ESG activity and bank lending during financial crises

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Abstract

This paper explores how banks' environmental, social, and governance (ESG) activities affect their lending during financial crises. We use a sample of European listed banks with available ESG scores from 2002 to 2020 and consider the global financial crisis of 2007-2009 and the European sovereign debt crisis of 2010-2012. We estimate a two-step system GMM dynamic panel data model and also address potential endogeneity with instrumental variable (IV) estimations. We find that lending falls to a lesser extent for banks with higher ESG scores during crisis times. An investigation of the different potential channels shows that, during crises, banks more engaged in ESG activities are less affected in terms of credit risk, asset risk, and profitability. They also face a lower reduction in market funding, allowing them to downsize to a lesser extent during crises, and their deposit rates do not increase as much as in less ESG-engaged banks. A deeper investigation reveals that our findings mainly hold for banks focused on traditional lending and deposit activities and are essentially driven by the environmental pillar component of ESG scores and the global financial crisis of 2007-2009.

JEL classification: G01, G21, G30

Keywords: Environmental Social Governance (ESG) scores, Bank Lending, Bank Risk, Environmental pillar, Financial Crisis, European banks

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1. Introduction

There has been a growing interest in corporate social responsibility (CSR) and environmental, social, and governance (ESG)[1] from researchers, practitioners, and regulators, especially after the 2007-2009 global financial crisis (GFC) and more recently in the wake of the COVID-19 pandemic. Firms increasingly face internal and external pressures to improve their non-financial performance, and they consider ways to mitigate the negative environmental and social impacts to address the emerging needs of society. There are many empirical studies on how ESG activities influence non-financial firm performance, and the findings are mixed. Some studies find that ESG activities boost firm performance by providing product differentiation and reducing systematic risk (Albertini, 2013; Friede et al., 2015; Broadstock et al., 2020; among others). Others claim that ESG activities might generate inefficiently allocated capital, lead to opportunity costs and that the relationship is neutral or even negative (Devinney, 2009; Oikonomou et al., 2012; Dixon-Fowler et al., 2013; Santis et al., 2016; among others).

Despite a considerable body of literature on its influence on non-financial firms, whether and how ESG engagement impacts financial institutions, particularly banks, has been relatively less explored. Banks have been in the spotlight to be more responsible to their customers and make more sustainable lending decisions, as they are the main funders of the fossil fuel sector that caused global warming (Hasan et al., 2022; Houston and Shan, 2022)[2]. Some recent studies have focused on how banks' ESG activity impacts bank value (Azmi et al., 2021) and bank stability (Di Tommaso and Thornton, 2020; Chiaramonte et al., 2021), also providing conflicting findings. This mixed evidence points to a need to better understand the conditions under which ESG activity is likely to influence bank outcomes. In this paper, we explore how ESG activities affect banks' lending during financial crisis times.

Growing evidence supports the view that, during crisis times, non-financial firms with better ESG engagement have lower downside risk, and they are more resilient in terms of market performance (Lins et al., 2017; Albuquerque et al., 2020; Hoepner et al., 2021; Broadstock et al., 2021). Albuquerque et al. (2019) develop a theoretical model where ESG investments help firms improve their product differentiation, leading to a more loyal customer base and a lower price elasticity of demand in response to aggregate shocks. Very few studies specifically focus on how ESG activities impact bank behavior during turbulent times; Cornett et al. (2016) and Chiaramonte et al. (2021) are some exceptions. These studies document that banks with higher ESG engagement have better financial performance and stability during crises, such as the GFC. But, whether and how ESG activities affect individual bank lending during financial crises remains an open question. To the best of our knowledge, no studies explore this issue.

Understanding how ESG activity affects bank lending, especially in crisis times, is essential because banks are greatly linked to environmental degradation through their lending activities. Banks rely on substantial resources from society, as most of their funding originates from depositors. They play a crucial role in allocating funds by considering the needs and preferences of savers and investors into appropriate capital investments (Scholtens, 2006). With their role as financial intermediaries and credit providers, they contribute to the development of the economy (Levine, 2005; Scholtens, 2009). Financial crisis times are characterized by higher information asymmetries (Flannery et al., 2013). During such times, banks face an overall decrease in funding, and thus they prefer lending to borrowers with whom they have a longer

[1] CSR and ESG are increasingly used interchangeably in the literature.

[2] The 60 largest commercial and investment banks have invested into the fossil fuel sector by more than USD 3.8 trillion between 2016 and 2020 (Hasan et al. 2022).

lending relationship. Moreover, banks become more cautious about lending due to the potential increases in loan defaults, leading to an overall reduction in lending (Ivashina and Scharfstein, 2010; Lou and Yin, 2014; Cubillas and Suárez, 2018). Such reductions in the credit supply in crisis times have severe implications on the real economy, propagating the overall decrease in investments or employment (Berger et al., 2020). Hence, whether banks' involvement in ESG activities could influence their behavior in terms of lending during crisis times is an important question. If bank lending is differently affected because of banks' engagement in ESG principles, the implications for the real economy could be very different.

Critics of banks and some environmental lobby groups are skeptical of banks' real motives for integrating ESG considerations in their activities. They argue that banks have prioritized maximizing their profits in the short-term over longer-term sustainability goals; the recent subprime mortgage crisis is given as an example (Cornett et al., 2016). However, there is growing evidence that banks address carbon risk within their lending decisions, incorporated through credit risk assessment criteria and the cost of debt (e.g., Jung et al., 2018; Herbohn et al., 2019). They offer lower loan rates to firms with better corporate social responsibility performance (Cheung et al., 2018). They are motivated to boost their corporate social responsibility reputation to attract more creditworthy borrowers (Wu and Shen, 2013; Herbohn et al., 2019). They offer savings accounts that support socially and environmentally responsible projects (Scholtens, 2009). Houston and Shan (2022) document that banks are concerned about the ESG performance of their potential borrowers due to financial and reputational motivations. Specifically, they find that banks with strong ESG performance are more likely to lend to borrowers with better ESG ratings and positively influence the borrower's future ESG performance. Consistent with this, recent research has documented an association between firms' sustainability performance and loan pricing (Chava, 2014; Hasan et al., 2017; Hauptmann, 2017). Hasan et al. (2022) find that banks' commitment to better climate-related disclosures causes the borrowing firms to reduce polluting behavior and improve their environmental ratings.

The theoretical literature on the potential relationship between ESG and firm value is based on two main opposing views. The "overinvestment view" states that managers tend to overinvest in ESG for their personal benefits arising from agency theory or to gain support from society, and these investments are accepted as a waste of resources (Cespa and Cestone, 2007; Barnea and Rubin, 2010). Meanwhile, the "stakeholder theory" asserts that ESG investments benefit all stakeholders. By lowering idiosyncratic risk, asymmetric information, and agency costs, such investments are expected to reduce the cost of capital (Godfrey, 2005; El Ghoul et al., 2011; El Ghoul and Karoui, 2017) and improve access to finance (Cheng et al., 2014). If, as argued by the literature, firms with better ESG engagement are less severely impacted during crisis times than less engaged firms (Lins et al., 2017; Albuquerque et al., 2020; Hoepner et al., 2021; Broadstock et al., 2021), we should expect banks to continue to fund such entities more easily at the detriment of other firms. If, as documented in the literature (Houston and Shan, 2022; Hasan et al., 2022), banks with higher ESG scores are already engaged with firms with stronger ESG engagement, then we would also expect ongoing bank-firm relationships to be less likely interrupted, and overall lending activities consequently less affected during turmoil.

Our empirical analysis uses a sample of 83 European commercial banks with annual ESG scores available[3] from 2002 to 2020. We investigate the influence of ESG activity on bank lending

[3] We use ESG-related data from Thomson Reuters ASSET 4 which is one of the most comprehensive databases that contains more than 450 different historically available ESG metrics and widely used in the literature (Esteban-Sanchez et al., 2017; Albuquerque et al., 2020; Bătae et al., 2021; Chiaramonte et al., 2021; among others).

during financial crisis times, i.e., considering both the GFC in 2007-2009 and the sovereign debt crisis in 2010-2012. In our baseline estimations, to account for the dynamic nature of lending, we conduct two-step system GMM dynamic panel data estimation techniques. Empirical studies testing the impact of ESG on firm performance or other outcomes suffer from identification issues. Indeed, whether ESG activities are actually beneficial for firms or whether more profitable firms engage in such activities simply because they can afford remains an open question (Albuquerque et al., 2020). We address this empirical challenge by also conducting two-stage least squares (2SLS) estimations with instrumental variables. Our findings reveal that while all banks in our sample decrease their lending during crisis times, banks with higher ESG scores are less affected. Such banks can still, to some extent, continue to lend, whereas banks that are less ESG-engaged experience more difficulties performing their intermediation function. The findings are robust to alternative estimation methodologies, controlling for macroeconomic conditions and the COVID-19 health crisis.

To go deeper, we examine the channels through which ESG activity affects bank lending during times of crisis. Specifically, we explore the impact of ESG on bank risk, banks' pricing behavior, and the components of their balance sheets in crisis times. Banks that are perceived as less affected by rises in credit risk and overall asset risk are more likely to maintain their lending activities than their peers. The same would hold for institutions suffering from a lower fall in profitability during turmoil or whose depositors are less likely to run or require higher interest rates. The structure of bank funding during uncertain times also has an important effect on bank lending (Ritz and Walther, 2015). Banks that are more likely to attract depositors who withdraw their holdings from jeopardized banks will also be able to lend more (Cornett et al., 2011; Acharya and Naqvi, 2012; Barry et al., 2020). During crisis times, there is a dry-up in the wholesale funding market, and banks face market funding liquidity shocks which are directly propagated into bank lending (Brei et al., 2013; De Haan and van den End, 2013). The market would be more confident to lend to banks that are perceived as safer and such banks would have more funding sources to continue their lending activities.

We document that while crisis times negatively affect credit risk, and more generally, asset risk for all banks, banks with stronger ESG engagement are less impacted, possibly explaining that lending can continue to take place more easily during stressful periods. We also show that banks with higher ESG scores face a relatively lower decrease in their profitability and that the depositors of these banks request a lower increase in deposit rates in crisis times. Such banks are also the ones that suffer less from a fall in market funding and that downsize their balance sheet to a lesser extent during crises.

In further analyses, we go deeper and investigate the influence of banks' business models on the moderating impact of ESG on the decrease in lending during crisis times. We find that our results mainly originate from banks focused on traditional deposit and lending activities and that are less diversified into noninterest activities. Such banks are those that are the least affected in terms of lending during financial crises when they have a higher ESG score. This finding is consistent with the literature showing that traditional banking activities are more stable over time due to higher switching and information costs and lower correlation with the business cycle than non-interest activities (such as trading, and commission and fee activities) (DeYoung and Roland, 2001; Lepetit et al., 2008a; Lepetit et al., 2008b; Meslier et al., 2014; Köhler, 2015). If such traditional banking-oriented institutions are more engaged with high ESG firms and relationship banking, we would expect them to be less affected by a decrease in lending during the turmoil.

We also perform some additional analyses and find that our results are mainly driven by the environmental pillar component of the ESG score. As awareness of environmental issues progressively increases, it is not surprising that this component has the highest impact on lending in turbulent times (Azmi et al., 2021). Considering the strategic role banks play in funding environmental impact projects, investors are more likely to favor banks that focus on environmental issues such as climate change and air pollution. We also disentangle the financial crisis periods (GFC in 2007-2009 and the European sovereign debt crisis in 2010-2012). Our results mainly hold during the GFC period.

Our paper contributes to the literature in several ways. First, we contribute to the recently emerging field of research (Cornett et al., 2016; Chiaramonte et al., 2021; Broadstock et al., 2021) on the impact of ESG on bank performance in crisis times and provide further insights by documenting that banks with higher ESG engagement are less negatively affected in terms of lending during turbulent times. Such banks are hence better able to perform their intermediation function when the economy strongly needs such support. Second, we focus on European banks as an empirical context. European banks have pioneered in sustainability implementations compared to those headquartered in other regions (Ho et al., 2012; Chiaramonte et al., 2021). In line with the rising importance of climate change and growing evidence of its financial impact on banks, there have been significant regulatory developments in Europe to improve non-financial information and diversity disclosure[4]. For instance, the Non-Financial Reporting Directive (2014/95/EU) took effect in 2014, and banking stress tests start to include climate-related risks in 2022. Third, we provide deeper insights on the channels of how ESG engagement might help banks to be less negatively impacted during crisis times. Our findings have important implications that support the regulatory initiatives regarding improved disclosures on non–financial reporting. Better standards for ESG disclosures are increasingly helpful for financial decisions, and governments and regulators need to focus on the proliferation of policies and standards.

The rest of the paper is organized as follows. Section 2 presents the data, variables, and the approach we use for our empirical investigation. Section 3 discusses the empirical findings, and Section 4 provides conclusions and policy implications.

2. Data, variables, and methodology

2.1. Data sources and sample

Our bank-level data is from Thomson Reuters Refinitiv Eikon (formerly known as Datastream Eikon), and ESG-related data is taken from the Thomson Reuters ASSET4 database. We focus on publicly listed commercial banks headquartered in Europe. We extract bank-level data for 182 listed banks in Thomson Reuters Refinitiv Eikon. We restrict our sample to banks with annual ESG-related data available for at least three consecutive years between 2002 and 2020. We collect year-end observations over a relatively extended period, 2002-2020[5]. Our final

[4] The Non-Financial Reporting Directive (2014/95/EU) took effect in 2014; and it requires some large companies, including banks, to provide information on how they work on social and environmental practices, how much they respect human rights or diversity on board of directors (Chiaramonte et al., 2021). Moreover, the European Central Bank (ECB) announced in November 2020 that banking stress tests starting from 2022 capture climate-related risks (ECB, 2020). The ECB requires banks to properly manage and clearly disclose such risks.

[5] We start the sample in 2002 because ESG scores are not available prior to that year.

sample is comprised of 83 publicly listed commercial banks from 20 European countries[6]. The data regarding country controls are from the World Bank World Development Indicators and the World Bank Global Financial Development Databases.

2.2. Variables

A brief description of variables, data sources, and summary statistics are presented in Table 1.

>>> INSERT TABLE 1 HERE<<<

2.2.1. Dependent variables

The main dependent variable to measure lending activity is the logarithm of the yearly growth rate of total loans (*LOANGRW*). For robustness, we also use the change in loans to total assets ratio calculated as the year-to-year difference of total loans normalized by total assets at the beginning of the period *(*Δ*LOANS_TA*). Table 1 indicates that the average lending growth in our sample is 5.26%.

2.2.2. ESG variables

ESG-related variables are extracted from the Thomson Reuters ASSET4 database, which contains scores that measure a company's environmental, social, and governance performance and commitment since 2002. These scores are calculated by content research analysts trained to collect ESG data, and they are based on publicly reported company-level data such as annual company reports and corporate social responsibility reports, stock exchange filings, and the news media. The scores are grouped into ten categories[7] that form the three pillar scores (environment, social, and governance) and the combined score[8]. This paper uses the combined ESG score (*ESG*), which ranges from 1 to 100. For robustness, we also use the change in ESG score (*ESG CHANGE*) calculated as the annual percentage change in the ESG score. We observe in Table 1 that the average *ESG* in our sample is 49.05, with a standard deviation of 19.50, showing a high variability.

Figure 1 shows the behavior of *ESG* and *LOANGRW* through time between 2002 and 2020. We take the yearly averages of the variables to generate the series. Figure 1 shows that there is a strong decrease in lending during crisis times for the years between 2008 and 2012, covering both the GFC and the sovereign debt crisis. Moreover, after both crises, lending has not grown as much as it had in the three years before the GFC. Meanwhile, although the crisis years show a slowdown, there is an overall improvement in the average ESG scores of banks in our sample, consistent with the progressive increase in the awareness of environmental and social issues among banks.

<<<INSERT FIGURE 1 HERE<<<

In our additional analysis, we explore whether the components of ESG scores differently affect lending during crisis times. For this purpose, we use the three pillars of ESG scores.

[6] These countries are Austria, Belgium, Cyprus, Czech Republic, Denmark, Finland, France, Georgia, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Poland, Portugal, Romania, Spain, Sweden, and the United Kingdom.

[7] The ten categories for the three pillars are explained in detail in Table 1.

[8] The combined ESG score is a weighted average of the categories that differ per industry for the environmental and social pillars. For the categories in the governance pillar, the weights are the same across the industries.

Specifically, the environmental pillar score (*ENV*) captures reported environmental performance and commitment regarding resource use, emissions, and innovation. The governance pillar score (*GOV*) shows the governance-related information capturing the commitment to following best practice corporate governance principles and the effectiveness of equal treatment of shareholders. The social pillar score (*SOC*) considers workplace, human rights, community, and product responsibility-related activities. All indices range from 1 to 100. Table 1 shows that the average scores of *GOV* (54.18) and *SOC* (54.72) are higher than those of *ENV* (47.37). The standard deviation of *ENV* is also higher (33.43) than those of *GOV* and *SOC* (24.76 and 23.66, respectively), indicating a higher variation in the environmental performance scores of major banks in Europe.

2.2.3. Control variables

We control for a range of bank and country-level variables following the extant literature on the determinants of bank lending (Kim and Sohn, 2017; Ananou et al., 2021; Bilgin et al., 2021). Bank-level controls include the differences in bank size (*SIZE*) calculated as the natural logarithm of total assets; the share of non-performing loans in gross loans (*NPL*); and differences in capitalization (*CAPITAL*) calculated as the ratio of bank equity to total assets.

To account for differences in macroeconomic environments and banking markets, as country-level controls, we use GDP growth (*GDPGRW*), measured as annual GDP per capita growth[9], the inflation rate (*INFLATION*), and bank concentration (*CONCENTRATION*), calculated as the total assets of the five largest banks as a share of the total assets of the entire bank universe in the country (Soedarmono et al., 2013; Danisman and Demirel, 2019).

Table 2 presents the correlation coefficients among the independent variables in the baseline estimations, indicating no major collinearity issues.

>>> INSERT TABLE 2 HERE<<<

2.3. Methodology

Our regressions are conducted using yearly panel data estimations for the sample of 83 publicly listed commercial banks from 2002 to 2020. We explore the relationship between ESG activities and bank lending during crisis times in an empirical setting accounting for potential endogeneity issues. Following Wintoki et al. (2012) and Chiaramonte et al. (2021), we use the system generalized method of moments (GMM) estimator built by Blundell and Bond (1998) and Arellano and Bover (1995) with Windmeijer-corrected standard errors (Winmeijer, 2005) to account for endogeneity[10].

System GMM combines the first differences with the level form, i.e., the regressions are estimated in levels and first differences simultaneously. The method reduces any biases and imprecision that would be associated with the first difference GMM. Meanwhile, it controls for heterogeneous endogeneity that might result from time-invariant variables. It captures the dynamic structure of the relationship between bank lending, ESG activity, and the crisis.

[9] We obtain similar findings when we use annual GDP growth instead of annual GDP per capita growth. The results are available upon request.

[10] As a robustness check, we also use a bank fixed-effects panel data regression model (as confirmed by the Hausman test) by clustering the standard errors at the bank level. Our results are available upon request, and they are broadly in line with the GMM findings.

Therefore, since the System GMM methodology can handle dynamic relationships, in our setting, which focuses on loan growth, it is expected to be superior to standard panel data techniques such as Fixed and Random Effects models. We consider the lagged dependent variable as endogenous and the rest of the explanatory variables as exogenous. We use the second and higher order lags and differences of the dependent variable as instruments to address endogeneity resulting from including the lagged dependent variable as an explanatory variable. We keep the number of instruments smaller than the number of groups (Roodman, 2009). We test for over-identifying restrictions using the Hansen test and also test for the first-order and second-order autocorrelation.

Our baseline specification to test the effects of ESG on bank lending in crisis times is as follows:

$$LOANGRW_{i,t} = LOANGRW_{i,t-1} + \beta_1 CRISIS_t + \beta_2 ESG_{i,t-1} * CRISIS_t + \beta_3 ESG_{\ i,t-1} + \beta_4 COVID_t + \theta' X_{i,t-1} + \vartheta' Y_{j,t-1} + \alpha_j + \varepsilon_{it} \quad (1)$$

where i stands for banks, j for countries, and t for years. All explanatory variables are lagged by one year to alleviate any potential reverse causality problems. Our main dependent variable is *LOANGRW*. We include the first lag of *LOANGRW* as an explanatory variable because first-order autocorrelation is present in the error terms. *ESG* stands for overall bank-level ESG scores. *CRISIS* is a binary indicator that equals one between 2007 and 2012, capturing both the GFC (2007-2009) and the European sovereign debt crisis (2010-2012), and zero otherwise. These two crises have originated in the credit markets and are rooted in the financial sector, which has led to a broad distrust in financial firms. Meanwhile, the COVID-19 pandemic started from public health concerns, not due to economic conditions (Albuquerque et al., 2020), and it should be treated differently from the two financial crises. But the potential negative impact of COVID-19 on bank lending also needs to be controlled in the estimations. For this purpose, we include the binary indicator variable, *COVID*, in Equation 1, which equals 1 for the year 2020 and 0 otherwise.

We include the interaction variable *ESG*CRISIS* in Equation 1 to explore the influence of ESG during crisis times. Our coefficient of interest is $\beta_1 + \beta_2$, i.e., the sum of the coefficients of the *ESG*CRISIS* and the *CRISIS* variables. A negative and significant $\beta_1 + \beta_2$ and positive and significant β_2 would show that lending falls for all banks in the sample during the crisis but to a significantly lesser extent for higher ESG banks. X stands for bank-level control variables, and Y for country controls. We use country-fixed effects that diminish omitted variable problems, such as differences in macroeconomic conditions, policy applications, and accounting and regulatory practices.

3. Results

3.1. Baseline results

The baseline findings are displayed in Table 3. The regressions are estimated using the two-step system GMM estimators. As argued above, the first lags of explanatory variables are used to mitigate any potential reverse causality issues. Robust-Windmeijer corrected standard errors are given in parentheses. Country fixed effects are included in all specifications. At the bottom of the table, we report the Hansen test p-values, the insignificance of the statistics confirming the validity of the instruments. Moreover, we provide AR(2) second-order autocorrelation tests at the bottom of the table, the insignificance of the statistics showing no second-order serial correlation in the error terms.

Model 1 presents the baseline estimations and uses *LOANGRW* as the dependent variable. The sum of the coefficients of *CRISIS* ($\beta 1$) and *ESG *CRISIS* ($\beta 2$) presented at the bottom of the table is significant and negative at the 1% level. Meanwhile, the coefficient of the interaction term $\beta 2$ is positive and significant at the 1% level, indicating that ESG activity mitigates, to some extent, the fall in bank lending during crisis periods. In terms of economic magnitude, a one-standard-deviation increase (19.50) in *ESG* in crisis times mitigates the decrease in bank lending by 3.2% (19.50*0.164%), and the overall decrease in bank lending corresponds to -8.74% (-11.939%+3.2%). Model 2 uses an alternative dependent variable, Δ*LOANS_TA,* and Model 3 uses an alternative ESG proxy, *ESG CHANGE*. Our results continue to hold in both models 2 and 3. Models 4 and 5 are estimated on subsamples. *HIGH ESG* stands for the subsample of banks whose ESG score is above the median (>49.93) and *LOW ESG* for the subsample of banks with an ESG score below the median. We continue to implement the two-step system GMM dynamic panel data estimation techniques. While the coefficients of *CRISIS* are negative and significant for both subsamples, the magnitude of the negative impact of the crisis on bank lending is higher for the subsample of banks whose ESG score is lower, providing additional support for earlier findings.

On the whole, overall lending falls during crisis times but to a lesser extent for banks with higher ESG scores. Such banks normally have a larger base of borrowing firms highly engaged in ESG themselves (Houston and Shan, 2022; Hasan et al., 2022); hence, our results could be explained by the quality of bank borrowers during crisis times. Indeed, if in line with Godfrey (2005), El Ghoul et al. (2011), and El Ghoul and Karoui (2017), ESG firms actually benefit from ESG investments specifically in terms of lower idiosyncratic risk and agency costs during crises, such banks should have a better ability to maintain their lending relationships and support their borrowers.

Considering the impact of control variables, we observe that they generally have the expected signs. Specifically, bank lending is negatively associated with increased credit risk as proxied by higher non-performing loans. This is in line with prior evidence documenting the significant negative correlation between credit risk and bank lending behavior (Stepanyan and Guo, 2011; Ananou et al., 2021). Higher capitalization is negatively associated with bank lending. Specifically, banks might shrink their assets to meet higher capital levels, which would decrease the availability of bank lending (Hanson et al., 2011; Fang et al., 2020). We find that larger banks tend to have lower loan growth. This is in line with the notion that large banks can better achieve diversification in their asset portfolios. Thus, they are likely to hold less loans relative to total assets (Demsetz and Strahan, 1997). Small banks are better at collecting and acting on soft information than large banks, and large banks might be less willing to lend to firms with no financial records, leading to less lending overall (Berger et al., 2005; Berger and Black, 2011). Moreover, our findings indicate that bank lending is higher for countries with higher GDP per capita growth and lower inflation. Finally, lending falls during the COVID-19 pandemic, as would be expected.

>>> INSERT TABLE 3 HERE<<<

3.2. Instrumental variable estimations

While reverse causality concerns are mitigated in our estimations by including lagged independent variables in our regressions, there are other potential sources of endogeneity, such as omitted variables. Hence, in addition to dynamic panel data estimation with the two-step system GMM estimators, we use instrumental variable (IV) regressions with two-stage least

squares (2SLS) estimators to further address potential endogeneity concerns. In this setting, the ESG variable is taken as endogenous but finding a potentially exogenous instrument for such a variable is a challenging task. A strong and valid instrument should not directly influence the dependent variable (bank lending) other than through its indirect effect on the endogenous variable (ESG variable). Based on the extant literature on CSR and ESG, we use four potential instruments to address endogeneity.

First, following prior studies (Benlemlih and Bitar, 2018; Bhandari and Javakhadze, 2017; Azmi et al., 2021; Bose et al., 2021), we use the previous year's ESG score to instrument ESG performance. The previous year's ESG score is likely positively correlated with the current ESG score. Second, following Ioannou and Serafeim (2012), Cheng et al., 2014, Arouri et al. (2019), and Azmi et al. (2021), we use an average country-level ESG rating. Ioannou and Serafeim (2012) show that CSR is determined by country characteristics and that a firm's CSR is impacted by a time-varying component at the country level. We would expect the country-level ESG score to be positively correlated with the current ESG score. However, it is not clearly evident that the country-level ESG scores would directly affect bank lending.

Third, recent literature suggests that CSR activities around the location of the firm are positively associated with firms' CSR activities through knowledge spillovers and institutional pressures (Husted et al. (2016); Bardos et al. (2020); Awaysheh et al., 2020). In this spirit, following Bardos et al. (2020), we use CO2 emissions (metric tons per capita) (*CO2 EMISSIONS*) in the country where the bank is headquartered, stemming from the burning of fossil fuels and the manufacturing of cement. We collect this data from the World Bank Environmental Social and Governance (ESG) Database. We expect banks located in countries in which CO2 emissions are higher to have a lower ESG score.

Fourth, following Cornett et al. (2016), we use gender diversity on the board (*GENDERDIV*) as an instrumental variable. *GENDERDIV* is calculated as the total number of female directors divided by the total number of board members. *GENDERDIV* is an ex-ante theoretically plausible instrument because gender diversity and ESG practices are likely to be highly positively correlated. There is a consensus in the literature that firms' sustainability performance is expected to increase with more women on the board (Gillan et al., 2021). The literature has indeed shown that a higher share of women on boards is positively associated with charitable contributions, climate change and environmental impact concerns, and reputation-based CSR measures (Williams, 2003; Zhang et al., 2013). However, it is not evident in the literature why gender diversity would be directly correlated to bank lending, although some papers argue that it could affect the riskiness of loans (Berger et al., 2014; Karavitis et al., 2021). We perform specification tests to validate the relevance and strength of our instruments.

Table 4 presents the findings of the instrumental variable estimations for the impact of ESG activity on bank lending in crisis times. Columns 1 and 2 present the first and second stage findings for the instrumental variable analysis when *ESG* is taken as endogenous, and it is instrumented by the country mean of ESG scores (*COUNTRY ESG*) and previous year ESG score (*L.ESG*). The first stage equation in Column 1 uses *ESG* as the dependent variable. The two instruments for *ESG* and other control variables are used to estimate the predicted *ESG* for each bank. We use panel data estimation techniques with bank fixed effects in Column 1 and implement the two-step system GMM dynamic panel data estimation techniques in Column 2, respectively. In Column 1, we observe the expected positive and significant impacts of *COUNTRY ESG* and *L.ESG* on *ESG*. Next, in Column 2, the predicted *ESG* ($\widehat{ESG}$) is included. Column 2 shows that the sum of the coefficients of CRISIS and $\widehat{ESG}$ **CRISIS* is negative and

significant at the 1% level, while the coefficient of the interaction term keeps its significance and positive sign, confirming previous findings. The instrument's validity is tested using the F-statistic for the instrumental variable, which is 286 and significant at the 1% level, well above the weak instrument criteria, i.e., critical values (Stock and Yogo, 2005)[11]. Columns 3 and 4 present the first and second stage findings of the instrumental variable estimations when we use CO2 emissions (metric tons per capita) as an instrument (*CO2 EMISSIONS*). In Column 3, we observe the expected negative and significant impact of *CO2 EMISSIONS* on *ESG*. Column 4 shows that the sum of the coefficients of CRISIS and $\widehat{ESG}$ **CRISIS* is negative and significant at the 1% level, confirming previous findings. Columns 5 and 6 present the first and second stage findings when we use gender diversity on the board as an instrument (*GENDERDIV*). Again, we still obtain the expected positive and significant impact of *GENDERDIV* on *ESG*. Column 6 shows that the sum of the coefficients of CRISIS and $\widehat{ESG}$ **CRISIS* is negative and significant at the 1% level, confirming previous findings.

>>> INSERT TABLE 4 HERE<<<

3.3. Channels analysis

In this section, we investigate the possible reasons why, during crisis times, banks with higher ESG scores decrease lending to a lesser extent than banks with lower ESG scores. We test for potential channels and explore the impact of ESG on bank risk, banks' pricing behavior, and the components of their balance sheets in crisis times. For this purpose, we estimate the following set of equations:

$$Y_{i,t} = Y_{i,t-1} + \beta_1 CRISIS_t + \beta_2 ESG_{i,t-1} * CRISIS_t + \beta_3 ESG_{\ i,t-1} + \beta_4 COVID_t + \ \theta' X_{i,t-1} + \vartheta' Y_{j,t-1} + \alpha_j + \varepsilon_{it} \quad (2)$$

where $Y_{i,t}$ stands for various outcome channel variables, and the rest of the variables are as in Equation 1, except for bank-level controls ($X_{i,t-1}$). Bank-level controls are adjusted to reflect the change in our dependent variables; they now include only *SIZE* and *CAPITAL; NPL* is excluded as a control.

To explore the impact of ESG scores on bank risk as a potential channel, we consider the influence of *ESG* on credit risk measures such as the ratio of non-performing loans to gross loans (*NPL*) and the ratio of loan loss provisions to gross loans (*LLP*). We also look at asset risk more generally by using the standard deviation of the return on assets (*ROA*) calculated using three-year rolling windows (*SDROA*).

To investigate the impact of ESG scores on pricing behavior, we take as proxies the implicit interest rate on loans measured as the interest income on loans to total loans (*INTINC*) and the implicit rate on deposits measured as the interest expenses on deposits to total deposits (*INTEXP*). We also consider how profitability is affected by using *ROA* as the dependent variable. Eventually, we also look at whether ESG scores influence the structure of balance sheets during crises. Specifically, we consider the ratio of total liabilities to total assets (*TOTAL*

[11] The critical value for the Cragg–Donald statistic for 10% maximal size distortion is 19.93.

LIABILITIES), the share of total deposits in total assets (*DEPOSITS*), the ratio of market funding to total assets (*MARKET FUNDING*) and change in total assets (*Δ TOTAL ASSETS*), respectively. We calculate *MARKET FUNDING* as the share of assets funded by non-deposit liabilities, i.e., total liabilities excluding equity & total deposits, divided by total assets (Brei et al., 2013).

Table 5 displays the channels analysis findings regarding bank risk. Models 1-3 use the following dependent variables: *NPL*, *LLP*, and *SDROA*, respectively. The sum of the coefficients of *CRISIS* and *ESG*CRISIS* ($\beta 1 + \beta 2$) are positive and significant at the 1% level in all models. Meanwhile, the coefficients of *CRISIS* ($\beta 1$) are positive and significant at the 1% level, and the coefficients of *ESG*CRISIS* ($\beta 2$) are negative and significant. This indicates that while all the banks in our sample exhibit higher credit risk (i.e., *NPL* and *LLP*) and asset risk (i.e., *SDROA*) in crisis times, banks with higher ESG scores are less affected. Hence, the fact that banks with higher ESG can more easily pursue their lending activities during crises is possibly driven by their lower exposure to asset and credit risk. Indeed, according to the stakeholder theory, ESG investments lower the perceived riskiness of firms and reduce agency and information asymmetry problems (Godfrey, 2005; El Ghoul et al., 2011; El Ghoul and Karoui, 2017). Because higher ESG banks are more involved in high ESG firms for their lending activities, consistently, their risk should be less affected during crisis times and, consequently, their lending.

>>> INSERT TABLE 5 HERE<<<

Table 6 presents the findings regarding implicit rates on loans and deposits, profitability, and balance sheet structure. Models 1-2 consider *INTEXP* and *INTINC* as dependent variables. The coefficient of $\beta 1 + \beta 2$ displayed at the bottom of the table is significant and positive for *INTEXP* but not significant for *INTINC*. This indicates that while implicit deposit rates increase in crisis times, the increase is lower for banks with higher ESG scores. Meanwhile, the crisis has no significant impact on the implicit interest rate on loans regardless of how much banks are involved in ESG activities. This indicates that depositors of banks with higher ESG scores require a lower increase in interest rates during turmoil, possibly because they are more confident than depositors in banks with lower ESG scores. This finding is in line with Azmi et al. (2021), who find a positive relationship between ESG and the net interest margin of emerging market banks. Higher ESG banks are perceived to be more transparent and less risky by investors in crisis times. Their depositors might be more tolerant of lower interest rate premia in exchange for better environmental performance. This finding is also consistent with the predictions of the theoretical model of Albuquerque et al. (2019). In times of crisis, ESG activity helps banks differentiate their products, generate a more loyal customer base, and advance to lower price elasticity of demand.

Next, Models 3-7 investigate the impact of ESG on *ROA*, *TOTAL LIABILITIES*, *DEPOSITS*, *MARKET FUNDING*, and *ΔTOTAL ASSETS*, respectively. The coefficients of $\beta 1 + \beta 2$ are significantly negative, and the interaction terms are significantly positive for *ROA*, *TOTAL LIABILITIES*, *MARKET FUNDING*, and *Δ TOTAL ASSETS*. This shows that while banks experience a fall in profitability, total liabilities, market funding, and total assets, in crisis times, banks with higher ESG scores are significantly less affected. They downsize to a lesser extent by presumably being less impacted by the fall in market funding. While the share of deposits

in total liabilities remains unchanged for all banks during crisis times, ESG banks are able to limit the fall in their total assets possibly by borrowing more easily on the market, which allows them to cut lending to a lesser extent in crisis times.

Overall, our findings indicate that during crisis times, higher ESG banks decrease their lending to a significantly lesser extent, possibly because their credit and asset risk, profitability, and size are less affected than other banks. Banks with higher ESG involvement downsize their balance sheet to a lesser extent by borrowing more extensively on the market than other banks. Moreover, their deposit cost increases to a lesser extent than the deposit cost of low ESG banks in crisis times. This is possibly because banks with higher ESG scores are perceived as more transparent, increasing depositors' trust (Azmi et al., 2021).

>>> INSERT TABLE 6 HERE<<<

3.4. Further investigations

For further insights, in this section, we perform additional tests. We first consider the influence of bank business models on the impact of ESG activity on bank lending in crisis times. We next disentangle the impact of ESG activity on bank lending for the three ESG components and the different financial crisis periods.

3.4.1. The effect of bank business models

In this section, we consider the influence of bank business models to investigate whether our findings originate from banks focused more on traditional intermediation activities (lending and deposits) or more diversified in their income structure. We present the findings in Table 7. Models 1 and 2 split banks into ones that have a higher and lower share of loans in total assets (LTA), greater than and smaller than 75th and 25th percentile, respectively. Models 3 and 4 show the findings for banks whose loans to total assets ratio (LTA) and deposits to total assets ratio (DepTA) are simultaneously greater and smaller than their median values. Models 5 and 6 oppose relatively highly and lowly diversified banks by considering the median of the share of noninterest income in total income (NII). The sum of the coefficients of *CRISIS ($\beta 1$)* and *ESG *CRISIS ($\beta 2$)* are only significantly negative and $\beta 2$ is significantly positive only in Models 1, 3, and 6. These are the subsamples of banks with a higher share of loans and deposits in total assets and a lower share of noninterest income in total income. Therefore, our results mainly originate from banks focused on traditional deposit and lending activities and less diversified into noninterest activities. Such banks are the least affected in terms of lending during financial crises when they have a higher ESG score.

This finding is consistent with the literature showing that traditional banking activities are more stable over time mainly because they are based on relationship banking. Such relationships are less easy to end because of switching and information costs. Meanwhile, non-interest income (from trading activities, and commission and fee activities) is highly correlated with the business cycle (DeYoung and Roland, 2001; Lepetit et al., 2008a; Lepetit et al., 2008b; Meslier et al., 2014; Köhler, 2015). When banks are more oriented towards traditional banking activities as well as to higher ESG firms, they suffer less from a fall in lending during crises.

>>> INSERT TABLE 7 HERE<<<

3.4.2 Disentangling the ESG components and the financial crisis periods

In this section, we first explore whether the components (the three pillars) of ESG scores differently affect lending during crisis times. We then disentangle the impact of ESG activity on bank lending for different crisis periods, i.e., the subprime crisis in 2007–2009 and the European sovereign debt crisis in 2010- 2012.

Table 8 provides the findings regarding ESG Components. We use the environmental pillar score (*ENV*), the governance pillar score (*GOV*), and the social pillar score (*SOC*) as independent variables of interest, respectively (Columns 1-3). For this purpose, we include the interaction terms *ENV *CRISIS*, *GOV *CRISIS*, and *SOC*CRISIS* in the regressions. The sum of the coefficients of *CRISIS* and interaction terms (presented at the bottom of the table) are significantly negative, and the interaction term is significantly positive at the 1% level only for the environmental pillar but not for the other components. Therefore, our main finding showing that banks are able to decrease their lending significantly less during turmoil times when they are more engaged in ESG activities is essentially driven by the environmental pillar. This result is in line with Azmi et al. (2021) and Chiaramonte et al. (2021), who find that the environmental pillar component has the greatest positive effect on bank value and stability, respectively. As attention towards global warming and transition to sustainability has been progressively increasing, investors could be more concerned regarding banks' consideration of environmental matters in turbulent times. They would be more likely to prefer banks that focus and act on environmental issues when there is more uncertainty (Azmi et al., 2021; Chiaramonte et al., 2021). To investigate whether it is only the environmental pillar that matters, we also consider the impact of the ESG components on lending of banks with different business models during crisis times. Our findings show that banks focused on traditional deposit and lending activities and less diversified into noninterest activities, and with higher environmental (ENV) and social scores (SOC), exhibit a significantly lower reduction in lending. Therefore, both environmental and social scores matter for banks that are more oriented into traditional banking activities during turmoil[12].

>>> INSERT TABLE 8 HERE<<<

Table 9 considers the different financial crisis periods separately. Models 1 and 2 look at whether the relationship differs for the subprime crisis in 2007-2009 and the European sovereign debt crisis in 2010-2012. For this purpose, we use two dummy variables, *CRISIS 2008* and *CRISIS DEBT*. *CRISIS 2008* takes the value of 1 from 2007 to 2009 and 0 otherwise, and *CRISIS DEBT* takes the value of 1 from 2010 to 2012 and 0 otherwise. We interact these variables with *ESG*. While the sum of the coefficients of the crisis term and the ESG variable is significantly negative for these two periods, the interaction term coefficient is only positive and significant for the case of the 2007-2009 subprime crisis. Our findings are hence mainly driven by the GFC. Considering the two crises separately by introducing each of the three pillars (environmental (*ENV*), governance (*GOV*), social (*SOC*)) in the regressions still reveals that our findings mainly hold during GFC with only the environmental pillar playing a significant role[13]. This might be because the subprime crisis had originated in the credit markets, and banks with higher ESG scores were able to better differentiate their lending according to borrowers' environmental performance (Chen et al., 2021; Zhou et al., 2021; Chiaramonte et al., 2021).

[12] The results are available from the authors on request.
[13] The results of these estimations are not displayed in the paper but available on request.

>>> INSERT TABLE 9 HERE<<<

4. Conclusion

This paper investigates the relationship between European banks' environmental, social, and governance (ESG) activities and their lending during times of financial crisis. In our regressions, we employ a sample of 83 listed banks from 20 European countries for the 2002-2020 period and use dynamic panel data estimation techniques with the two-step system GMM estimators. We cover both the 2007-2009 global financial crisis (GFC) and the 2010-2012 European sovereign debt crisis. Our findings show that ESG activity mitigates to some extent the negative impact of crises on bank lending. Our results are robust to alternative specifications to address potential endogeneity issues (instrumental variables (IV) and two-stage least squares (2SLS) estimations). Deeper investigations show that such a finding is mostly driven by banks focused on traditional activities, the environmental pillar component of ESG, and the global financial crisis of 2007-2009.

Our channel investigations show that higher ESG banks also suffer from a lower increase in credit risk and overall asset risk. They also experience a lower fall in profitability than their peers. Moreover, the depositors of such banks request a lower increase in deposit rates in crisis times. Banks with higher ESG activity are also the ones that face a lower reduction in market funding, allowing them to downsize their balance sheets to a lesser extent during crises. Such findings suggest that, during crisis times, banks with higher ESG engagement appear to be more successful in efficiently allocating resources for both demanders and providers of capital. They are perceived to be less risky and possibly more transparent, increasing depositors' trust. Such banks could hence also face a lower likelihood of runs.

Our findings reveal that improving ESG engagement in the banking sector is not only beneficial in terms of decreasing the environmental and social impacts but also helps to mitigate the reduction in bank lending during turbulent times. Banks play an essential role in the economy and specifically during crisis times when borrowers need them even more. However, during such episodes, banks are known to sharply reduce lending because of a much higher default risk among borrowers. This prevents banks from efficiently performing their intermediation function and delays the time of economic recovery even more. Our findings suggest that ESG engagement could contribute to smoothening such ups and downs in financial intermediation and possibly reduce its cost for the economy in the long run by preserving long-term lending relationships.

Our findings also support the regulatory efforts in terms of better disclosures of non-financial information. Specifically, our findings support the recent regulatory changes in Europe brought by the Non-Financial Reporting Directive, requiring large banks to provide information on social and environmental practices and on how much they respect human rights or pay attention to diversity on their board of directors. As a future policy, regulatory bodies might need to consider how to extend these requirements to smaller financial institutions.

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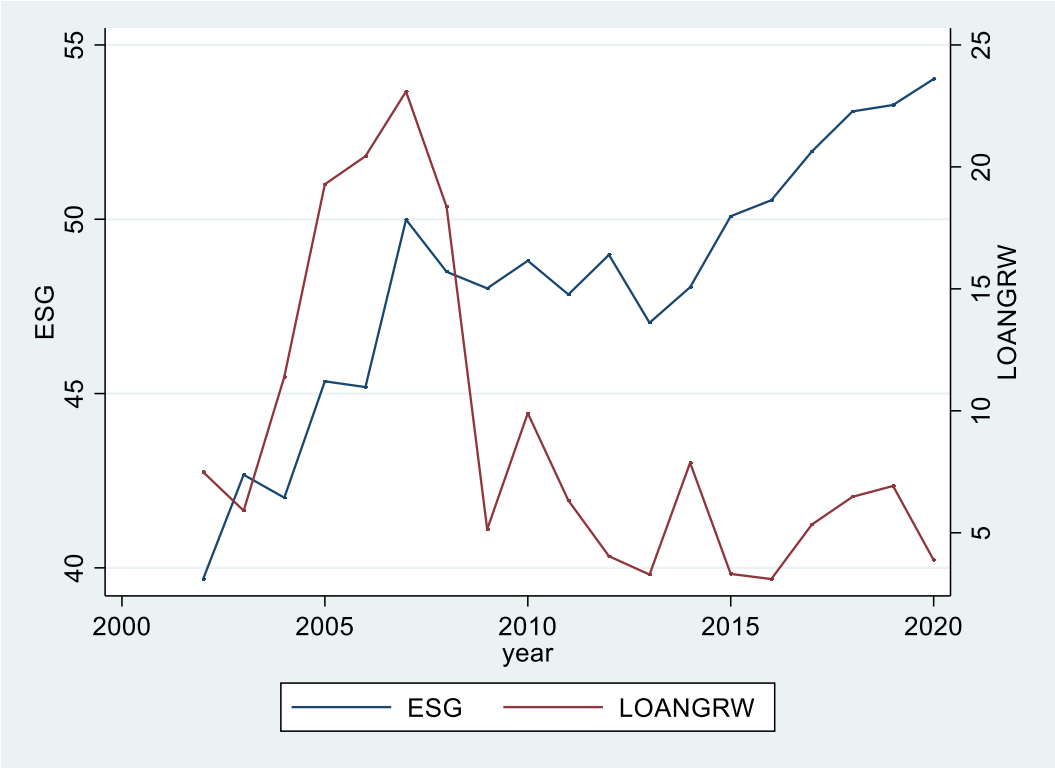
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Figure 1: The behavior of ESG and loan growth through time



Note: This figure shows the time-series behavior of the variables *ESG* and *LOANGRW* between 2002-2020. We take the yearly averages of the variables to generate the series in the figure. The variables are generated from our sample of 83 listed banks from 20 European countries. *LOANGRW* is the average annual growth rate of total loans, and *ESG* is the average overall company score based on the environmental, social, and corporate governance pillars, respectively.

Table 1 Variable descriptions and summary statistics

Variable	Description	Obs	Mean	Min	Max	Median	Stand. Dev.
Dependent variables							
LOANGRW	The yearly logarithmic growth rate of total loans, Ln (1+ (Total loans at time t – Total loans at time t-1) / Total loans at time t-1)). (Source: Thomson Reuters Refinitiv).	1286	8.53	-34.97	99.45	4.32	19.64
∆LOANS_TA	The year-to-year difference of the total loans normalized by total assets at the beginning of the period. (Source: Thomson Reuters Refinitiv).	1236	5.28	-25.76	55.98	2.43	12.47
LLP	The ratio of loan loss provisions to gross loans. (Source: Thomson Reuters Refinitiv).	1296	0.96	-0.62	6.44	0.63	1.14
SDROA	It is the standard deviation of *ROA*, calculated using three-year rolling windows. (Source: Thomson Reuters Refinitiv).	1131	0.54	0.01	7.37	0.24	1.05
INT EXPENSE	The ratio of interest expense on deposits to total deposits. (Source: Thomson Reuters Refinitiv).	1245	0.02	0.00	0.13	0.02	0.02
INT INCOME	The share of interest income on loans to total loans. (Source: Thomson Reuters Refinitiv).	1229	0.04	0.00	0.14	0.04	0.02
ROA	Return on assets. (Source: Thomson Reuters Refinitiv).	1200	0.99	-5.78	5.81	0.95	1.29
TOTAL LIABILITIES	The ratio of total liabilities to total assets. (Source: Thomson Reuters Refinitiv).	1412	0.91	0.16	1.00	0.93	0.10
DEPOSITS	The ratio of deposits to total assets. (Source: Thomson Reuters Refinitiv).	1232	53.16	4.53	88.81	52.73	18.78
MARKET FUNDING	The ratio of market funding to total assets. We calculate market funding as the share of total assets funded by non-deposit liabilities, i.e., (total liabilities-shareholders equity- total deposits)/ total assets (Source: Thomson Reuters Refinitiv).	1346	0.40	0.03	0.93	0.40	0.21
∆ TOTAL ASSETS	The annual change in total assets normalized by average total assets in the current and previous years. (Source: Thomson Reuters Refinitiv).	1326	7.48	-25.93	63.97	5.29	14.69
ESG variables							
ESG	ESG Combined Score is an overall company score which is the weighted sum of the environmental, social, and corporate governance pillar scores. (Source: Thomson Reuters ASSET4)	1034	49.05	1.57	89.74	49.93	19.50
ESG CHANGE	The annual percentage change in the ESG score.	950	3.65	-59.61	71.72	2.63	22.78
ENV	Environmental pillar score shows banks' environmental performance, and it is a weighted sum of the following three categories: resource use score, emissions score, and innovation score. (Source: Thomson Reuters ASSET4)	1034	47.37	0	97.56	52.39	33.43

GOV	Governance pillar score represents the governance performance, and it is a weighted sum of the following three categories: management score, shareholders score, and CSR strategy score. (Source: Thomson Reuters ASSET4)	1034	54.18	1.88	97.37	57.29	24.76
SOC	Social pillar score is a weighted sum of the following four categories: workforce score, human rights score, community score, and product responsibility score. (Source: Thomson Reuters ASSET4)	1034	54.72	0.68	97.32	58.92	23.66
Control Variables							
SIZE	Natural logarithm of total assets (Source: Thomson Reuters Refinitiv).	1412	18.50	10.88	23.87	18.30	2.07
CAPITAL	The ratio of bank equity to total assets (Source: Thomson Reuters Refinitiv).	1262	20.11	1.38	97.87	16.89	13.67
NPL	Non-performing loans to gross loans (Source: Thomson Reuters Refinitiv).	1123	6.79	0.05	59.82	3.57	9.85
COVID	A binary indicator that equals one for 2020 and zero otherwise.	1577	0.05	0	1	0	0.22
CRISIS	A binary indicator that equals one for 2007-2012 that captures both the global financial crisis of 2007-2009 and sovereign debt crisis of 2010-2012; and zero otherwise.	1577	0.26	0	1	0	0.44
GDPGRW	Annual GDP per capita growth (Source: World Bank World Development Indicators)	1577	1.24	-11.25	24.00	1.47	3.64
CONCENTRATION	5-bank asset concentration, calculated as the total assets of the three largest banks as a share of the total assets of the entire bank universe in the country (Source: World Bank Global Financial Development Database)	1560	65.65	0.00	100.00	75.93	31.41
INFLATION	The annual growth rate of the GDP implicit deflator. (Source: World Bank World Development Indicators)	1577	2.23	-4.67	23.15	1.85	2.36

Note: This table presents variables used in our empirical analysis, their brief descriptions, and summary statistics.

Table 2: Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) *ESG*	1												
(2) *ESG CHANGE*	0.1831*	1											
(3) *ENV*	0.7209*	-0.0456	1										
(4) *GOV*	0.7136*	0.0665*	0.4561*	1									
(5) *SOC*	0.8292*	0.0201	0.7973*	0.5614*	1								
(6) *NPL*	-0.0663*	-0.0286	-0.0493	-0.1511*	-0.0898*	1							
(7) *CAPITAL*	-0.1481*	0.0084	-0.1267*	-0.1720*	-0.2026*	-0.1632*	1						
(8) *SIZE*	0.4148*	-0.0706*	0.5404*	0.4065*	0.5091*	-0.2601*	-0.1213*	1					
(9) *GDPGRW*	-0.0681*	0.033	-0.1529*	-0.002	-0.0824*	-0.0302	-0.0021	-0.028	1				
(10) *CONCENTRATION*	-0.0694*	-0.0132	-0.0671*	-0.0768*	-0.1334*	-0.0303	0.0924*	0.0158	0.1647*	1			
(11) *INFLATION*	-0.056	0.0165	-0.0935*	0.0209	-0.0115	-0.2407*	0.0403	-0.0272	0.3433*	-0.0189	1		
(12) *CRISIS*	-0.0192	-0.0358	0.0536	-0.0131	-0.0378	-0.0919*	0.0293	0.0161	-0.2536*	0.2161*	-0.049	1	
(13) *COVID*	0.0634*	0.0134	0.0693*	0.0207	0.0852*	0.0094	-0.0374	0.0244	-0.4974*	-0.4956*	0.0402	-0.1409*	1

Note: This table displays the correlation matrix for the variables that are used in our baseline analysis, * indicates significance at 0.05.

Table 3: Effect of ESG on Bank lending- Baseline Estimations

	(1) Baseline	(2) Δ*LOANS_TA*	(3) *ESG CHANGE*	(4) *HIGH ESG*	(5) *LOW ESG*
ESG	0.043	0.018			
	(0.04)	(0.01)			
CRISIS (β1)	-11.939***	-5.348***	-3.378***	-2.756***	-4.727***
	(2.98)	(1.36)	(0.76)	(0.45)	(1.19)
*ESG *CRISIS (β2)*	0.164***	0.050**			
	(0.05)	(0.02)			
ESG CHANGE			-0.025		
			(0.02)		
*ESG CHANGE *CRISIS (β3)*			0.220***		
			(0.08)		
COVID	-4.707***	-2.215***	-4.038***	-4.187***	-5.304*
	(1.18)	(0.57)	(1.26)	(1.21)	(2.80)
NPL	-0.205***	-0.231***	-0.199***	-0.112***	-0.298***
	(0.06)	(0.04)	(0.06)	(0.02)	(0.04)
CAPITAL	-0.132***	-0.009	-0.092*	-0.060**	-0.081**
	(0.05)	(0.02)	(0.05)	(0.03)	(0.04)
SIZE	-2.657***	-1.304**	-0.958	-0.934***	-1.948***
	(0.96)	(0.65)	(0.74)	(0.21)	(0.45)
GDPGRW	0.359**	-0.017	0.273*	0.423***	-0.274***
	(0.14)	(0.04)	(0.15)	(0.14)	(0.09)
CONCENTRATION	0.016	0.006	0.009	0.023*	0.006
	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
INFLATION	-0.509*	-0.010	-0.969***	-0.410***	-0.155
	(0.27)	(0.15)	(0.33)	(0.13)	(0.22)
L. ΔLOANS_TA		0.405***			
		(0.04)			
L.LOANGRW	0.392***		0.431***	0.656***	0.338***
	(0.04)		(0.05)	(0.04)	(0.04)
Constant	54.996***	27.259**	21.940*	21.319***	44.763***
	(13.64)	(12.69)	(12.10)	(3.59)	(8.94)
β1+ β2	-11.775***	-5.298***			

β1+ β3			-3.158***		
Country FE	YES	YES	YES	YES	YES
Number of observations	774	765	718	550	408
Number of banks	75	74	73	41	36
Number of instruments	60	83	59	40	31
Hansen p-value	0.174	0.803	0.421	0.510	0.957
AR (2)	0.382	0.507	0.128	0.089	0.485

Note: This table presents the baseline regression findings for the impact of ESG activity on bank lending in crisis times. We use a sample of 83 listed banks from 20 European countries and yearly data for the period 2002-2020. We implement the two-step system GMM dynamic panel data estimation techniques. The first lags of explanatory variables are used to mitigate any potential reverse causality. Country fixed effects are used in all models. The dependent variable is the annual growth rate of total loans, *LOANGRW*, in all models, except for Column 2. Column 2 uses Δ*LOANS_TA* as an alternative dependent variable calculated as the ratio of the year-to-year difference of the total loans normalized by total assets at the beginning of the period. Column 3 uses an alternative ESG proxy, *ESG CHANGE, (ESG CHANGE)* calculated as the annual percentage change in the ESG score. Columns 4 and 5 use subsamples, and HIGH ESG indicates the subsample of banks whose ESG score is above the median (>49.93) and LOW ESG below the median, respectively. *ESG* is the overall company score based on the environmental, social, and corporate governance pillars; *CRISIS* is a binary indicator that equals one for 2007-2012, captures both the global financial crisis of 2007-2009 and the sovereign debt crisis of 2010-2012, and zero otherwise; *ESG CHANGE* is the ratio of the year-to-year difference of ESG score normalized by ESG score at the beginning of the period; *COVID* is a binary indicator that equals one for 2020 and zero otherwise; *NPL* is the ratio of non-performing loans to gross loans; *CAPITAL* is the ratio of bank equity to total assets; *SIZE* is the natural logarithm of total assets; *GDPGRW* is the annual GDP per capita growth; *CONCENTRATION* is the 5-bank asset concentration in a country; *INFLATION* is the annual growth rate of the GDP implicit deflator. Windmeijer corrected standard errors are used when clustering the error terms and given in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Instrumental Variable Estimations

	(1) IV First stage	(2) IV Second stage	(3) IV First stage	(4) IV Second stage	(5) IV First stage	(6) IV Second stage
$\widehat{ESG}$		-0.009		0.087		0.194**
		(0.06)		(0.10)		(0.09)
COUNTRY ESG	0.636***					
	(0.05)					
L. ESG	0.425***					
	(0.03)					
CO2 EMISSIONS			-1.109*			
			(0.60)			
GENDERDIV					0.186***	
					(0.04)	
CRISIS (β1)	-0.941	-12.248***	-0.935	-17.898***	-0.268	-12.112**
	(0.82)	(4.18)	(1.03)	(5.83)	(1.09)	(5.99)
$\widehat{ESG}$*CRISIS (β2)*		0.198**		0.286**		0.187*
		(0.08)		(0.11)		(0.11)
COVID	2.123	-4.091***	0.000		3.464	-4.763***
	(1.92)	(1.19)	(.)		(2.44)	(1.28)
NPL	-0.034	-0.242***	0.142*	-0.191***	0.142**	-0.189***
	(0.05)	(0.05)	(0.07)	(0.06)	(0.06)	(0.06)
CAPITAL	0.093*	-0.068	0.137*	-0.133**	0.185***	-0.167***
	(0.05)	(0.05)	(0.07)	(0.06)	(0.07)	(0.06)
SIZE	3.637***	-1.849**	9.989***	-3.523**	9.239***	-3.531***
	(0.98)	(0.80)	(1.29)	(1.40)	(1.21)	(1.00)
GDPGRW	0.151	0.329**	0.123	0.261*	0.138	0.339**
	(0.13)	(0.13)	(0.18)	(0.14)	(0.17)	(0.15)
CONCENTRATION	0.007	0.012	-0.069***	0.010	-0.045***	0.024
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
INFLATION	0.289	-0.652***	-0.469	-0.361	-0.229	-0.579*
	(0.24)	(0.23)	(0.32)	(0.31)	(0.30)	(0.32)

L.LOANGRW		0.361***		0.408***		0.432***
		(0.05)		(0.05)		(0.04)
Constant	-72.507***	36.590***	-124.339***	70.008***	-117.360***	62.056***
	(17.46)	(12.56)	(27.14)	(20.38)	(21.63)	(14.07)
β1+ β2		-12.05**		-17.612***		-11.925***
Country FE	YES	YES	YES	YES	YES	YES
Bank FE	YES	NO	YES	NO	YES	NO
R2 Adjusted	0.7824		0.6727		0.6269	
Number of observations	781	718	721	708	821	754
Number of banks	75	73		71		75
Number of instruments		59		57		60
Hansen p-value		0.270		0.10		0.163
AR (2)		0.117		0.273		0.554
F Statistic	286.00***		3.37**		17.77***	

Note: This table presents the instrumental variable analysis findings for the impact of ESG activity on bank lending in crisis times. We use a sample of 83 listed banks from 20 European countries and yearly data for the period 2002-2020. The dependent variables are *ESG* in Columns 1, 3, and 5 (for the first-stage estimations) and *LOANGRW* in Columns 2, 4, and 6 (for the second-stage estimations), respectively. *ESG* variable is taken as endogenous. Columns 1 and 2 present the first and second stage findings for the instrumental variable analysis when the *ESG* variable is instrumented by country mean of ESG scores (*COUNTRY ESG*) and previous year ESG score (*L.ESG*). Columns 3 and 4 present the instrumental variable estimations' first and second stage findings when we use the instrument: CO2 emissions (metric tons per capita) (*CO2 EMISSIONS*). Columns 5 and 6 present the first and second stage findings of the instrumental variable estimations when we use the following instrument: gender diversity on the board (*GENDERDIV*). Except for Columns 1, 3, and 5, we implement the two-step system GMM dynamic panel data estimation techniques. Columns 1, 3, and 5 use panel data estimation techniques with bank and country fixed effects. The first lags of explanatory variables are used to mitigate any potential reverse causality. Windmeijer corrected standard errors are used when clustering the error terms and given in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Channels Estimations-The impact on bank risk

	(1) *NPL*	(2) *LLP*	(3) *SDROA*
ESG	-0.005	-0.003**	-0.002***
	(0.01)	(0.00)	(0.00)
CRISIS (β1)	1.241***	0.370***	0.172***
	(0.34)	(0.07)	(0.02)
*ESG *CRISIS (β2)*	-0.018***	-0.002*	-0.001**
	(0.01)	(0.00)	(0.00)
COVID	0.035	0.553***	0.081***
	(0.20)	(0.08)	(0.02)
CAPITAL	-0.010	0.002	0.024***
	(0.01)	(0.00)	(0.00)
SIZE	0.402**	0.068**	-0.063***
	(0.18)	(0.03)	(0.02)
GDPGRW	-0.194***	-0.013***	-0.048***
	(0.03)	(0.00)	(0.00)
CONCENTRATION	0.009***	0.001*	0.001***
	(0.00)	(0.00)	(0.00)
INFLATION	0.047	0.018	-0.007
	(0.03)	(0.01)	(0.01)
L.*NPL*	0.869***		
	(0.00)		
L.*LLP*		0.633***	
		(0.02)	
L.*SDROA*			0.629***
			(0.00)
Constant	-9.402**	-1.420**	0.696**
	(4.09)	(0.71)	(0.31)
β1+ β2	1.223***	0.368***	0.171***
Country FE	YES	YES	YES
Number of observations	778	846	767
Number of banks	76	80	75
Number of instruments	59	60	68
Hansen p-value	0.589	0.206	0.136

AR (2)	0.839	0.893	0.205

Note: This table presents the regression findings for channels analysis regarding the impact of ESG on bank risk in crisis times. We use a sample of 83 listed banks from 20 European countries and yearly data for the period 2002-2020. We implement the two-step system GMM dynamic panel data estimation techniques. The first lags of explanatory variables are used to mitigate any potential reverse causality. Country fixed effects are used in all models. Models 1 and 2 use the following dependent variables: the ratio of non-performing loans to gross loans (*NPL*) and the ratio of loan loss provisions to gross loans (*LLP*). Model 3 uses *SDROA*, which is the standard deviation of *ROA* calculated using three-year rolling windows. Windmeijer corrected standard errors are used when clustering the error terms and given in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Channels Estimations- Effects on the pricing and the components of the balance sheet

	(1) INT EXPENSE	*(2) INT INCOME*	*(3) ROA*	*(4) TOTAL LIABILITIES*	*(5) DEPOSITS*	*(6) MARKET FUNDING*	*(7) Δ TOTAL ASSETS*
ESG	-0.0000	-0.0000	-0.0006	-0.0001***	0.0121	-0.0006***	-0.0313**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)
CRISIS (β1)	0.043***	0.004	-0.4890***	-0.037**	-0.5280	-0.0183***	-3.0267***
	(0.00)	(0.00)	(0.11)	(0.00)	(0.66)	(0.00)	(0.87)
*ESG *CRISIS (β2)*	-0.001***	0.000*	0.0048***	0.001*	-0.0070	0.006***	0.0304*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.02)
COVID	-0.0029***	-0.0036***	-0.5466***	0.0039***	-0.3839	0.0038	0.9324
	(0.00)	(0.00)	(0.06)	(0.00)	(0.44)	(0.00)	(0.61)
CAPITAL	0.0001***	0.0001*	0.0074***	0.0002**	-0.0308*		-0.0467***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)		(0.01)
SIZE	0.0001	-0.0009	-0.1305***	0.0016***	-0.2118	0.0076***	
	(0.00)	(0.00)	(0.03)	(0.00)	(0.17)	(0.00)	
GDPGRW	0.0003***	0.0006***	-0.0018	0.0004***	0.0867*	-0.0008**	0.1047*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.05)	(0.00)	(0.05)
CONCENTRATION	-0.0000***	-0.0000	0.0009**	0.0000	0.0014	0.0001***	-0.0278***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
INFLATION	0.0670***	0.0000	0.0770***	-0.0006**	-0.0893	0.0013**	0.3470***
	(0.01)	(0.00)	(0.01)	(0.00)	(0.07)	(0.00)	(0.05)
L. Dependent variable	0.7716***	0.7301***	0.2557***	0.9989***	0.9498***	0.7613***	0.1994***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
Constant	-0.0067	0.0253**	3.0602***	-0.0174	7.5779*	-0.0678*	8.4468***
	(0.01)	(0.01)	(0.65)	(0.02)	(4.30)	(0.04)	(0.86)
β1+ β2	0.042***	0.004	-0.4842***	-0.036**	-0.535	-0.0123***	-2.9963***
Country FE	YES	YES	YES	YES	YES	YES	YES
Number of observations	810	811	818	873	838	924	852
Number of banks	77	78	80	82	81	81	81
Number of instruments	59	60	60	60	41	73	63
Hansen p-value	0.1580	0.1506	0.1187	0.5676	0.3850	0.6314	0.4045
AR (2)	0.068	0.9279	0.6514	0.0607	0.0234	0.9381	0.2739

Note: This table presents the regression findings for channels analysis regarding the impact of ESG on bank pricing and the components of the balance sheet in

crisis times. We use a sample of 83 listed banks from 20 European countries and yearly data for the period 2002-2020. We implement the two-step system GMM dynamic panel data estimation techniques. The first lags of explanatory variables are used to mitigate any potential reverse causality. Country fixed effects are used in all models. Models 1-7 use the following dependent variables: interest expense on deposits to total deposits (*INTEXP*), interest income on loans to total loans (*INTINC*), return on assets (*ROA*), the ratio of total liabilities to total assets (*TOTAL LIABILITIES*), the share of total deposits in total assets (*DEPOSITS*), the ratio of market funding to total assets (*MARKET FUNDING*), and change in total assets (*Δ TOTAL ASSETS*) respectively. Windmeijer corrected standard errors are used when clustering the error terms and given in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Additional analysis: the effect of bank business models

	(1) LTA> 75th percentile	(2) LTA< 25th percentile	(3) LTA> Median & DepTA> Median	(4) LTA< Median & DepTA< Median	(5) NII> Median	(6) NII< Median
ESG	-0.070***	0.071	-0.062**	0.061	0.022*	-0.040***
	(0.01)	(0.06)	(0.03)	(0.04)	(0.01)	(0.01)
CRISIS (β1)	-6.092***	-1.277	-8.959***	-3.567	-4.844*	-9.622***
	(1.00)	(10.06)	(2.63)	(4.56)	(2.53)	(1.35)
*ESG *CRISIS (β2)*	0.040**	-0.002	0.106**	0.040	0.054	0.090***
	(0.02)	(0.17)	(0.05)	(0.08)	(0.04)	(0.03)
COVID	1.114	-4.779	-2.449*	-2.633**	-2.830***	-8.747***
	(1.36)	(8.87)	(1.44)	(1.14)	(0.65)	(0.85)
NPL	-0.184***	-0.052	-0.234***	-0.408***	-0.281***	-0.222***
	(0.01)	(0.14)	(0.03)	(0.08)	(0.02)	(0.02)
CAPITAL	-0.145***	-0.152	-0.356***	-0.018	-0.161***	-0.049
	(0.02)	(0.10)	(0.04)	(0.04)	(0.01)	(0.03)
SIZE	-1.170***	-0.787	-1.369***	-1.305*	-1.766***	-0.829***
	(0.22)	(1.04)	(0.32)	(0.70)	(0.12)	(0.11)
GDPGRW	-0.169**	1.070***	-0.447***	1.461***	0.052	0.033
	(0.07)	(0.17)	(0.11)	(0.10)	(0.08)	(0.07)
CONCENTRATION	0.050***	-0.002	0.008	0.005	-0.009***	0.017***
	(0.01)	(0.04)	(0.01)	(0.01)	(0.00)	(0.01)
INFLATION	1.017***	-0.990**	0.413**	-0.899***	-0.363***	0.185*
	(0.06)	(0.44)	(0.20)	(0.17)	(0.13)	(0.11)
L.LOANGRW	0.282***	0.066	0.430***	0.116	0.201***	0.362***
	(0.01)	(0.11)	(0.02)	(0.07)	(0.01)	(0.01)
Constant	30.338***	19.436	39.937***	29.564*	44.459***	24.074***
	(3.73)	(17.58)	(5.07)	(15.63)	(2.99)	(1.54)
β1+ β2	-6.052***	-1.275	-8.853***	-3.527	-4.79*	-9.532***
Country FE	YES	YES	YES	YES	YES	YES
Number of observations	212	204	235	258	422	352
Number of banks	47	28	49	32	58	64
Hansen p-value	0.824	0.998	0.567	0.996	0.387	0.357
AR (2)	0.756	0.442	0.411	0.941	0.279	0.840

Note: This table presents additional tests and the regression findings for business model analysis for the impact of ESG activity on bank lending in crisis times. We use a sample of 83 listed banks from 20 European countries and yearly data for the period 2002-2020. We implement the two-step system GMM dynamic panel data estimation techniques. The first lags of explanatory variables are used to mitigate any potential reverse causality. Country fixed effects are used in all models.

The dependent variable is the annual growth rate of total loans, *LOANGRW*, in all models. Models 1 and 2 report the baseline regression findings for banks whose share of total loans in total assets (LTA) are greater and smaller than the 75th percentile (LTA>75.22%) and 25th percentile (LTA<57.14%), respectively. Models 3 and 4 report the baseline regression findings for banks whose share of loans in total assets (LTA) and the share of deposits in total assets (DepTA) are both greater and smaller than their median values, respectively. The median LTA and DepTA in our sample stand at 66.78% and 52.73%, respectively. Models 5 and 6 report the baseline regression findings for banks whose share of noninterest income in total income (NII) are greater and smaller than the median value (30.61%), respectively. Windmeijer corrected standard errors are used when clustering the error terms and given in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Additional analysis- ESG pillars

	(1) ENV	(2) GOV	(3) SOC
ENV	-0.018		
	(0.02)		
CRISIS (β1)	-7.045***	-3.405*	-6.123**
	(1.83)	(1.90)	(2.61)
*ENV *CRISIS (β2)*	0.069**		
	(0.03)		
GOV		0.053**	
		(0.02)	
*GOV *CRISIS (β3)*		0.010	
		(0.03)	
SOC			-0.036
			(0.04)
*SOC *CRISIS (β4)*			0.048
			(0.04)
L.LOANGRW	0.380***	0.350***	0.381***
	(0.04)	(0.03)	(0.04)
COVID	-4.723***	-3.395***	-4.753***
	(1.18)	(1.05)	(1.22)
NPL	-0.228***	-0.244***	-0.229***
	(0.06)	(0.06)	(0.06)
CAPITAL	-0.092*	-0.098**	-0.117**
	(0.05)	(0.04)	(0.05)
SIZE	-2.307**	-2.833***	-1.730
	(1.09)	(0.50)	(1.12)
GDPGRW	0.325**	0.274***	0.352***
	(0.13)	(0.08)	(0.13)
L.CONCENTRATION	0.008	0.021**	0.005
	(0.02)	(0.01)	(0.02)
L.INFLATION	-0.641**	-0.591***	-0.648**
	(0.25)	(0.13)	(0.26)
Constant	50.928***	56.920***	43.821***
	(15.86)	(7.79)	(16.38)
β1+ β2	-6.976***		

β1+ β3		-3.395*	
β1+ β4			-6.075***
Country FE	YES	YES	YES
Number of observations	774	774	774
Number of banks	75	75	75
Number of instruments	60	75	60
Hansen p-value	0.159	0.416	0.147
AR (2)	0.354	0.414	0.394

Note: This table presents the regression findings for the impact of ESG components (environmental pillar (*ENV*), governance pillar (*GOV*), and social pillar (*SOC*) scores) on bank lending in crisis times. We use a sample of 83 listed banks from 20 European countries and yearly data for the period 2002-2020. We implement the two-step system GMM dynamic panel data estimation techniques. The dependent variable is the annual growth rate of total loans, *LOANGRW*, in all models. The first lags of explanatory variables are used to mitigate any potential reverse causality. Country fixed effects are used in all models. Windmeijer corrected standard errors are used when clustering the error terms and given in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Additional analysis- Disentangling the financial crisis periods

	(1) *CRISIS 2008*	(2) *CRISIS DEBT*
ESG	0.070*	0.081**
	(0.04)	(0.04)
CRISIS 2008 (β1)	-17.329***	-5.022***
	(4.48)	(0.96)
ESG CRISIS 2008 (β2)*	0.237***	
	(0.09)	
CRISIS DEBT (β3)	-2.629***	-3.668*
	(0.69)	(1.99)
*ESG * CRISIS DEBT (β4)*		0.022
		(0.03)
COVID (β5)	-4.824***	-4.938***
	(1.18)	(1.18)
*ESG * COVID (β6)*		
NPL	-0.219***	-0.209***
	(0.06)	(0.06)
CAPITAL	-0.139***	-0.132***
	(0.04)	(0.04)
SIZE	-2.800***	-2.812***
	(1.02)	(1.00)
GDPGRW	0.368***	0.346**
	(0.13)	(0.14)
CONCENTRATION	0.018	0.019
	(0.02)	(0.02)
INFLATION	-0.578**	-0.516**
	(0.25)	(0.26)
L.LOANGRW	0.421***	0.420***
	(0.04)	(0.04)
Constant	55.561***	54.398***
	(14.02)	(14.07)
β1+ β2	-17.092***	
β3+ β4		-3.646*

β5+ β6		
Country FE	YES	YES
Number of observations	774	774
Number of banks	75	75
Number of instruments	61	61
Hansen p-value	0.171	0.152
AR (2)	0.326	0.318

Note: This table presents additional tests and disentangles the impact of ESG activity on bank lending for different financial crisis periods, i.e., the subprime crisis in 2007–2009 and the European sovereign debt crisis in 2010- 2012. We use a sample of 83 listed banks from 20 European countries and yearly data for the period 2002-2020. We implement the two-step system GMM dynamic panel data estimation techniques. The first lags of explanatory variables are used to mitigate any potential reverse causality. Country fixed effects are used in all models. The dependent variable is the annual growth rate of total loans, *LOANGRW*, in all models. *CRISIS 2008* takes a value of 1 for 2007-2009 and 0 otherwise, and *CRISIS DEBT* takes 1 for the years 2010-2012 and 0 otherwise. Windmeijer corrected standard errors are used when clustering the error terms and given in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$