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ESG and asset quality in the banking industry: The moderating role of financial performance

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ABSTRACT

This paper aims to analyse the relationship between ESG and bank asset quality and the moderating role of profitability. We examine an international sample of 96 banks located in 33 countries using quarterly data covering the 2017-Q4 - 2022-Q3 period. Our findings show the existence of a positive ESG - asset quality relationship, which can be even reversed for particularly high levels of profitability. Moreover, we report significant differences between banks located in the European Union (EU) and in non-EU countries. We contribute to the literature by analysing the ESG - asset quality relationship, which has been hitherto largely overlooked, and we are the first quantifying how the marginal effect of ESG on asset quality varies depending on the level of profitability. Our findings have important policy and managerial implications in that banks should not only implement (and be pushed to implement) better ESG strategies, but also stabilise their financial performance, avoiding unsustainable short-term profits that could reverse the beneficial effects of ESG on asset quality.

1. Introduction

The Environmental, Social and Governance (ESG) paradigm has recently captured the attention of the banking and financial industry for numerous reasons. First, investors are increasingly willing to incorporate ESG into their investment decisions, given that, at international level, asset managers are expected to increase their ESG-related assets under management to USD 33.9 trillions by 2026 (PwC, 2022). Second, ESG risks represent a pressing threat for the financial sector (Weber et al., 2008; Kalfaoglou, 2021), and they have been put under the spotlight by regulatory and supervisory authorities at worldwide level (FSB, 2017; ECB, 2020; FED, 2022). Third, high levels of ESG scores are associated with less risk-taking by banks (Galletta et al., 2023), resulting in a more stable and sound banking system, due to longer term profit orientation, more effective risk management and better capability to attract investors that are increasingly aware of the impact of ESG risks. Fourth, also at macro-level, ESG practices play an important role in improving bank stability during periods of financial turmoil, highlighting the pivotal role of ESG factors to strengthen the systemic-wide stability of the banking system, which make it more resilient and capable to face endogenous as well as exogenous shocks (Chiaramonte et al., 2021; Aevoae et al., 2022). Fifth, ESG can be considered as an important determinant of bank solvency risk, given that ESG indicators can be employed also to forecast bank financial distress (Citterio and King, 2023).

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While bank regulators, managers and investors have traditionally focused on financial risks, new emerging risks related to ESG aspects pose a threat to the financial system and to the real economy, pushing an increasing number of bank stakeholders to demand more effective ESG strategies and ESG risk management practices, in an attempt to make banks more resilient, sustainable and capable to face such a type of risks.

Although the literature on ESG in the banking industry is gaining momentum (Azmi et al., 2021; Al Amosh and Khatib, 2022; Agnese and Giacomini, 2023), there are still various gaps that need to be filled. While the strand of literature focusing on the relationship between financial and ESG performance is very developed (Shakil et al., 2019; Batae et al., 2021; El Khoury et al., 2021), only a limited number of studies have focused on the analysis of the effects of ESG practices on bank asset quality. To the best of our knowledge, Di Tommaso and Thornton's (2020) paper is amongst the few studies employing a measure of asset quality as a dependent variable, although their main focus is on a comprehensive measure of bank stability.

We aim to fill this gap by proposing an empirical analysis of the relationship between ESG and bank asset quality by analysing an international sample of 96 banks located in 33 different countries (904 observations). We employ a wide range of sources, including Morgan Stanley Capital International and Bloomberg (for ESG ratings), Bankfocus (for bank-level data) and the International Monetary Fund (for macroeconomic variables), and panel data fixed effect regression to assess whether high levels of ESG scores are statistically associated with better asset quality (measured by NPL ratio and the relative amount of impaired loans).

In addition, we hypothesise that bank profitability can play an important role in shaping the relationship between ESG and asset quality. In general, banks do not maintain a high level of profitability in the long run and, if they do in the short run, they are characterised by high levels of volatility in financial performance (Akhtaruzzaman et al., 2021). Furthermore, more profitable banks may devote less funds to loan monitoring purposes and instead use their additional resources, such as retained earnings, to finance risky and potentially highly profitable projects (Avignone et al., 2021; Berger and DeYoung, 1997). Therefore, very high profitable banks would become less stable and riskier, thereby offsetting the positive effects of ESG practices on asset quality.

Broadly speaking, ESG practices are significantly different at worldwide level due to different regulatory requirements, stakeholder pressure and awareness of ESG risks. These differences are particularly relevant with reference to EU and non-EU countries. From a regulatory perspective, amongst several other requirements, the recent entry into force of the EU Corporate Sustainability Reporting Directive in 2023 has forced firms to increase their levels of transparency on ESG matters, thereby pushing them to implement more effective ESG strategies. Along the same lines, stakeholders including customers, employees and non-governmental organisations seem to be particularly active in EU when it comes to pushing firms implementing more environmentally and socially sustainable strategies (Liesen et al., 2015; Cadez et al., 2019). Also with reference to the level of awareness of ESG risks, it appears to be higher in EU compared to other developed countries like the US (Gatzert and Reichel, 2022). Thus, in light of the higher levels of effectiveness of ESG practices in EU, we expect that the beneficial ESG – asset quality relationship is weaker for non-EU banks compared to their EU peers.

Based on the previous arguments, we analyse the potential moderating effect of profitability (measured by ROE and ROA) and how this effect differs between EU and non-EU countries. More specifically, we quantify how the marginal effect of ESG on asset quality varies with the level of profitability. This approach provides a better and more specific understanding for financial institutions and banking regulators on the role that profits play in the ESG – asset quality relationship. It also represents an important contribution because, to the best of our knowledge, the quantification of marginal effects has been used in other areas of financial research,¹ but not in the analysis of the ESG and asset quality. Furthermore, although many articles have directly tested the effects of ESG on the performance of the banking sector (Shakil et al., 2019; Batae et al., 2021; El Khoury et al., 2021), to our knowledge, none of them has considered how this performance can determine the impact of ESG on asset quality.

Our main findings show that (i) higher levels of ESG scores are statistically significantly associated with higher levels of asset quality (i.e. lower levels of NPLs and impaired loans); and that (ii) very high levels of profitability attenuate, or even reverse, the effects of ESG on asset quality. We interpret our first finding in light of the stakeholder theory (Freeman, 1984), according to which stakeholders exercise a pressure on banks to improve their ESG practices while at the same time improving asset quality, pushing banks to be more sustainable and stable in a long-term perspective. As for the moderating role of profitability, we explain this finding in light of the 'skipping hypothesis' (Berger and DeYoung, 1997), according to which banks that are willing to maximise their profits may decide to skimping on the resources devoted to loan monitoring, while at the same time bearing the negative consequences of higher levels of non-performing loans in the future, resulting in a less stable and socially sustainable banking system. Moreover, we find that the EU banks benefit more from ESG strategies in terms of asset quality improvement and are also less penalised by the moderating role of profitability than their non-EU peers. According to the Ernst & Young (EY, 2022) Sustainable Finance Index 2022, EU banks lead ESG activities implementation in relation to other world countries, and ESG regulation and disclosure requirements in this region have been more solid so far (Cicchello et al., 2023), which could justify this result.

We contribute to the literature by empirically analysing a policy-relevant relationship, with important consequences in terms of bank risk and financial stability that has been largely overlooked in the extant literature. In addition, we shed light on the moderating effect of profitability, examining the interplay between shareholder and stakeholder theory to dig deeper on the relationship between ESG performance, financial performance and asset quality.

The rest of the article is structured as follows. In Section 2 we review the theoretical background; in Section 3 we focus on the research methodology; and in Section 4 we explain and discuss the results. Finally, we show the most important conclusions and implications of our research.

¹ For instance, some articles have used marginal effects in the analysis of the monetary policy transmission through the bank lending channel (Cantero-Saiz et al., 2014, 2018, 2022).

2. Theoretical background

Since the purpose of this article is to analyse the relationship between ESG and bank asset quality, and how this relationship is shaped by bank profitability in the EU and the non-EU countries, we need to combine two main strands of the literature. The first strand (summarised in Section 2.1) refers to the literature on ESG and its impact on financial performance and risk in the banking sector. The second one (described in Section 2.2) relates to the determinants of bank asset quality and credit risk taking. Based on these two strands, in Section 2.3 we propose our research hypotheses.

2.1. ESG in banking

Numerous studies have focused on the main consequences of ESG performance and strategies on various dimensions. Specifically, a vast strand focuses on the relationship between ESG and bank performance. For instance, by analysing an international sample of 46 listed banks, [El Khoury et al. \(2021\)](#) find a positive relationship between ESG scores and bank performance (measured by means of ROE and ROA), although this beneficial relationship is reversed when ESG scores are particularly high. Also [Shakil et al. \(2019\)](#) provide evidence of a positive association between ESG and financial performance in a sample of 93 banks operating in emerging economies. However, the literature is not unanimous on the sign of this relationship, given that other scholars reject the hypothesis of a positive relationship ([Bătae et al., 2021](#)). By focusing on bank market performance, [Azmi et al. \(2021\)](#) provide evidence of a positive relationship between ESG activities and market value. Similar results have also been obtained by [La Torre et al. \(2021\)](#). This positive relationship might be due to several reasons. For instance, [Agnese and Giacomini \(2023\)](#) find that ESG factors can play an important role in reducing bank funding costs by significantly reducing the cost of issuance of bonds in the primary markets. [Al Amosh and Khatib \(2022\)](#) show that ESG scores are associated with better financial performance because ESG activities attract more visitors in bank websites, resulting in more effective online marketing campaigns.

While there are several studies focusing on the ESG – profitability nexus, in the banking industry, the relationship between ESG and bank asset quality has not been explored in depth so far. Broadly speaking, various studies have examined the contribution of ESG factors in the reduction of bank risk and stability, by focusing on different dimensions. By analysing a sample of European banks, [Chiaromonte et al. \(2021\)](#) find that ESG scores play an important role in improving bank stability during periods of financial turmoil (i. e. the global financial crisis and the European sovereign debt crisis), highlighting the pivotal role of ESG factors to strengthen the systemic-wide stability of the banking system and ensure that banks avoid excessive risk taking, making them more resilient and capable to face endogenous as well as exogenous shocks. According to [Galletta et al. \(2023\)](#), ESG scores are negatively related to operational risk and, consequently, contribute in reducing capital absorption. [Aevoae et al. \(2022\)](#) analyse the impact of ESG on banks' systemic risk contribution and show that ESG scores have a beneficial effect in that they reduce banks' contribution to systemic-wide distress. By focusing on a sample of U.S. and European banks analysed over the 2012 – 2019 time horizon, [Citterio and King \(2023\)](#) show that ESG indicators can even be employed to forecast bank financial distress, highlighting the importance of ESG factors as a major determinant of bank solvency risk in the medium-long term. [Di Tommaso and Thornton \(2020\)](#) use the z-score as their main measure of bank risk taking and show that ESG scores are associated with a reduction in bank risk-taking. Along the same lines, [Neitzert and Petras \(2022\)](#) remark the importance of ESG factors in bank risk management by providing empirical evidence of negative relationship between ESG scores and bank z-score.

While the literature has focused on several dimensions of bank risk (operational risk, systemic risk, solvency risk, etc.), contributions dealing with credit risk and asset quality are much scarcer. To the best of our knowledge, [Di Tommaso and Thornton's \(2020\)](#) paper is amongst the few studies employing a measure of asset quality as a dependent variable (i.e. the non-performing loan to total loan ratio), although their main objective is the measurement of bank overall risk taking by means of the z-score. However, our paper is different in several respects: first they study how ESG scores affect bank value and risk taking and consequently use variables such as CDS spread, Tobin's Q and equity price. In contrast, we focus on a more specific aspect, namely on the ex-post financial consequences of bank credit risk taking strategies (i.e. asset quality) by using NPL and impaired loan ratios as dependent variables. Second, they use a European sample, whilst in our analysis we focus on both EU and non-EU banks and differentiate between them. Third, their analysis stops in 2018 while we analyse up to the third quarter of 2022. Lastly, they do not take into consideration the moderating role of financial performance, whilst we are the first quantifying how the marginal effect of ESG on asset quality varies depending on the level of profitability.

2.2. Bank asset quality and credit risk taking

The second strand of literature related to our paper is that focusing on the determinants of bank asset quality and credit risk taking. This stream of literature has gained momentum especially after the global financial crisis and the subsequent sovereign debt crisis, which were amongst the most important causes of soaring levels of NPLs in bank balance sheets in several countries ([Kauko, 2012](#)). For instance, [Ghosh \(2015\)](#) focuses on the US banking industry where the global financial crisis has started, and shows that bank capitalisation and profitability respectively have a beneficial and a detrimental effect on asset quality, while at the same time also other factors play a prominent role such as GDP growth and inflation. [Castro \(2013\)](#) analyses the so called GIPSI countries (Greece, Ireland, Portugal, Spain and Italy), the most troubled countries of the Eurozone, notably affected by the sovereign debt crisis, and find that bank asset quality worsens as GDP growth decreases, while it is positively affected by an appreciation of the exchange rate. [Louzis et al. \(2012\)](#) focus on the Greek banking industry, and find that the levels of interest rate, public debt and GDP are important determinants of bank asset quality. In their analysis of the Italian banking sector, [Mohaddes et al. \(2017\)](#) show that persistence in GDP growth may result in a significant reduction in the NPL ratio.

Broadly speaking, the literature has shown that both macroeconomic and microeconomic variables play a role in influencing bank asset quality. For instance, [Dimitrios et al. \(2016\)](#) provide evidence that GDP growth, the level of unemployment and the level of taxation are amongst the main country-level determinants of bank asset quality, whilst the loan to deposit ratio and the level of profitability are the most relevant bank-specific factors. Specifically, the most important macroeconomic determinants identified by previous studies are GDP growth ([Louzis et al., 2012](#); [Castro, 2013](#); [Beck et al., 2015](#); [Ghosh, 2015](#); [Dimitrios et al., 2016](#); [Mohaddes et al., 2017](#)), changes in the exchange rate ([Castro, 2013](#); [Beck et al., 2015](#)), interest rates ([Delis and Kouretas, 2011](#); [Louzis et al., 2012](#); [Beck et al., 2015](#)) inflation ([Ghosh, 2015](#)) and unemployment ([Ghosh, 2015](#); [Dimitrios et al., 2016](#)), whilst the main bank-specific are the level of capitalisation ([Ghosh, 2015](#); [Balakrishnan and Ertan, 2018](#)), size ([Delis and Kouretas, 2011](#); [Balakrishnan and Ertan, 2018](#)), liquidity ([Balakrishnan and Ertan, 2018](#)), profitability ([Delis and Kouretas, 2011](#); [Ghosh, 2015](#); [Dimitrios et al., 2016](#)), amount of deposits ([Dimitrios et al., 2016](#)), efficiency ([Delis and Kouretas, 2011](#); [Çifter, 2015](#); [Badunenko et al., 2022](#)), asset structure ([Avignone et al., 2021](#)) and funding structure ([Avignone et al., 2021](#); [Bongiovanni et al., 2021](#)).

On the one hand, firm probability of default (and consequently the stock of NPLs and impaired loans) is strongly influenced by the economic cycle and by economic policy interventions, and consequently asset quality is significantly affected by macroeconomic variables ([Louzis et al., 2012](#)). On the other hand, also bank specific variables play a prominent role. Specifically, profitability may play an important role in that less profitable banks have strong incentives to increase their risk-taking in an attempt to increase profitability ([Mare, 2015](#)). However, profitable banks can also use retained earnings to increase risky lending ([Avignone et al., 2021](#)). Size is another potential determinant of asset quality because large banks can either adopt a too-big-to-fail policy and increase risky lending in search for higher returns ([Stern and Feldman, 2004](#); [Brewer and Jagtiani, 2013](#); [Demirgüç-Kunt and Huizinga, 2013](#)), or benefit from higher levels of diversification and better managerial capabilities, thereby improving asset quality ([Bertay et al., 2013](#)). Bank asset structure and business model matter as well, given that commercial banks are more exposed to deterioration of loan quality ([Altunbas et al., 2017](#)). Funding structure may also play a relevant role in that the strength of the market discipline exercised by creditors is strictly related to bank decisions to rely more on retail or on wholesale funding ([Huang and Ratnovski, 2011](#)). Bank ability to cover its loans with deposits is another important determinant, given that, if loans exceed the deposit base, then banks are facing a funding gap that should be covered by accessing financial markets that are more volatile and expensive compared to retail funding ([Van den End, 2016](#)). Lastly, the literature has shown that the level of capitalisation may be considered as an important determinant of bank asset quality, because highly capitalised banks have more room to increase their credit risk exposure compared to less capitalised banks that are pushed to fulfil regulatory requirements ([Gambacorta and Shin, 2018](#)), potentially resulting in lower levels of asset quality. Amongst these bank-specific variables, the role of ESG performance and its impact on asset quality has been largely neglected in the extant literature. In this paper, we aim to fill this gap.

2.3. Hypothesis development

According to the stakeholder theory ([Freeman, 1984](#)), a stakeholder-focused bank management contributes to balance the interests of investing and non-investing stakeholders, resulting in lower levels of risk taking and, consequently in a better asset quality. In this perspective, more sustainable banks with higher ESG ratings may be particularly prudent in their lending policies and tend to invest in less risky projects, thereby improving asset quality.

Broadly speaking, sustainable banks can also incorporate ESG criteria in their lending decisions, by financing firms that are capable of managing ESG risks and penalising firms that are not ([Thompson and Cowton, 2004](#); [Nandy and Lodh, 2012](#); [Erragragui, 2018](#)). As a matter of fact, some banks have decided to price firm climate exposure by demanding higher lending rates to fossil fuel-based borrowers ([Delis et al., 2021](#)). The final objective of this approach is a more effective credit risk management framework, which should result in higher levels of asset quality. Furthermore, in light of the widely acknowledged relationship between asset quality and financial stability ([Velliscig et al., 2022](#)), socially sustainable banks should be particularly concerned about financial stability, given that banking crises have a detrimental impact on the real economy, with serious negative consequences on the society as a whole ([Kindleberger, 1978](#)). In this context, banks that are willing to act as socially responsible lenders in line with the ESG paradigm, should avoid financial crises and do their best to preserve financial stability. On this regard, previous research has shed light on the positive consequences of ESG scores in terms of financial stability ([Chiaromonte et al., 2021](#)). Thus, banks with high ESG scores should be willing to maintain a sufficiently high level of asset quality, in an attempt to increase their soundness and resilience and avoid bank-specific crises that could soon be turned into systemic crises, and also resist to crises that could be caused by less sustainable and unstable banks. Finally, sustainable banks are generally more oriented towards the stabilisation of their long-term profitability, rather than focused on short-term and highly volatile profits. They can achieve this objective by effectively managing ESG risks which can materialise in the medium or long run ([Kalfaoglou, 2021](#)), and by keeping high quality assets in their balance sheet, so that they can reduce credit losses and sustain their financial performance over a longer time horizon. Based on these considerations, we develop our first research hypothesis as follows:

H1. : There is a positive relationship between ESG scores and bank asset quality.

While the stakeholder theory plays a prominent role in explaining the relationship between ESG and asset quality, also other aspects pertaining the financial side of the coin should be taken into consideration in order to have a more complete picture. Bank financial performance may be an important factor not only with reference to its direct impact on asset quality ([Ghosh, 2015](#); [Dimitrios et al., 2016](#)), but also with reference to the role it can play in shaping the relationship between ESG performance and asset quality. Highly profitable banks can implement various risk-taking strategies ([Martynova et al., 2015](#)) that could potentially compromise the positive consequences of ESG in terms of improvement in asset quality. According to the “skipping hypothesis” ([Berger and DeYoung,](#)

1997), banks that are willing to maximise their profits may decide to skimp on the resources devoted to loan monitoring, while at the same time bearing the negative consequences of higher levels of non-performing loans in the future. The reduction of loan monitoring costs results in higher levels of profits, counterbalanced by higher levels of non-performing loans. In these circumstances, a highly profitable bank that implements this strategy would see vanishing the positive consequences of ESG in terms of asset quality. More profitable banks could be less risky because it is easier for them to accumulate capital via higher retained earnings (Flannery and Rangan, 2006). However, the literature has shown that profitable banks could also use these additional resources they get from retained earnings to finance risky (but potentially highly profitable) projects, resulting in lower asset quality (Avignone et al., 2021). In both cases, highly profitable banks would not only worsen their asset quality, but also become less stable, riskier and more likely to cause and be affected by financial stability problems, betraying the expectations of their stakeholders, regardless of their efforts in terms of ESG strategies and outweighing the positive consequences of ESG in terms of asset quality improvements. On a more general level, highly profitable banks are riskier, often unable to maintain very high level of profitability in the long-run, subject to higher levels of volatility in their financial performance (Akhtaruzzaman et al., 2021), more oriented towards high levels of profit in the short term, and in creating shareholder value by adopting myopic strategies, without being concerned about long-term sustainability in their financial performance and about the needs of their stakeholders. Based on these considerations, we develop our second research hypothesis as follows:

H2. : High levels of profitability attenuate the strength of the positive relationship between ESG and asset quality.

The beneficial ESG - asset quality relationship hypothesised in H1 may also be affected by the level of effectiveness of bank ESG practices. In particular, regulatory and stakeholder pressure as well as higher levels of awareness regarding ESG risks in EU may play an important role in influencing the strength of this relationship. More specifically, from a regulatory standpoint, several regulatory initiatives have pushed EU companies (including banks) to implement more effective ESG strategies. Amongst them, it is noteworthy to mention, the European Commission's action plan "financing sustainable growth" that has created a roadmap for sustainable finance in the EU, the European Parliament's climate benchmark regulation that has made more comparable and transparent the benchmark methodologies of ESG metrics, the EU taxonomy regulation that has established a common European taxonomy to classify sustainable financial products and the recent entry into force of the EU Corporate Sustainability Reporting Directive in 2023.² On this regard, non-EU countries have generally lagged behind EU countries when it comes to ESG regulatory requirements (Krueger et al., 2021). Along the same lines, stakeholders including customers, employees and non-governmental organisations seem to be particularly active in EU when it comes to pushing firms implementing more effective ESG strategies (Liesen et al., 2015; Cadez et al., 2019), especially when it comes to social and environmental risks (Lai et al., 2019). Also with reference to the level of awareness of ESG risks, it appears to be higher in EU compared to other developed countries like the US (Gatzert and Reichel, 2022) and although EU countries opt for a combination of mandatory and voluntary measures (Camilleri, 2015), European companies have a leadership role in ESG practices at worldwide level (Sassen et al., 2016; EY, 2022). Thus, in light of the higher levels of effectiveness of ESG practices in EU, we expect that the beneficial ESG – asset quality relationship is weaker for non-EU banks compared to their EU peers.

In light of these considerations, we develop our third research hypothesis as follows:

H3. : The beneficial ESG – asset quality relationship is weaker for non-EU banks.

3. Research methodology

3.1. Sample

To test our research hypotheses, we select all the banks with quarterly financial data available in the Bankfocus database. Given that we use ESG scores, we can only include in the sample those banks that also have ESG ratings in Morgan Stanley Capital International (MSCI), which is our main ESG proxy. MSCI ratings employ a rule-based methodology to measure to what extent banks are exposed to ESG risks and how effectively they are managed compared to their peers (large and internationally active listed banks).³ In line with previous studies, we use consolidated data whenever available, but when these data are not available, we use the unconsolidated ones (Čihák and Hesse, 2010). We also remove those banks with no financial data available for the variables used in our analysis. Furthermore, all the bank-level variables except for ESG scores are winsorised at 1% and 99% level to mitigate the potential effect of outliers (Brockman and Unlu, 2009; Battaglia and Gallo, 2013). The final sample consists of an unbalanced panel of 96 banks from 33 countries⁴ between 2017-Q4 and 2022-Q3 (904 observations). We rely on this sample period and on quarterly data to make our empirical analysis up to date and to exploit the full granularity of the time series dimension of the three main sources of our variables (MSCI, Bankfocus and International Monetary Fund data). Specifically, we use Moody's Analytics Bankfocus database

² These regulatory requirements are available at the following links: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022L2464> <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1594974685574&uri=CELEX:32020R0852> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0097> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32019R2089>

³ For additional information, see the following link: <https://www.msci.com/our-solutions/esg-investing/esg-ratings>.

⁴ Specifically, the countries are as follows: Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Cyprus, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, India, Indonesia, Israel, Italy, Japan, Mexico, the Netherlands, Norway, Poland, Republic of Korea, Saudi Arabia, Singapore, Spain, Sweden, Switzerland, Thailand, the United Kingdom and the United States. In addition, our sample includes banks with different business models (e.g. commercial banks, investment banks, universal banks, etc.).

(Bureau van Dijk)⁵ to obtain the financial data of the banks, MSCI and Bloomberg statistics to get the ESG scores, and the International Monetary Fund database for macroeconomic variables.

3.2. Econometric model and methodology

We use an econometric methodology based on a panel fixed effect estimation, which is widely employed in the banking literature focusing on asset quality and ESG (Beltrame et al., 2018; Mirza et al., 2015; Wang et al., 2023) and incorporate both ESG scores and their interactions with country regions and financial performance indicators. Formally, our baseline empirical model is as follows:

$$\begin{aligned} ASSQUAL_{i,t} = & \beta_0 + \beta_1 ESG_{i,t-1} + \beta_2 (NON_EU_m * ESG_{i,t-1}) + \beta_3 ROE_{i,t-1} \\ & + \beta_4 (ESG_{i,t-1} * ROE_{i,t-1}) + \beta_5 (NON_EU_m * ESG_{i,t-1} * ROE_{i,t-1}) + \beta_6 FUNDSTR_{i,t-1} \\ & + \beta_7 ASSTR_{i,t-1} + \beta_8 SIZE_{i,t-1} + \beta_9 CAP_{i,t-1} + \beta_{10} LOANDEP_{i,t-1} + \beta_{11} EFFIC_{i,t-1} \\ & + \beta_{12} \Delta GDP_{m,t} + \beta_{13} INFL_{m,t} + \sum_{i=1}^t \pi_i Quarter_t + \sum_{m=1}^m \vartheta_i Country_m + \varepsilon_{i,t} \end{aligned} \quad (1)$$

The dependent variable in Eq. (1), ASSQUAL, represents the asset quality of a bank and it is captured by three indicators of bank assets' exposure to credit risk (Wang et al., 2019): the ratio of non-performing loans over gross loans (NPL_LOANS), the ratio of impaired loans over equity (IL_EQ) and the impaired loans to gross loans ratio (IL_LOANS).⁶

We use both bank-specific and macroeconomic proxies as independent variables.⁷

ESG is the main variable of interest to test H1 and includes the environmental, social and governance ratings published by MSCI (Albuquerque et al., 2019; Sabbaghi, 2022). Based on this information, we constructed a variable that takes a whole number from 0 to 6 according to the ESG rating scale used by MSCI (Table 1).⁸ As we propose in H1, banks with higher ESG scores should exhibit better asset quality and, hence, lower credit risk, therefore we expect the ESG variable to have a negative and statistically significant coefficient, given that our dependent variables are inverse measures of asset quality.

NON_EU represents a dummy variable that takes the value of 1 for banks that belong to a non-EU country, and 0 otherwise. The dummy is included in Eq. (1) as an interaction term with the ESG indicator (NON_EU*ESG). This interaction term allows us to test whether the effects of ESG on asset quality are different for non-EU banks in relation to EU banks. In our H3, we hypothesize that the credit risk reduction caused by ESG strategies can be less pronounced in the non-EU countries. According to the Ernst & Young (EY, 2022) Sustainable Finance Index 2022, banks in the non-EU region lag behind their European peers in overall ESG activity. Moreover, the EU has implemented stricter ESG reporting and disclosure regulations, in comparison to the US for example, and has encountered less skepticism and reticence by adopting these rules (Cicchello et al., 2023). As a result, a positive and significant coefficient for NON_EU*ESG is expected.

ROE is the return on equity ratio and represents bank's profitability.⁹ This measure is one of the most commonly used in the literature (Berger, 1995; Hsieh and Lee, 2010). Less profitable banks may be pushed to increase their credit risk taking in an attempt to increase profitability (Mare, 2015). In these circumstances a negative relationship between ROE and ASSQUAL could be expected. However, if banks are very focused on profit maximisation objectives, they could use these retained earnings to finance more profitable but very risky projects, therefore the relationship between ROE and the dependent variable could also be positive (Avignone et al., 2021).

To analyse how profitability shapes the relationship between ESG scores and bank asset quality, we include in our Eq. (1) the interaction term between the variables ESG and ROE (ESG*ROE). Moreover, in order to differentiate between the EU and the non-EU region, we include the interaction term between the dummy NON_EU, the ESG variable and the profitability indicator (NON_EU*ESG*ROE). In our H2, we propose that high profitability attenuates the credit risk reduction associated to ESG practices. The rationale of this hypothesis is that high profitable banks are in general riskier and often unable to maintain very high profitability levels in the long run (Akhataruzzaman et al., 2021). As a result, they are more oriented towards maximising short-term profits and creating shareholder value by adopting myopic strategies, without being really concerned about the long-term sustainability of their financial performance. Thus, we expect the interaction terms ESG*ROE and NON_EU*ESG*ROE to have significant and positive coefficients.

FUNDSTR is the level of deposits over total assets and represents a proxy for bank funding structure (Avignone et al., 2021). Banks that rely more on deposits instead of wholesale funding are considered less risky, especially during crises, because market-based funding is more volatile (Altunbas et al., 2011). Hence, a negative relationship between FUNDSTR and ASSQUAL is expected.

ASSTR is the ratio of total loans over assets and captures the lending business model orientation of the bank (Cantero-Saiz et al., 2019). On the one hand, banks that engage in traditional lending activity by providing customer loans are expected to be more exposed

⁵ Bankfocus database provides data on over 45,000 banks at worldwide level.

⁶ The concepts of impaired loans and non-performing loans are substantially different as the former is an accounting term referred to the financial reporting of problem loans in the balance sheet whilst the latter is regulatory term employed for prudential supervision purposes. For further information, see the guidelines on non-performing exposures and forbearance provided by the Bank for International Settlements (available at the following link: <https://www.bis.org/bcb/publ/d403.pdf>) and IFRS 9 – financial instruments (available at the following link: <https://www.ifrs.org/content/dam/ifrs/publications/pdf-standards/english/2022/issued/part-a/ifrs-9-financial-instruments.pdf?byypass=on>).

⁷ Bank-specific independent variables are lagged by one quarter to avoid endogeneity bias.

⁸ To check the robustness of our results, we replace the ESG rating used by MSCI with the ESG scores provided by Bloomberg.

⁹ As robustness checks, ROE will be replaced with return on assets (ROA). The results of these robustness checks are shown later in this article.

Table 1
ESG scores.

MSCI ESG Categories	MSCI ESG Rating	ESG score assigned
Laggard	CCC	0
	B	1
Average	BB	2
	BBB	3
	A	4
Leader	AA	5
	AAA	6

to credit risk (Altunbas et al., 2007). Based on this argument, the relationship between ASSTR and ASSQUAL should be positive. On the other hand, banks with higher amounts of loans have less proportion of securities, which reduces their exposure to other related risks, such as sovereign risk (De Bruyckere et al., 2013). Hence, the relationship between ASSTR and ASSQUAL could also be negative.

SIZE is calculated as the natural logarithm of total assets (deflated) and denotes the size of a bank (Goldberg and Rai, 1996). Larger banks can achieve higher product and loan diversification levels than smaller ones, which reduces credit risk (Dietrich and Wanzenried, 2011). Consequently, the relationship between SIZE and ASSQUAL could be negative. Nevertheless, previous research has shown that a positive relationship could also be possible, because a larger size can increase credit risk due to higher organisational complexity that may result in reduced management efficiency and less effective internal controls (Cetorelli et al., 2007). Furthermore, too big to fail banks are usually more protected by governments given their importance in the overall economy. This additional protection may lead larger banks to take greater risks (Mishkin, 1999).

CAP is the ratio of equity over assets (Avignone et al., 2021). Highly capitalised banks have more room to increase their credit risk exposure compared to less capitalised banks that are pushed to fulfil regulatory requirements (Gambacorta and Shin, 2018), potentially resulting in lower levels of asset quality. Thus, a positive coefficient for the variable CAP should be expected.

LOANDEP represents the ratio of loans to total deposits (Fries and Taci, 2005). If loans exceed the deposit base, there is a funding gap for which banks may need to access financial markets. Financial markets are more volatile than retail funding, and consequently banks with higher loan to deposits volumes would be riskier (Van den End, 2016), and this would imply a positive relationship between LOANDEP and ASSQUAL.

EFFIC is the cost to income ratio and denotes bank efficiency. More efficient banks tend to be more capitalised, thereby promoting stability and reducing risk. In addition, less efficient banks would have stronger incentives to assume higher levels of credit risk to compensate for increased costs and lost returns (Fiordelisi et al., 2011; Hughes and Mester, 2012). Hence, the variable EFFIC would have a significant and negative coefficient.

Δ GDP captures the real Gross Domestic Product (GDP) growth (De Bruyckere et al., 2013). Better economic conditions are expected to increase bank valuation and reduce risks. At the same time, economic recessions may amplify banking crises and deteriorate asset quality (Cantero-Saiz et al., 2019). Thus, we expect a negative and significant coefficient for the variable Δ GDP.

INFL represents the Consumer Price Index (CPI) (base quarter = 2017-Q2) and is a proxy for the inflation level (Twum et al., 2021). Higher inflation leads to increased costs and tend to impair credit quality. Additionally, high inflation implies macroeconomic instability and uncertainty, which can significantly increase credit risk (Foglia, 2008; Ghosh, 2015). Hence, the relationship between INFL and ASSQUAL should be positive.

Finally, we include quarter and country fixed-effect dummies to control for quarter- and country-specific factors. The error term is $\varepsilon_{i,t}$. $i = 1, 2, \dots, I$ represents a specific bank i ; $m = 1, 2, \dots, M$ indicates a particular country m ; and $t = 1, 2, \dots, T$ denotes a particular quarter t .

Table 2 shows a summary of the independent variables and their expected relationships with the dependent variable. Table 3 depicts the descriptive statistics of the variables and Table 4 represents their correlations. All regressions are run with bank-level clusters that allow for correlation in the error term, as suggested by Petersen (2009) and robust standard errors to control for heteroskedasticity and dependence (White, 1980).

4. Research results and discussion

4.1. Results of the baseline model

Table 5 shows the results of the baseline model. In Model (a), we consider the ratio of non-performing loans over gross loans as the dependent variable (NPL_LOANS), whereas in Models (b) and (c) our dependent variables are the ratio of impaired loans to equity (IL_EQ) and the ratio of impaired loans over gross loans (IL_LOANS), respectively. The R-squared is very high (greater than 0.9), showing that the model proposed provides a good fit for our data.

In all models in Table 5, the variable ESG has a negative and statistically significant coefficient. This result suggests that improvements in the ESG scores lead to a significant improvement in asset quality. However, the interaction term NON_EU*ESG is not significant, therefore this relationship turns out to be less important for the non-EU banks than the EU ones.

The variable ROE is negative and significant, which implies that improvements in the return on equity ratio are associated to a risk reduction for banks. Probably, under reasonable and stable levels of profitability, banks would use their additional resources, such as retained earnings, to accumulate capital and reduce risk, which could explain this result (Flannery and Rangan, 2006). We interact the

Table 2
Summary of the independent variables.

Variable	Proxy	Expected sign
ESG	ESG numerical scores (from 0 to 6) based on MSCI ESG ratings (from CCC to AAA)	Negative
NON_EU*ESG	Interaction term between ESG and NON_EU (Dummy variable: 1 (non-EU banks); 0 (EU banks))	Positive
ROE	Return on equity	Negative/ Positive
ESG*ROE	Interaction term between ESG and ROE	Positive
NON_EU*ESG*ROE	Interaction term between NON_EU, ESG and ROE	Positive
FUNDSTR	Deposits/ Assets	Negative
ASSTR	Loans/ Assets	Negative/ Positive
SIZE	Natural logarithm (Assets)	Negative/ Positive
CAP	Equity/ Assets	Positive
LOANDEP	Loans/ Deposits	Positive
EFFIC	Cost/ Income	Negative
ΔGDP	$(GDP_t - GDP_{t-1}) / GDP_{t-1}$	Negative
INFL	CPI (Base quarter = 2017-Q2)	Positive

Table 3
Descriptive statistics.

Variable	Mean	St. deviation	Minimum	Maximum
NPL_LOANS	2.6350	5.0940	0.0661	41.7506
IL_EQ	17.2104	32.8329	0.5714	272.3788
IL_LOANS	0.0264	0.0509	0.0007	0.4175
ESG	3.4967	1.2380	0	6
ROE	13.5633	7.6290	-11.6650	44.4150
FUNDSTR	0.7000	0.1657	0.2242	1.0668
ASSTR	0.5864	0.1337	0.2164	0.8724
SIZE	19.3966	1.3064	15.9179	21.9400
CAP	8.7282	2.8134	3.3747	17.3619
LOANDEP	0.8769	0.2762	0.2790	2.2603
EFFIC	53.6630	14.3400	16.2585	94.4187
ΔGDP	0.0100	0.0614	-0.2289	0.2428
INFL	107.9531	7.0839	97.7723	158.2193

Table 4
Correlations.

	ESG	ROE	FUNDSTR	ASSTR	SIZE	CAP	LOANDEP	EFFIC	ΔGDP	INFL
ESG	1									
ROE	0.1602	1								
FUNDSTR	-0.1119	0.1486	1							
ASSTR	-0.1194	-0.0945	0.3658	1						
SIZE	-0.0543	-0.2240	-0.3723	-0.4888	1					
CAP	-0.1850	0.0436	0.3292	0.2894	-0.4289	1				
LOANDEP	-0.0023	-0.1470	-0.6016	0.4475	-0.0727	-0.1220	1			
EFFIC	0.1595	-0.3853	-0.0002	-0.0998	0.0817	-0.0654	-0.0926	1		
ΔGDP	-0.1236	-0.0552	0.0610	-0.0454	0.0720	-0.0182	-0.1013	-0.2053	1	
INFL	0.0819	0.2315	0.2611	0.0458	-0.0782	0.0891	-0.1427	-0.0456	-0.1005	1

variable ESG with the return on equity indicator (ESG*ROE) and with the dummy NON_EU as well (NON_EU*ESG*ROE). Thus, we take into consideration that the effect of ESG on asset quality may vary for different values of ROE and for the EU and the non-EU banks. The results reported in Table 5 show that the interaction term ESG*ROE is not significant, whereas the interacted variable NON_EU*ESG*ROE has a positive and significant coefficient. It suggests that ROE alters more significantly the ESG – asset quality relationship for non-EU banks than for the EU ones. Regarding our control variables, ΔGDP shows a negative and significant coefficient. According to this result, better economic conditions would significantly reduce credit risks (Cantero-Saiz et al., 2019).

However, to interpret more in depth the ESG – asset quality relationship and how ROE moderates this relationship in both EU and non-EU countries, it is necessary to compute the marginal effect of the variable ESG on bank asset quality by taking the first derivative of Eq. (1) in relation to ESG:

$$\frac{\partial ASSQUAL_{i,t}}{\partial ESG_{i,t-1}} = \beta_1 + \beta_2 NON_EU_m + \beta_4 ROE_{i,t-1} + \beta_5 (NON_EU_m * ROE_{i,t-1}) \quad (1.1)$$

Table 5
Results of the baseline model.

	(a)	(b)	(c)
VARIABLES	NPL_LOANS	IL_EQ	IL_LOANS
ESG	-2.1753 ** (0.9387)	-15.2025 ** (6.0441)	-0.0218 ** (0.0094)
NON_EU*ESG	1.0942 (0.7706)	7.4630 (4.9065)	0.0109 (0.0077)
ROE	-0.3245 *** (0.1253)	-2.3540 *** (0.8531)	-0.0032 *** (0.0013)
ESG*ROE	0.0348 (0.0227)	0.2595 (0.1586)	0.0003 (0.0002)
NON_EU*ESG*ROE	0.0376 ** (0.0176)	0.2586 ** (0.1208)	0.0004 ** (0.0002)
FUNDSTR	-1.8341 (3.6331)	-5.5013 (22.8474)	-0.0183 (0.0363)
ASSTR	3.6269 (3.9871)	42.4711 (26.0187)	0.0363 (0.0399)
SIZE	0.0696 (0.2281)	1.0817 (1.3763)	0.0007 (0.0023)
CAP	0.3835 (0.2726)	1.1604 (1.6910)	0.0038 (0.0027)
LOANDEP	-1.6676 (2.4789)	-10.8652 (15.8743)	-0.0167 (0.0248)
EFFIC	-0.0067 (0.0236)	-0.0857 (0.1479)	-0.0001 (0.0002)
ΔGDP	-1.9710 * (1.0356)	-12.4120 * (7.2711)	-0.0197 * (0.0104)
INFL	0.1042 (0.0812)	0.7115 (0.5388)	0.0010 (0.0008)
Observations	904	904	904
R-squared	0.904	0.914	0.904
Number of ID	96	96	96
Robust standard errors	YES	YES	YES
Clusters	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES
Country Fixed Effects	YES	YES	YES

First, the results show the coefficients associated with each variable. Second, they depict the level of significance of each variable: *** indicates a level of significance of 0.01; ** indicates a level of significance of 0.05; and * indicates a level of significance of 0.1.

In Eq. (1.1), the marginal effect of ESG on asset quality depends on the dummy NON_EU and the profitability indicator (ROE), which is a continuous variable and, consequently, can adopt infinite values. Hence, to capture the marginal effect of ESG and its significance for all the possible values of ROE, we perform linear restriction tests of the sum of the coefficients β_1 , β_2 , β_4 and β_5 in Eq. (1.1) for different values of ROE and NON_EU, and we use plots to properly interpret the results. Since the dummy NON_EU only takes two possible values (0 or 1), the marginal effect in Eq. (1.1) is divided into two possible scenarios:

-First scenario: Non-EU countries (NON_EU dummy = 1):

$$\frac{\partial ASSQUAL_{i,t}}{\partial ESG_{i,t-1}} = \beta_1 + \beta_2 NON_EU_m + \beta_4 ROE_{i,t-1} + \beta_5 (NON_EU_m * ROE_{i,t-1}) \tag{1.1.1}$$

-Second scenario: EU countries (NON_EU dummy = 0):

$$\frac{\partial ASSQUAL_{i,t}}{\partial ESG_{i,t-1}} = \beta_1 + \beta_4 ROE_{i,t-1} \tag{1.1.2}$$

In the first scenario (Eq. (1.1.1)), $\beta_1 + \beta_2 NON_EU$ depicts the marginal effect of ESG for non-EU banks (NON_EU = 1) when ROE is zero. On the other hand, $\beta_1 + \beta_2 NON_EU + \beta_4 ROE + \beta_5 NON_EU * ROE$ shows the marginal effect of ESG for non-EU banks (NON_EU = 1) when ROE is different from zero. In the second scenario (Eq. (1.1.2)), β_1 captures the marginal effect of ESG for EU banks (NON_EU = 0) when ROE is zero. $\beta_1 + \beta_4 ROE$ represents the marginal effect of ESG for EU banks (NON_EU = 0) when ROE is different from zero.

Fig. 1 represents the marginal effect of ESG scores on bank asset quality in relation to ROE for each of our dependent variables (NPL_LOANS, IL_EQ and IL_LOANS) and for non-EU and EU banks. The dotted lines represent the 90% confidence interval (Aiken and West, 1991). Confidence intervals of 90% show when ESG scores have a statistically significant effect on asset quality (whenever both upper and lower bounds of the 90% confidence interval are either above or below zero). The plot of the first scenario (Eq. (1.1.1) and Model (a)), shows that if non-EU banks have a ROE equal or lower than 12.635%, the marginal effect is negative and significant, showing that an improvement in the ESG score is statistically associated to a reduction in the proportion of non-performing loans (i.e. to higher levels of asset quality). However, if ROE is greater than 12.635% and lower than 21.235%, the marginal effect is not

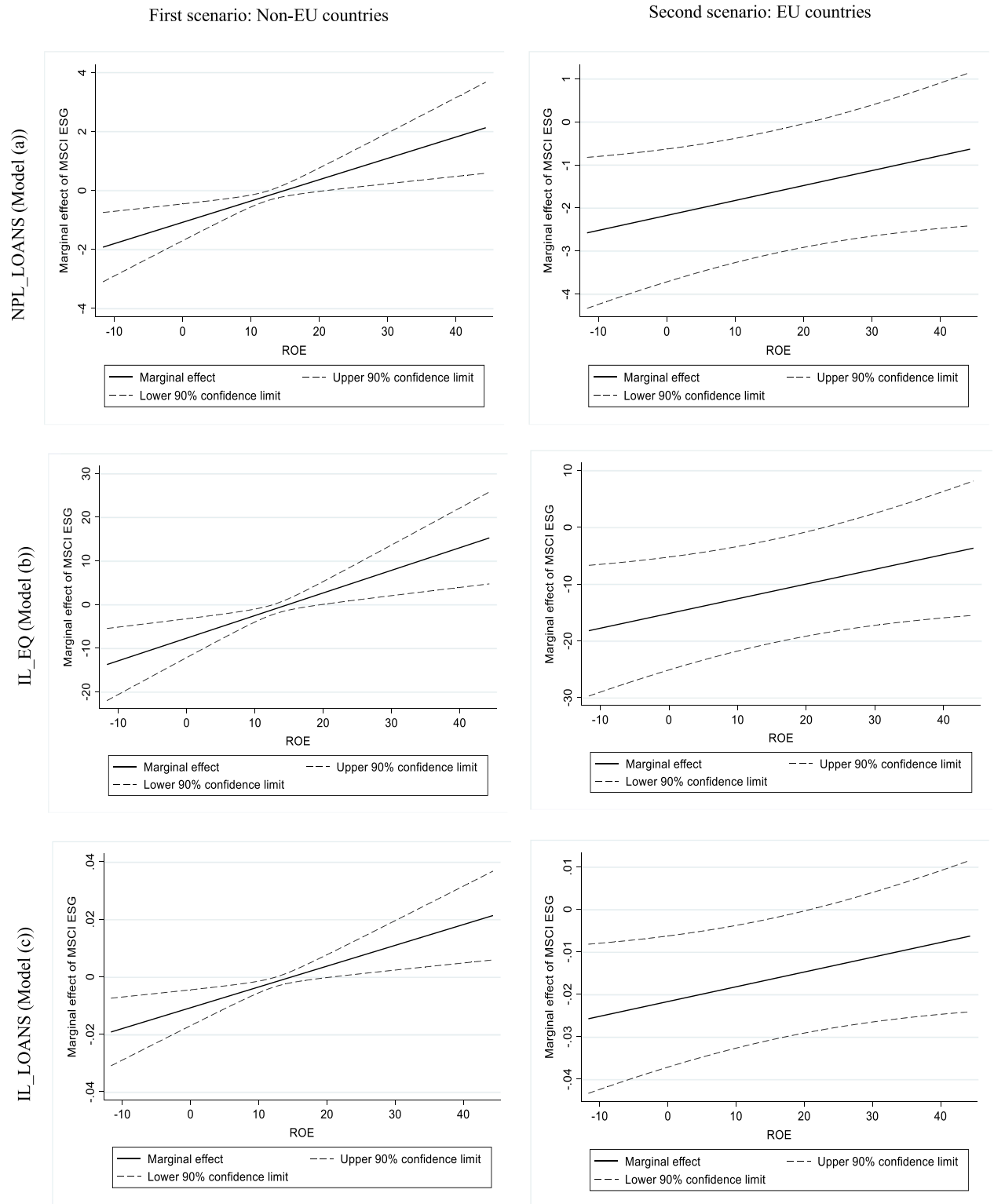


Fig. 1. Marginal effect of ESG on Asset quality. Based on Table 5, Baseline model.

significant because the upper bound of the 90% confidence interval is above zero, whereas the lower bound is below zero. Thus, for these banks any improvement in their ESG score would not significantly alter their level of non-performing loans. Finally, if ROE is greater or equal to 21.235%, the marginal effect is positive and significant, therefore better ESG scores are associated to an increase in credit risk and a deterioration in asset quality. These results, which partially support H1 and H2, suggest that high levels of profitability completely offset, or even reverse, the positive impacts that ESG has on asset quality. Plots of Models (b) and (c) report similar findings for the first scenario of non-EU banks.

Several aspects could justify our results. First, if profitability is moderate and stable, sustainable banks could behave according to the stakeholder theory and implement strategies aimed at reducing credit risk to consider all their stakeholders' needs (Freeman, 1984). Actually, banks with better ESG scores would be especially prudent in their lending practices and would invest less in risky projects, which would improve asset quality (Di Tommaso and Thornton, 2020). Second, banks with superior ESG performance would manage credit risks more effectively by financing sustainable firms that are less risky from an ESG perspective (Nandy and Lodh, 2012; Erragragui, 2018). Third, more sustainable banks are more concerned with financial stability issues and the adverse effects that banking crises have on the economy and the society. As a result, these banks would behave according to the ESG paradigm and avoid financial crises by preserving their own financial stability (Chiaramonte et al., 2021). Fourth, banks with better ESG scores would be more oriented towards the stabilisation of their long-term profits instead of focusing just on a short-term and highly volatile financial performance objective. In order to achieve this objective, they would manage ESG risks more effectively while at the same time keeping high quality assets (Kalfaoglou, 2021).

All of these strategies aimed at preserving bank stability and managing risks effectively would require moderate, but more stable profits that can be sustained in the long run (Kalfaoglou, 2021). These banks could be using their additional economic resources to improve their loan monitoring activities (Flannery and Rangan, 2006), which is why they would experience more modest (but stable) levels of profitability. However, if sustainable banks still prioritise financial performance and try to boost profitability beyond a reasonable level, they may probably need to implement risky, but potentially highly profitable, strategies that can eliminate the benefits of ESG in terms of asset quality improvement (Martynova et al., 2015). According to the skimping theory (Berger and DeYoung, 1997), these banks could be using their retained earnings to finance risky projects with high profitability expectations

Table 6
Results of the robustness check (replacing ROE with ROA).

	(a)	(b)	(c)
VARIABLES	NPL_LOANS	IL_EQ	IL_LOANS
ESG	-2.2386 * *	-15.9243 * *	-0.0224 * *
	(0.9737)	(6.4256)	(0.0097)
NON_EU*ESG	1.2604	8.8515 *	0.0126
	(0.7928)	(5.1841)	(0.0079)
ROA	-4.4760 * **	-31.8963 * **	-0.0448 * **
	(1.5936)	(11.0558)	(0.0159)
ESG*ROA	0.3331	2.5888	0.0033
	(0.3310)	(2.3282)	(0.0033)
NON_EU*ESG*ROA	0.5758 * *	3.9467 * *	0.0058 * *
	(0.2911)	(1.9824)	(0.0029)
FUNDSTR	-3.6708	-19.8814	-0.0367
	(3.8506)	(25.0722)	(0.0385)
ASSTR	4.8883	54.6819 *	0.0489
	(4.1759)	(28.2282)	(0.0418)
SIZE	0.0624	1.1129	0.0006
	(0.2259)	(1.3988)	(0.0023)
CAP	0.5241 *	2.1204	0.0052 *
	(0.3007)	(1.9049)	(0.0030)
LOANDEP	-2.7610	-19.6157	-0.0276
	(2.5644)	(16.7982)	(0.0256)
EFFIC	-0.0070	-0.0707	-0.0001
	(0.0211)	(0.1338)	(0.0002)
ΔGDP	-1.2362	-7.3089	-0.0124
	(0.8402)	(5.8332)	(0.0084)
INFL	0.0826	0.5395	0.0008
	(0.0757)	(0.4979)	(0.0008)
Observations	904	904	904
R-squared	0.903	0.910	0.903
Number of ID	96	96	96
Robust standard errors	YES	YES	YES
Clusters	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES
Country Fixed Effects	YES	YES	YES

First, the results show the coefficients associated with each variable. Second, they depict the level of significance of each variable: * ** indicates a level of significance of 0.01; * * indicates a level of significance of 0.05; and * indicates a level of significance of 0.1.

instead of supporting other safer strategies such as loan monitoring. Furthermore, if profitability ambitions become very high, it would be extremely difficult for banks to maintain such a high level in the long run and, as result, they would be much less stable and very prone to financial stability problems (Akhtaruzzaman et al., 2021). In this circumstance, banks would betray their shareholders' expectations experiencing even increases in credit risk, regardless of their attempts to improve their ESG scores. Therefore, the mere willingness of becoming more sustainable would not be enough to achieve significant credit risk reductions if banks do not really abandon this short-term profit maximisation perspective and do not achieve stable and realistic profitable levels that can be maintained in the long run to satisfy the demands of stakeholders.

The results of the second scenario (EU banks) in Fig. 1 (Eq. (1.1.2) and Model (a)) show that the marginal effect is negative and significant if ROE is equal or lower than 21.035%. For these EU banks, an improvement in the ESG score leads to a reduction in credit risk and, as a result, asset quality is enhanced. If ROE is greater than 21.035%, the marginal effect is not significant and ESG scores do not significantly affect asset quality. Contrary to non-EU banks, the ESG – asset quality relationship is never reversed in EU countries, regardless of the profitability levels. Again, these results partially support H1 and H2, and reveal that if profitability goes beyond a certain level, the beneficial effects of ESG initiatives on asset quality are completely vanished. Our results also support H3 and show that EU banks benefit more from ESG actions in terms of credit risk reduction and are less penalised by the moderating role of profitability. In this regard, EU banks enjoy significant credit risk reductions from ESG strategies for a much larger range of profitability (ROE < 21.035%) than non-EU banks (ROE < 12.635%). Additionally, the beneficial ESG – asset quality relationship is never reversed for EU banks, even if their profitability ambitions are very high. In the worst case, they just lack the credit risk alleviation associated to this type of strategies. As we mentioned previously, EU banks outperform non-EU banks in terms of ESG implementation. This aspect, along with the more advanced ESG regulation in this region could explain why ESG benefits on asset quality are more important in the EU (Cicchello et al., 2023). Plots of Models (b) and (c) report similar results for the second scenario of EU banks.

4.2. Robustness checks

As robustness checks we replaced the variable ROE with ROA. The results of this estimation, which are shown in Table 6 and in Fig. 2, are similar to those reported previously in relation to H1, H2 and H3, supporting the robustness of our baseline model. Different from the previous analyses, the control variable CAP shows a positive and statistically significant coefficient in Table 6, but only in Models (a) and (c), whereas it is not significant in Model (b). Similarly, ASSTR is significant and positive, but only in Model (b). Since the results of the variables CAP and ASSTR are not consistent across all the estimations, there is not conclusive evidence in our sample about the impact of bank capital or asset structure on asset quality.

Given that the ESG scores of different providers are poorly correlated (Berg et al., 2022), we performed another robustness test by replacing the MSCI ESG scores with the ESG scores provided by Bloomberg (BLOOM_ESG).¹⁰ Similarly to those provided by MSCI, also Bloomberg ESG scores summarise bank performance and disclosures for environmental, social and governance pillars. These scores range from 0 to 10 (with 10 representing the highest score).¹¹ Results shown in Table 7 and in Fig. 3 support the trend identified in the baseline model, with the only difference that the moderating role of profitability is slightly more pronounced for both groups of countries.¹²

5. Conclusions and implications

This article analyses how ESG affects bank asset quality. We also test how these effects are conditioned by the profitability of each bank and the region where it operates (non-EU vs. EU). Using quarterly data of 96 banks from 33 countries (904 observations) between 2017-Q4 and 2022-Q3, we find that in the non-EU countries, an improvement in the ESG scores leads to a reduction in credit risk and, hence, improves asset quality, but only for banks with low or moderate levels of profitability. However, if profitability becomes relatively high, any attempt to improve ESG performance would not significantly affect credit risk. Moreover, if profits are very high, the ESG – asset quality relationship may be reversed and an increase in ESG scores is associated to an increase in credit risk. EU banks benefit more from the credit risk reduction associated to an increase in the ESG score since asset quality improves for a larger range of profitability. Moreover, for these banks, the ESG – asset quality relationship is never reversed regardless of the profitability level achieved. In the worst case, when profitability becomes relatively high, asset quality is not significantly affected by ESG scores. Therefore, EU banks are less penalised than their non-EU peers by the moderating role of profitability in the ESG – asset quality relationship.

These results are very relevant because they suggest that high profits would offset, or even reverse, the positive effects that ESG scores have in terms of asset quality and credit risk reduction, which have important implications. First, our findings suggest a new

¹⁰ For this analysis we removed banks with no ESG data in Bloomberg. The new sample includes 95 banks from 2017-Q4 to 2022-Q3 and for the same 33 countries as the baseline model (896 observations). For consistency with our baseline model, we transformed Bloomberg annual ESG data into quarterly data by using linear interpolation (Amore and Bennedsen, 2016).

¹¹ See more information at <https://www.bloomberg.com/professional/product/esg-data/>.

¹² As an additional robustness test, we replaced the variable measuring bank asset structure (ASSTR) with the ratio between liquidity and short-term funding (LIQ), measuring bank liquidity. We perform this test because these variables are highly correlated with each other, and consequently we cannot include both of them in our regression model due to potential multicollinearity problems. The results of this test are similar to those of the baseline model. For the sake of brevity, these results are not included in the article but are available from the authors upon request.

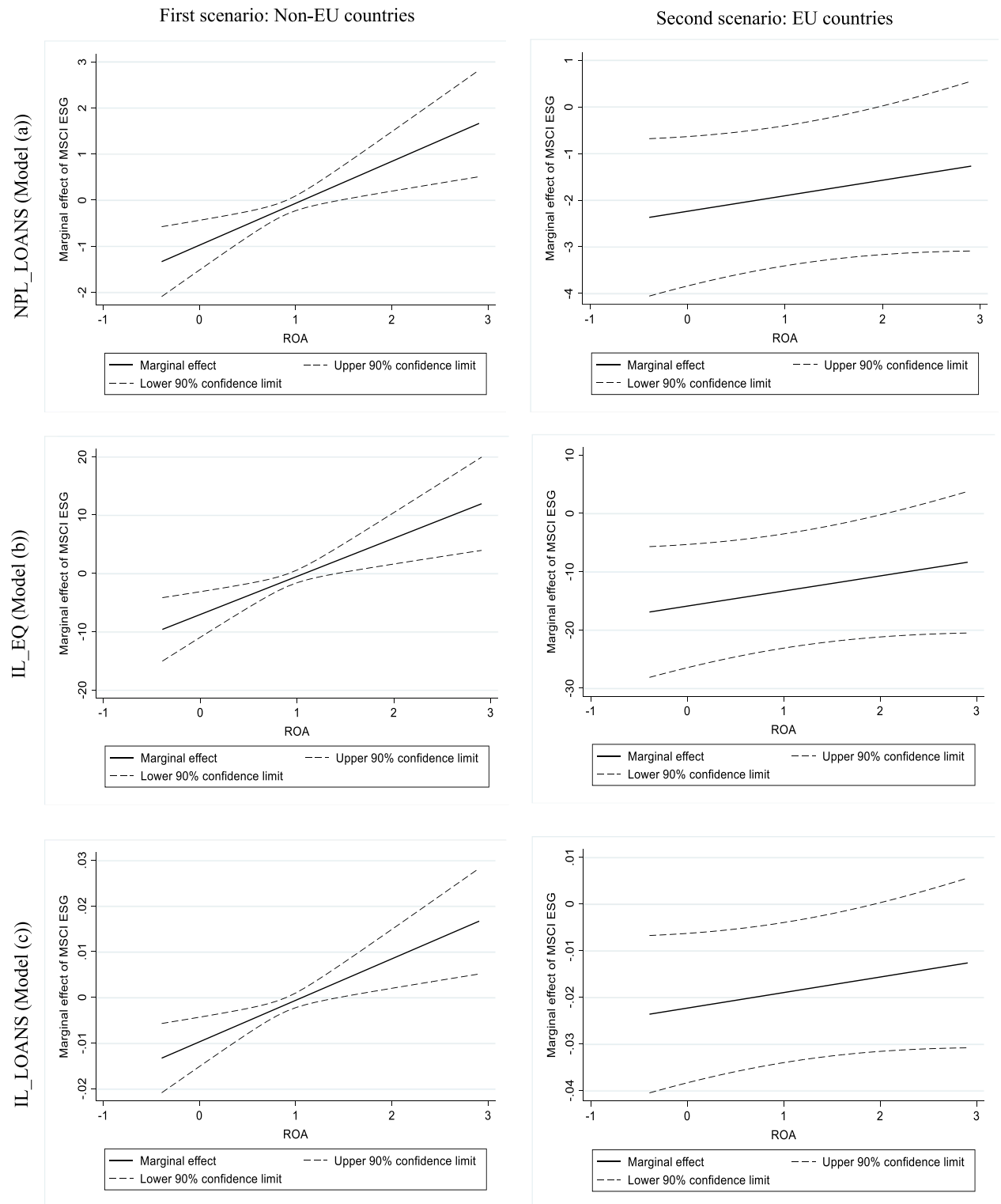


Fig. 2. Marginal effect of ESG on Asset quality. Based on Table 6, Robustness check (replacing ROE with ROA).

Table 7

Results of the robustness check (replacing MSCI ESG scores with Bloomberg ESG scores).

	(a)	(b)	(c)
VARIABLES	NPL_LOANS	IL_EQ	IL_LOANS
BLOOM_ESG	-1.3768 *	-11.5651 *	-0.0138 *
	(0.8294)	(6.2574)	(0.0083)
NON_EU*BLOOM_ESG	0.9181	7.2172	0.0092
	(0.7903)	(5.8168)	(0.0079)
ROE	-0.2820 **	-2.0975 **	-0.0028 **
	(0.1270)	(0.9619)	(0.0013)
BLOOM_ESG*ROE	0.0433 *	0.3144 *	0.0004 *
	(0.0229)	(0.1787)	(0.0002)
NON_EU*BLOOM_ESG*ROE	0.0330	0.2399	0.0003
	(0.0242)	(0.1772)	(0.0002)
FUNDSTR	2.0403	16.9742	0.0204
	(3.3386)	(22.8447)	(0.0334)
ASSTR	-0.2948	21.7147	-0.0029
	(3.1717)	(23.4642)	(0.0317)
SIZE	-0.0638	0.6591	-0.0006
	(0.1743)	(1.1137)	(0.0017)
CAP	0.1647	-0.3688	0.0016
	(0.1758)	(1.2101)	(0.0018)
LOANDEP	2.2739	15.0055	0.0227
	(2.0347)	(14.6163)	(0.0203)
EFFIC	0.0008	-0.0080	0.0000
	(0.0156)	(0.1125)	(0.0002)
ΔGDP	-1.9328	-13.4261	-0.0193
	(1.2951)	(9.8523)	(0.0130)
INFL	0.0958	0.7002	0.0010
	(0.1160)	(0.8604)	(0.0012)
Observations	896	896	896
R-squared	0.926	0.936	0.926
Number of ID	95	95	95
Robust standard errors	YES	YES	YES
Clusters	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES
Country Fixed Effects	YES	YES	YES

First, the results show the coefficients associated with each variable. Second, they depict the level of significance of each variable: ** indicates a level of significance of 0.05; and * indicates a level of significance of 0.1.

paradigm in the banking industry where short-term profit maximisation priorities should be abandoned in favour of the adoption of new strategies that really consider all stakeholders' needs. For instance, banks can orient their competitive advantages towards other non-financial aspects such as ethical issues, reputational aspects or a differentiated business culture where economic profit is a mean to achieve other superior objectives in line with the ESG paradigm. Second, policymakers should reinforce their strategies to promote financial stability. For example, supervisory interventions could be a useful tool to ensure that banks use their additional resources to effectively reduce credit risk instead of transferring them to other risky and highly profitable investments, resulting in a safer, more stable and more sustainable banking sector. Third, since ESG benefits for the banking sector are more important in EU, non-EU countries should move towards stricter regulations on ESG disclosure and standardisation so that differences between EU and non-EU countries are reduced and all banks can fully benefit from their sustainable practices. Finally, ESG practices still raise some concerns among bank managers due to their costs and their possible profitability losses. However, our results suggest that these strategies can also provide important benefits to banks in terms of asset quality. This fact could allow banks to improve their image and reputation, which could lead to superior and, most importantly, sustainable earnings in a long-term perspective. Therefore, not only banks could achieve sustainability objectives for the benefit of the society, but also serve their own commercial interests, for the benefit of their shareholders.

We acknowledge that our empirical analysis is affected by some limitations. In particular, although its international coverage, our sample is limited to 96 banks which may not be fully representative of the whole banking industry at worldwide level. In addition, even though it includes both developed and developing countries, the majority of the banks of our sample are located in developed countries and, consequently, our findings may not necessarily be generalised to developing countries. We leave to future research the analysis of larger samples that include more banks located in developing countries.

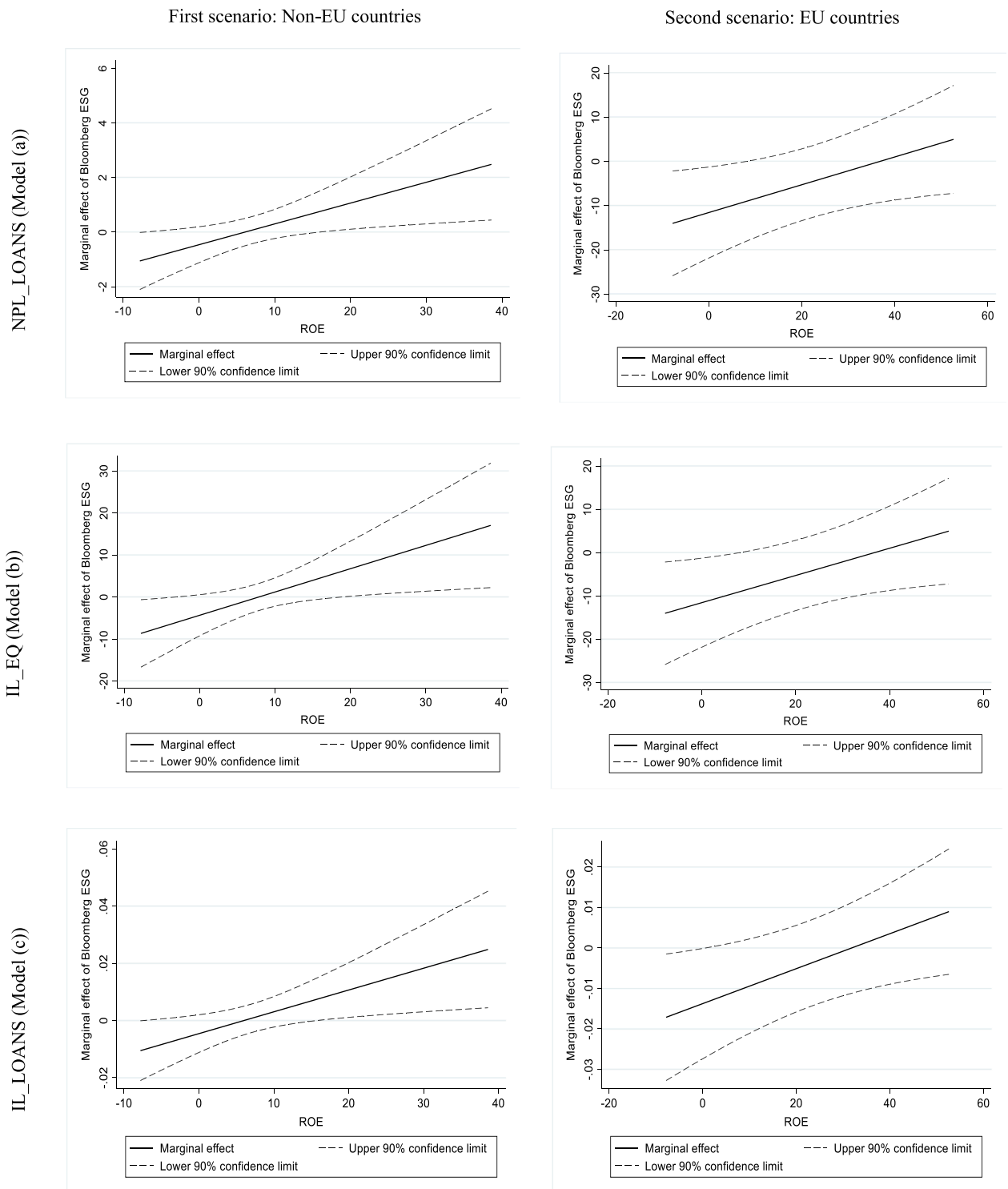


Fig. 3. Marginal effect of ESG on Asset quality. Based on Table 7, Robustness check (replacing MSCI ESG scores with Bloomberg ESG scores).

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CRedit authorship contribution statement

Polizzi Salvatore: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Cantero-Saiz María:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Scannella Enzo:** Conceptualization, Investigation, Supervision, Validation, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

None.

Data Availability

The authors do not have permission to share data.

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