assets. On the other hand, taking strong action to combat climate change results in a decrease in bank return on assets. Additionally, attaining quality education and promoting affordable and clean energy sources lead to an increase in bank return on equity. The European regional findings indicate that achieving SDG3 diminishes the ROA, ROE, and NII of European banks. Conversely, attaining SDG8 increases the ROA, ROE, and NII of European banks. SDG6 attainment decreases the ROA and ROE of European banks. However, achieving SDG7 increases the ROA and decreases the NII of European banks. SDG10 attainment increases the ROA but decreases the NII of European banks. Finally, SDG13 attainment lowers the ROA of European banks. The results for African banks indicate that achieving SDG6 and SDG8 have a positive impact on both ROA and

ROE, whereas achieving SDG13 has a negative impact on both metrics. Additionally, attaining SDG7 and SDG10 leads to an increase in ROA and NII. In the Asian region, achieving SDG6 and SDG13 results in a decrease in ROA for banks, while attaining SDG7 and SDG10 has a positive impact on ROA. Furthermore, achieving SDG8 leads to an increase in both ROA and ROE for Asian banks.

The implications of the findings are that bank regulators and supervisors should promote the attainment of the Sustainable Development Goals, which have a complementary impact on bank profitability. Therefore, there is a need for a balanced approach to encourage banks to support the sustainable development goals while considering potential economic challenges. It is crucial for regulators to recognize that some Sustainable Development Goals may have a negative effect on bank profitability, as demonstrated in Section 4, and the consequences may differ by region. Hence, it is imperative for bank regulators and supervisors to dissuade banks from aiding the achievement of SDGs that negatively impact their profitability.

One limitation of this study relates to the selection of sustainable development goals proxy indicators. It is possible that the chosen proxy variables for the selected SDGs may not completely capture the complex nature of the Sustainable Development Goals. Additionally, the present study failed to capture the SDG targets at a micro level. These constraints suggest several fruitful areas that can be explored in further research.

Future research could expand on this study by investigating the impact of the SDG targets on bank profitability. Additionally, the present study could be expanded by incorporating other countries, additional metrics of bank profitability, and alternative SDG proxy indicators that may offer further beneficial insights into this field of research. Moreover, future research could explore the effect of achieving Sustainable Development Goals on bank risk. This analysis can offer valuable and thorough insights into understanding the impact of reaching sustainable development targets on bank risk. Additionally, future investigations may explore the effect of achieving the sustainable development goals on bank profitability during the COVID-19 pandemic and the global financial crisis.

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