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Social Responsibility and Bank Resiliency

By *Thomas Gehrig, Maria Chiara Iannino, Stephan Unger*

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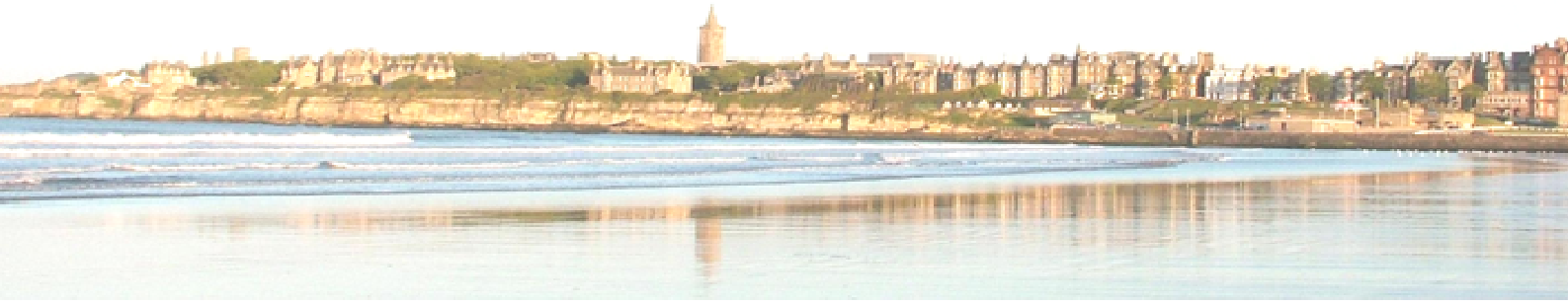

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Social Responsibility and Bank Resiliency*

Thomas Gehrig† Maria Chiara Iannino‡ Stephan Unger§

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Abstract

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Keywords: ESG-scores, systemic risk, bank resiliency, financial stability, capital shortfall, sustainable banking
JEL classification: G12, G21, G24, M14

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1 Introduction

Banking is a trust-based business as has become abundantly clear in the Great Financial Crisis even before the collapse of Lehman Brothers[1]. The rapid erosion of investors trust in the markets and banks did generate a near-collapse of the financial system and forced central banks to stabilize it and rebuild trust by massive provision of liquidity. While the ultimate sources of trust are still unsettled in the scientific debate, a number of contributing factors have been identified (see Knell and Stix (2015), Fungacova, Hasan and Weill (2019)). Notably, the ability to honour contracts and repay promised returns on investments has been identified as a basic pillar of trust, especially in the case of financial intermediaries and banks. In this paper, therefore, we take the view that banks' investments in social responsibility can be interpreted as such trust-building engagements. Consequently, we take the view that these investments should be reflected in the riskiness of banks' business models.

In particular, we analyse to what extent socially responsible activities do indeed enhance banks' resiliency. Will socially responsible activities reduce systemic risk exposure, and if so, which activity? Will they also reduce the contribution to systemic risk? Or do banks trade off investments in social responsibility against systemic risk exposure? Are these relations globally stable or can we identify regional differences?

These questions are of key importance since ESG ratings in general have moved into the focus of investors for evaluating the impact of socially responsible actions on firm performance and risk. Increasing awareness of green and climate finance is affecting investment behaviour as well as social and environmental risks. Moreover, as regulators and banking authorities are becoming increasingly attentive to the implications of ESG risk (EU Banking Package 2021, EBA 2021, BCBS 2020), banks are increasingly incentivized to adjust their business models in line with the UNEP Principles for Responsible Banking (2018), or even the Net-Zero Banking Alliance (2021).

In order to measure *social responsibility*, we refer to so-called ESG-ratings.[2,3] We concentrate on the particular ratings offered by Thomson Reuters, both in their older Asset-4 classification as well as their modern Refinitiv classification.[4] While there are many alternative ESG screens offered by different providers, we concentrate on the Thomson Reuters data, because those are widely analysed, and therefore their

[1] See Gehrig (2013), Gehrig (2015) and Knell and Stix (2015)

[2] ESG-ratings provide scores for firms' environmental (ENV), social (SOC), corporate governance (GOV) and economic (EC) activities.

[3] Our interpretation of ESG accords with the third viewpoint of ESG myths 1 of Larcker et al. (2021).

[4] We explain the differences and our take on those in more detail below.

strengths and weaknesses are widely known.[5] We are not implying that any screen is superior on the grounds of measuring various dimensions of social responsibility.

In order to measure *resiliency*, we provide two measures of systemic risk and two measures for individual banking risk. Implicitly, a bank is viewed as resilient when the risks of non-performing or no honouring contracts are low. In terms of exposure to systemic risk, we employ the expected capital shortfall measure SRISK of Brownlees and Engle (2017).[6] As a contribution measure, we employ Delta CoVaR by Adrian and Brunnermeier (2016), which is the market Value-at-Risk conditional on a bank being in distress.[7] Individual banking risk is measured by a dynamic market beta coefficient between the bank's return and the market return as a measure of systematic risk (Engle (2002)). A variant of Altman's well-established Z-score in the version of Fiordelisi and Marques-Ibanez (2013) is our measure of banks' insolvency risk.

In terms of results, we find that our measures for social responsibility, as proxied by ESG-scores, matter for systemic risk as well as for individual risk. Particularly, we find a significant negative relationship between systemic risk measures and average ESG-scores across all different methodologies used. Looking at the pillars composing the average score, the social pillar contributes the most to reducing systemic risk, in both exposure (SRISK) and contribution (Delta CoVaR). Moreover, some ESG scores do matter differently across the Atlantic. Notably, the positive impact of average CSR on banks' riskiness is lower in Europe. In particular, the corporate governance pillar score contributes to lowering systemic risk for US banks more than European banks.

At the level of subcategories that compose the various pillars, we find that ESG factors do matter for systemic risk as well as individual banking risk. Indicators of social long-term orientation, like *product responsibility*, *investments in social and human rights* and *workforce training* play a significant role in enhancing resiliency. We derive these results robustly in panel regressions, Instrumental Variable regressions, and making use of the change in TR methodology in 2017[8].

Systematic transatlantic differences arise, particularly in the case of labour markets organization as well as bank governance structure. Labour markets organization implies a lower exposure to systemic risk for European banks, as it can be seen in the positive differential impact of Employment quality scores. We also observe that scores of corporate governance, such as vision and strategy, do instead have a more positive impact on SRISK of US banks.

[5] Overall we take an agnostic view and ask about the informational content of the particular ESG screens used in the underlying data set.

[6] SRISK estimates the amount of assets exposed to systemic risk in case the market experiences a period of prolonged stress.

[7] Hence, it measures the contagion deriving from a bank being in distress to the whole banking system.

[8] For details see the paragraphs below.

Our results are particularly relevant to inform current policy debates about enhancing stability and resiliency of financial systems. For example, the European Commission explicitly calls for monitoring and regulating "systematic and consistent management of environmental social and governance (ESG) risks by banks"(EU Commission (2021)) in its Sustainable Finance Strategy 2021. Our results suggest that the introduction of specific instruments in order to manage ESG-risks may be preferable to adapting capital requirements to reflect ESG risk.[9]

We provide two methodological innovations in order to exploit an exogenous change in methodology in ESG scores to address potential endogeneity. Reverse causality is a fundamental concern in this literature, because there is empirical evidence both on out-performance typically preceding CSR investments[10] (Dorfleitner et al. (2015)), as well as resiliency driving CSR investments (Bouslah et al. (2013), Cornett et al. (2016)). We respond to potential endogeneity issues exploiting an exogenous shock in 2017, in the form of an unexpected change in the ESG scoring methodology. The identification strategy benefits from the fact that Thomson Reuters data provider changed its scoring method in 2017, retroactively updating components and ESG-scores, and dismissing the old Asset4 data in favour of the new Refinitiv data. This implies that we can still analyse the various drivers based on the former classification (Asset4) till 2017, which is the information that was available to market participants and could have affected their decisions and behaviour. Thus, we implement two identification strategies. First, we can use the new data (Refinitiv) as instruments, given they are highly correlated with the old data, but they lack of direct impact on the risk measures, because they were not available to market participants before 2017.

In order to improve the validity of our instrumental approach, we develop a new additional instrument about corporate scandals taken from the press. More precisely, the instrument consists of the lagged annual percentage of negative news related to fraud and financial crime in the whole banking system as provided by Factiva. We assume that this instrument is a proxy for the demand for CSR from stakeholders and, thus, correlated with the banks' commitment to CSR, but it should be uncorrelated with the risk propensity of the banks. Previous literature has used the industry average social score as an instrument (El Ghoul et al. (2011)), but we believe that our news instrument can also discriminate a market demand for social responsibility, rather than the firms' supply.

In a second attempt to reduce endogeneity, we also exploit the 2017 change in methodology to estimate whether a significant change in scoring, that we assume

[9]This is particularly relevant for globally systemically important financial institutions that predominantly apply an internal model-based approach to risk weighting.

[10]This holds particularly for measures of corporate governance.

was unexpected by the market and by the banks, has an impact on the market perception of systemic riskiness of these institutions. For this purpose, we consider the institutions that have seen a drastic increase or decrease in their ESG scoring as treated banks, and compare their SRISK level to the rest of the sample. We observe that a drastic decrease in ESG scores significantly and strongly increases SRISK, thus, the perception of systemic exposure of the banks increases. This is overall consistent with our hypothesis that CSR enhances the riskiness of the banks.

Finally, we also deal explicitly with a potential simultaneity bias by using properties of longitudinal data with a dynamic model that includes both lagged explanatory (ESG variables) and lagged dependent variables (risk measures).

Thus, we contribute in two major ways towards the existing literature, providing both new evidence and a methodological improvement, namely: i) by applying ESG-relevant factors towards the above-mentioned risk measures, comparing European and US financial institutions, in particular to systemic risk, and ii) by proposing identification strategies that would reduce a reverse causality bias. To the best of our knowledge, we are the first to address endogeneity between CSR and risk using the above-mentioned exogenous change in ESG methodology, and news sentiment as a proxy for the demand of CSR. Very few studies have looked at the impact of social responsibility on risk measures and have used methods able to resolve the issue of endogeneity between risk and social scores (El Ghoul et al. (2011) looking at cost of capital, Albuquerque, Koskinen, and Zhang (2019) looking at systematic risk and increased valuations), though none focused on the banking sector.

The paper is organized as follows. After a short survey of the literature in Section 2, Section 3 provides an overview of the sample and data. Section 4 presents the methodology used in the analysis and we set up the identification strategy for measuring the ESG score impact on our risk measures. The presentation of the results follows. First, we will present the results of the panel regressions using Asset 4 classification in Section 5, the IV regressions results are reported in Section 6, and, then, the impact of Refinitiv change in scoring in presented in Section 7. Finally, Section 8 discusses the policy implications of our results, and Section 9 concludes.

2 Literature

While there is a fast growing literature on ESG-investing, the focus of most research lies on returns, return volatility and profitability. This literature has long addressed the impact of environmental, social and governance policies on the firms' performance. On one hand, a strand of literature considers managers' investments into corporate social responsibility as detrimental to shareholders (Benabou and Tirole (2010); Krueger (2015)). On the other hand, proponents of a "value-enhancing view" suggest that in-

vestments in social responsibility pay off maximizing shareholder wealth (Anginer et al. (2018), Ferrell et al. (2016), Albuquerque et al. (2020)). A prominent example is the study of Lins et al. (2017), who identify a high ESG score with "social capital" and, thus, "trust". They estimate extra returns of four to seven percent for high social capital firms.

The issue of resiliency has been highlighted by the current pandemic. Recent studies by Albuquerque et al. (2020) and Pagano et al. (2020) focus on the profitability of ESG firms in the full stock market and find superior performance of ESG-firms. These finding are challenged by Berg et al. (2020) who demonstrate that the findings of Albuquerque et al. (2020) are highly dependent on their use of Refinitiv ESG II data, the Thomson Reuters ESG data available after a retrospective change in methodology in April 2020. They show that most results cannot be replicated on the basis of Refinitiv ESG I data, the data applying the methodology in use before April 2020. Thus, they show that no significant ESG effects can be measured on firm performance with the original scoring method. This finding asks the question about which scoring method did affect behaviour of market participants, if at all. It is evident that only Refinitiv ESG I was available to market participants prior to April 2020, when Refinitiv ESG II was suddenly (and surprisingly) introduced, retrospectively updating the variables. Also, Pagano et al. (2020) focus on returns. They do not aim at measuring resiliency in terms of risk measures, but rather identifying resiliency with social-distancing measures at the workplace, widely implemented by pandemic reaction policies. In contrast to those studies, our focus lies precisely on the relation of risk measures as proxies of resiliency and their relation to ESG-scores, which are defined by Thomson Reuters.[11]

Only few papers address the issues of resiliency, and analysed similar relations between ESG-scores and specific risk measures in banking. Dorfleitner et al. (2020a) and Dorfleitner et al. (2020b) have identified drivers of insolvency risk in a global sample of firms. Chiaramonte et al. (2020) analyse the impact of ESG in the insurance sector. Bouslah et al. (2013) analyse the relation between ESG components and systematic risk. Moreover, there is evidence about higher performance of firms with higher levels of social capital in periods of crisis (Lins et al. (2017)). Also ESG funds outperform conventional funds during periods of crisis (Becchetti et al. (2015a) and Nofsinger and Varma (2014)). However, none of these studies address the issue of systemic risk.

In the case of the banking industry, recent literature is focusing on whether attention to CSR impacts bank's behaviour. Kacperczyk and Peydró (2021) recently

[11] At least Refinitiv ESG I is exogenous as viewed by market participants, while the reasons for reclassification under Refinitiv ESG II have not been made transparent, and, therefore, may to some extent emerge endogenously.

show that banks committed to carbon neutrality affect carbon emissions via credit reallocation, moving loans from less to more virtuous companies. This behaviour seems to be due to a preference for green assets rather than risk considerations. The question whether corporate social responsible behaviour affects financial performance of banks has been studied by Cornett et al. (2016), who conclude that corporate social responsibility is rewarded by the markets. They also find that bigger banks tend to pursue more CSR measures than small banks. Moreover, they show that larger banks face an increase in CSR strengths and a steep drop in CSR concerns after 2009.

Closest to our work, Anginer et al. (2018) and Scholtens and van't Klosters (2019) focus on systemic risk in the banking sector. The former focuses on corporate governance dimension only, and, in agreement with our results, Anginer et al. (2018) find that shareholder-friendly policies, typically associated with a higher Corporate Governance score, tend to correlate positively with systemic risk of banks in both dimensions, exposure risk (SRISK) and contribution risk (Delta CoVaR). Scholtens and van't Klosters (2019) concentrate on a sample of the most systemic Eurozone banks and focus on the effect of both TR ESG equal-weighted score and pillars on both Z-score and SRISK. We add to their results by controlling for endogeneity and establishing causal links from the ESG scores to resiliency. Thus we verify that the social dimension plays the most significant role even after controlling for endogeneity. Moreover, since we analyse a larger sample, we can also study transatlantic differences. And finally, we go beyond the pillars, Environmental, Social and Corporate Governance, down to their underlying subcategories, which allows us to identify some of the ultimate drivers of resiliency.

3 Sample and Data

3.1 Sample

Our main sample set comprises 114 European financial institutions and 96 USA financial institutions from 2004 to 2019. The data includes all listed banks and diversified institutions so classified in the Compustat North America or Compustat Global databases, and simultaneously covered by Thomson Reuters Datastream ESG database.

We use daily Compustat market data and quarterly accounting data to estimate all risk measures. Compustat dataset also provides information on bank-level accounting data that we use as control variables, such as total assets, leverage, and net income. Then, we hand-match the available data with Thomson Reuters ESG database from Datastream.

For the European sample, we use the MSCI Europe index (Datastream data) as

the equity market return benchmark, while we use the S&P 500 index for the Northern American sample. Following Gehrig and Iannino (2021), we take the yield of German federal bonds (Bundesbank data) and select the US T-Bill rates (Datastream data), as the risk-free rates for European and US banks, respectively.

Finally, the relative annual number of negative news related to fraud and financial crime in the banking system is extracted from Factiva.

3.2 Data on Social Responsibility

According to the Financial Times Lexicon (Financial Times Lexicon (2018)), ESG is defined as *"a generic term used in capital markets and used by investors to evaluate corporate behaviour and to determine the future financial performance of companies."* We use two sets of annual ESG data from Thompson Reuters. We downloaded old Asset 4 ESG score in 2017, and new TR ESG Refinitiv in October 2020. The first set (Asset4) classified CSR into four pillars: **Environmental performance**, **Social performance**, **Governance performance** and **Economic performance**; and aggregate them into an equal-weighted ESG score. In order to evaluate the score for each pillar, different categories are considered individually with different weights. The pillar *Environmental performance* encompasses the categories Resource Reduction, Emissions Reduction, and Product Innovation. The pillar *Social* consists of Employment Quality, Health and Safety, Training and Development, Diversity, Human Rights, Community, and Product Responsibility, whereas the pillar *Corporate Governance* includes Board Structure, Compensation Policy, Board Functions, Shareholder Rights, and Vision and Strategy. Finally, the pillar *Economic* consists of Performance, Shareholders loyalty, and Client loyalty. 210 financial institutions in our sample are covered simultaneously by Compustat and Asset4 ESG data, 114 European firms and 96 US firms.[12]

In 2017, Thomson Reuters dismissed the previous categories and produced a new methodology, now called TR ESG Refinitiv. The main changes consider the removal of the Economic pillar and a weighted aggregate ESG score. The three pillars, Environmental, Social and Governance, are composed respectively by the following categories: Resourse use, Emission reduction and Innovation (ENV); Workforce, Human rights, Community and Product responsibility (SOC); and Management, Shareholders and CSR strategy (GOV). The methodology was further updated retrospectively on April 2020, therefore the data we downloaded refer to the new methodology, thus, they were not available to the market participants before April 2020 (Berg et al. (2020)). More financial institutions are covered by the new methodology compared to the old

[12]For more information about the methodology Asset4, you can refer to Refinitiv (2015) "ASSET4 ESG Data Glossary. February 2015.

Asset 4. Therefore, we could enlarge our dataset to 257 financial institutions, 152 European firms and 105 US firms.[13]

Tables 1 and 2 report a detailed list of the pillars and the sub-categories in each pillar for both the ESG datasets used, Asset 4 and Refinitiv. Moreover, Tables 3 and 4 report the summary statistics of the scores and the correlation matrix between each comparable pair in the two sets, and in the two geographical areas. The ESG aggregate scores are highly correlated in the two datasets, ranging from .78 in the US and .86 in the European sample. Important changes happened at the pillars level and the reclassification affected drastically the corporate governance score, with correlations from .59 (USA) to .65 (Europe). On average, all scores have decreased significantly, particularly the Corporate Governance dimension in the USA and the Environmental score in Europe.[14]

We conclude by showing the time evolution of the ESG scores (Asset4 data). Figures 1 to 5 report the evolution of the ESG aggregate score and the four pillars in Europe and in the USA. The figures reveal a steady average increase over the years, but also significant transatlantic differences, both, in the aggregate ESG score and, especially, in the pillars. Europe scores significantly higher in social responsibility, and its attention to CSR seems to have started earlier with a steady increase. It also scores higher in the Environmental and the Social dimensions. The US dominates in the Corporate Governance dimension, at least before the Refinitiv methodological change in April 2020, with high averages since early 2000.

4 Methodology

4.1 Measures of Resiliency

We conduct our analysis on four measures of risk. We consider two measures of systemic risk, as exposure (SRISK) and contribution (Delta CoVaR); and two measures of systematic risk, as distance to default (Z-score) and sensitivity to market return (beta).

The SRISK measure, developed by Brownlees and Engle (2017), is an estimate of the capital required to recapitalize an institution at market prices after a prolonged crisis, to render the bank compliant again with capital regulation. As such, it is a hybrid market-based measure of capital shortfall, since it combines market information (price of seasoned equity) with book values (capital requirements). It considers the

[13]For more information about the new methodology and a comparison with the old Asset 4 methodology, you can refer to TR (2017) "Thomson Reuters ESG Scores", November 2017, and to Refinitiv (2020) "Environmental, Social and Governance (ESG) scores from Refinitiv", April 2020.

[14]Details can be requested also for the full TR Refinitiv classification directly from the authors.

combined effect of the sensitivity of the bank returns to aggregate shocks, leverage and market capitalization of individual banks and the banking system at large. A bank is more likely to appear systemically risky if it faces a sizable capital shortfall in periods of depressed market conditions relative to good times when other banks are doing well (see Gehrig (2013)).

SRISK for bank i in period t is then estimated as:

$$\begin{aligned} SRISK_{i,t} &= E_{t-1}[Capital\ shortfall_i|Crisis] \\ &= E_{t-1}[k(Debt_{i,t}) - (1-k)(1-LRMES_{i,t})Equity_{i,t}], \end{aligned} \tag{1}$$

where k is the prudential capital ratio, that we assume at 8% (Brownlees and Engle (2017)); $LRMES_{it} = 1 - \exp(ln(1-d)beta)$ is the expected loss in equity value of bank i, if the market were to fall by more than a $d = 40\%$ threshold within the next six months (according to V-lab documentation[15]), and the market beta is a dynamic correlation coefficient between the bank's and the market returns (Engle, 2002). SRISK is estimated daily and then aggregated annually.

We follow Adrian and Brunnermeier (2016) in measuring the contribution to systemic risk by use of Delta CoVaR. This purely market based systemic risk measure assesses the spillovers of distress from a given bank to the financial system. Hence, it measures the contagion deriving from a bank being in distress to the whole banking system. Using a quantile regression approach, we identify this distress event of firm i as an equity loss equal to its $(1-\alpha)\%$ VaR, such as $r_{it} = VaR_{it}(\alpha)$, and CoVaR represents the maximum loss of the market return within the $\alpha\%$-confidence interval, conditionally on some event $C(r_{it})$ observed for bank i: $Pr(r_{mt} \leq CoVaR_t^{m|C(r_{it})}) = \alpha$. Then, the $Delta CoVaR of the bank i is then defined as the difference between the CoVaR of the financial system conditional on firm i being in distress and the CoVaR of the financial system conditional on firm i being in its median state, weighted by the bank's market capitalization:

$$\$\Delta CoVaR_{it}(\alpha) = -(CoVaR_t^{m|r_{it}=(VaR_{it}(\alpha))} - CoVaR_t^{m|r_{it}=Median(r_{it})}) * MV. \tag{2}$$

As its authors, we will transform Delta CoVaR to positive values. Moreover, Delta CoVaR is estimated daily and then aggregated annually.

Individual banking risk is measured both via systematic risk, as proxied by market beta, and a measure of bank default. The latter distance-to-default is widely proxied in the banking literature by the Z-score (Boyd and Runkle (1993), Fiordelisi and Marques-Ibanez (2013)). It measures the distance of bank's ROA to the insolvency threshold in multiples of standard deviations. This measure combines information

[15] https://vlab.stern.nyu.edu/docs/srisk/MES

on bank's performance (ROA), leverage (equity-to-assets ratio), and risk (standard deviation of ROA). Higher values of Z-score represent a larger distance-to-default. We estimate the following version of Z-score for each institution:

$$Z - score_{it} = \frac{ROA_{it} + E_{it}/TA_{it}}{\sigma_{ROA_i}}. \tag{3}$$

Z-score is estimated quarterly, and then aggregated annually.

Finally, we estimate a dynamic market beta coefficient between the bank's return and the market return. The return volatilities of each institution i, $\sigma_{i,t}$, and of the market, $\sigma_{m,t}$, are estimated by an asymmetric GJR GARCH model (Glosten et al. (1993)). The correlation between each institution return and the European market index, $\rho_{i,t}$, is estimated by a Dynamic Conditional Correlation (DCC) model (Engle (2002)). The beta measure is estimated daily and then aggregated annually:

$$Beta_{it} = \rho_{i,t}\frac{\sigma_{i,t}}{\sigma_{m,t}}. \tag{4}$$

Table 5 lists all the risk measures and control variables used in the analysis. Figure 6 reports the evolution of the risk measures over time, for Europe and the US separately. In terms of exposure to systemic risk, the capital shortfall (SRISK) for European banks in our sample exceeds that of US banks considerably. In terms of the contribution measure Delta CoVaR, no significant transatlantic differences can be detected. But in terms of individual bank risk, distance to default tends to be higher for European banks in our sample, while market beta tends to be lower.

4.2 ESG contributions towards resiliency

In order to analyse the explanatory power of ESG scores on any of the resiliency measures $RES \in \{$SRISK, ΔDelta CoVaR, Beta, Z-score$\}$, we regress separately the annual RES measure on each lagged categorical ESG, distinguishing the aggregate ESG score, the pillars and the sub-groups of each pillar. This allows us to extract the drivers of the RES levels.

Thus, we set up three models. First, we use the ESG aggregate score as proxy for social responsibility and regress $RES_{i,t}$ for company i at time t on the lagged score $ESG_{i,t-1}$ and the set of control variables $X_{q,i,t-1}$:

$$\begin{aligned} RES_{i,t} &= \alpha + \gamma_1 ESG_{i,t-1} + \gamma_2 ESG_{i,t-1} * ln(TA_{i,t-1}) + \gamma_3 ESG_{i,t-1} * Europe \\ &+ \lambda_0 RES_{i,t-1} + \sum_q \lambda_q X_{q,i,t-1} + \mu_i + \tau_t + \epsilon_{i,t}. \end{aligned} \tag{5}$$

We recall that i is the counter for each financial institution and t represents the year from 2004 to 2017. The dependent variable RES is the risk measure, alternatively as SRISK, Delta CoVaR, market beta or Z-score. ESG is the weighted-average aggregate score for each firm and year, and we include interacted terms with size ($ln(TA)$) to address the evidence that larger firms tend to be more involved in CSR practices (Cornett et al. (2016)).[16] Moreover, we interact ESG with a dummy for geographical location ($Eur = 1$ if bank headquarters are located in Europe) to address any differences between the two continents. Given the persistence we find in bank's riskiness, we control for the lagged value of the risk measure. Moreover, we include a set of lagged bank-specific variables as determinants of bank risk (Gehrig and Iannino (2021), Scholtens and van't Klosters (2019)), $X_{q,i,t-1}$, such as log of total assets, leverage, net income. In the particular case of SRISK, we also include market beta and Z-score as known drivers of the expected capital shortfall. Thus, we intend to study the effect on systemic risk, ceteris paribus the impact on systematic solvency and cost of capital. Moreover, in all specifications we include country fixed effects, μ_i, to capture supervisory differences among the banks in the sample, and year fixed effects, τ_t, to address changing macro-economics conditions.[17]

Secondly, we disentangle the effects of each pillars of the ESG score and regress RES on the four scores ($Pillar$), ENV-score, SOC-score, CG-score and EC-score, in order to identify which ESG category explains most of the systemic financial stability:

$$\begin{aligned} RES_{i,t} &= \alpha + \sum \gamma_1 Pillar_{i,t-1} + \sum \gamma_2 Pillar_{i,t-1} * ln(TA_{i,t-1}) \\ &+ \sum \gamma_3 Pillar_{i,t-1} * Eur + \lambda_0 RES_{i,t-1} + \sum_q \lambda_q X_{q,i,t-1} + \mu_i + \epsilon_{i,t}. \quad (6) \end{aligned}$$

As robustness check, due to the high correlation between the categorical scores, we regress the four pillars in a single specification, as well as run separate regressions for each pillar.

Finally, in order to have a more detailed insight on which categories of each pillar are sufficient to work as an effective policy measure to improve financial stability, we regress RES on each sub-categories of each pillar ($Subcat$):

$$\begin{aligned} RES_{i,t} &= \alpha + \sum \gamma_1 Subcat_{i,t-1} + \sum \gamma_2 Subcat_{i,t-1} * ln(TA_{i,t-1}) \\ &+ \sum \gamma_3 Subcat_{i,t-1} * Eur + \lambda_0 RES_{i,t-1} + \sum_q \lambda_q X_{q,i,t-1} + \mu_i + \epsilon_{i,t}. \quad (7) \end{aligned}$$

[16] As unreported robustness checks, we consider a weighted average of only Environmental and Social scores, excluding Corporate Governance and Economic Pillars.

[17] As robustness checks, we used firm fixed effects, and macro- economics variables (such as GDP growth, unemployment, PPI, banking system leverage).

As above, we regress the components of each pillars on both separate regressions per pillar and a single specification.

4.3 Identification strategy

Identifying the causal relation in this setting is difficult because resilient banks might also tend to be more inclined to introduce socially responsible policy measures. Literature supports the presence of reserve causality, especially in the case of corporate governance regarding the impact on performance (Dorfleitner et al. (2015), Friede et al. (2015). Less risky banks would invest more in corporate governance. There is less evidence that less risky banks would invest more in social and environmental measures, still we implement several steps in order to reduce endogeneity and simultaneity biases. We first use longitudinal data and fixed effects, and then exploit the change in methodology in 2017 to implement an IV approach and to explicitly study the effect of such exogenous change in ESG ratings on SRISK.

Let us start with analysing longitudinal data and fixed effects. Measures of risk are regressed on the first lag of ESG scores, thus allowing us to draw conclusions on how ESG affects the risk in the following year, safe from simultaneous bias. Moreover, we could still have issues of reverse causality if the risk measure affects ESG through its lags, because of its persistence. Thus, we introduce lagged dependent variables as control variables. We include either country fixed effects to address any omitted country- or firm-specific variables, on the assumption that endogeneity is driven by non-varying fixed effects. Literature supports that in small samples, country effects work better to control for unobserved heterogeneity (Gormley and Matsa (2014)).

In the next step, we use a 2SLS Instrumental Variable approach with robust standard errors using the change in methodology in 2017. Since the implementation of a new measurement method of ESG scores in 2017, the pillars of ESG scores have been calculated and aggregated differently in new scores under the name of Refinitiv. We use these new Refinitiv data 2020 as instruments for the old Asset 4 data in the sample 2004-2017.

Since ESG data based on this new methodology were not available prior to 2017, banks and financial institutions were not able to take the effects of ESG policy implementations into account (Berg et al. (2020)). Therefore, Refinitiv data could not affect risk measures directly, while we assume that they can affect SRISK only through their correlation with the old Asset 4 data. Tests of instrument validity are performed, suggesting we have a strong instrument that tends to be uncorrelated with the error term.

Moreover, in order to be able to test for the validity of the instruments with an overidentification Sargan's (1958) test, we introduce an additional instrument, as the annual percentage of negative news related to fraud and financial crime in

the banking system (data are extracted from Factiva). Every year, we measure the relative number of newspapers articles citing the banking sector, classified as negative and related to fraud and financial crime, over the total number of articles covering the banking sector in Europe and, separately, in the USA. We assume the lagged number of negative news to be a proxy for the demand for CSR from stakeholders, and therefore highly correlated with the future ESG scores, but uncorrelated with the future risk propensity of the banks. Figure 7 reports the relative evolution of the number of negative news for USA and Europe.

Finally, we also investigate systemic risk exposure at the time of the change in Refinitiv methodology assuming that banks were neither aware nor could affect the change in ESG methodology. Thus, we set the time dummy of the exogenous event to 2017 and consider 3 years before and 3 years after 2017 included. We consider treated banks all the institutions that have a drastic increase or decrease in ESG, and as control all other banks. We calculate the difference between the old Asset 4 data and the new Refinitiv data at 2017, and consider a drastic increase in scores if the difference lies above its 90th percentile, and a drastic decrease if the difference lie below the 10th percentile. We then apply all the control variables previously used, as well as year and country fixed effects. Particularly, we include the lagged risk measures to control for both the firm-specific riskiness of the banks, and lagged ESG scores as control variables for firm-specific preference for social responsibility. Lastly, we also try as a placebo test to check whether changing the time and/or the calculation of the difference has an effect.

In the following Section, we first report results from pooled OLS regressions using old Asset4 data including lag regressors and country/state fixed effects to control for unobserved heterogeneity that could affect both ESG scores and systemic risk at the bank level (Gormley and Matsa (2014)).[18] Then, we report the results from the Instrumental Variable approach using both old and new ESG data, where Refinitiv data are used as instruments for the Asset 4 data available at the time of market decisions. Finally, we report the results of the impact of a significant change in scoring, where treated banks are considered institutions with a drastic increase or decrease in ESG from the old Asset 4 to the new Refinitiv data.

[18]The Appendix report OLS regressions where the pillar scores are included separately, to show potential effect of multicollinearity between the scores (Tables 19 to 23).

5 Impact of ESG on financial institutions based on Asset 4 data only

We start this analysis looking at the OLS results based solely on the Asset 4 classification of Thomson Reuters, which was updated till 2017.

It is useful to start with the aggregate scores and then continuously dig deeper into the various components in order to distill the economic structure.

5.1 Aggregate Scores

Let us start with the equally weighted aggregate ESG score. Table 6 reports the results of the panel data regression on the two systemic risk measures, SRISK (exposure measure, column 1 in Tables) and Delta CoVaR (contribution measure, column 2), and on two measures of firm individual risk, Z-score (insolvency risk, column 3) and market beta (systematic risk, column 4). Across the board, we find a strongly significant and resiliency-enhancing effect of the aggregate ESG score (L.Equal-Weighted Rating) on all systemic risk measures. High ESG levels are related to a reduction in exposure and contribution risk, as well as systematic risk. A positive, but no significant effect, is evinced also on the risk of insolvency.

These results suggest that, on average, banks that score high in the ESG dimensions present lower individual riskiness (Bouslah, 2013, Scholtens et al., 2019). Though, more interesting, the markets seem to appreciate the social-responsible involvement of the banks in our sample. We observe that firms with better ESG ranking tend to be perceived as less systemically and systematically risky, in terms of their systemic contribution and exposure, and market beta. They could then face lower cost of capital, as some literature has evinced in non-financial firms.

Moreover, we identify significant transatlantic differences, by introducing a region dummy (Europe = 1) and interacting it the ESG score (L.Equal-Weighted Rating #Europe). We first observe that European banks enjoy significantly lower exposure to systemic risk and individual insolvency risk, on average. Though, we also observe that the systemic resiliency-enhancing effect of ESG-rating is significantly lower for European than for US banks, as the interaction term in SRISK (model 1) proposes. The following analysis on pillars and sub-categories will help to shed more lights on this transatlantic difference.

Importantly, we also find that firm size significantly reduces the positive resiliency-enhancing impact of ESG on all risk measures (L.Equal-Weighted Rating #c.ln(L.TA)). In other words, the effect of CSR on small vs. large firms is significantly different. ESG measures tend to be more effective in enhancing resiliency for smaller firms.

The remaining controls, particularly insolvency risk measured by Z-score, leverage,

net income, generate the expected significant signs (Gehrig and Iannino (2021)).

5.2 Pillars

By disentangling the components of the equal-weighted ESG score into its major pillars, ENV-score (L.Environmental), SOC-score (L.Social), CG-score (L.Corporate Governance) and EC-score (L.Economic), Table 7 provides more information about the drivers of the aggregate findings. According to this decomposition, we find that it is especially the *social factor* that greatly contributes to reducing both measures of systemic risk. In particular, one standard deviation increase in Social score, will decrease SRISK by 0.146 standard deviations, ceteris paribus. This result is consistent with the particular nature of the banking services, highly focused on human and social capital (Scholtens et al. 2019).

Consistently, the social factor plays a different role for smaller vs. larger firms, being more beneficial in reducing risk for smaller firms, for dependent on human capital. Size significantly reduces the positive resiliency-enhancing impact of the social pillar in the interaction term L.Social #c.ln(L.TA), as also seen in the overall ESG score.

Looking at contribution risk, *Environmental score* plays the strongest role, otherwise not affecting the other risk measures. A change in Environmental score will produce a decrease by 0.196 standard deviations in Delta CoVaR. In line with our results, other studies have not found a significant risk impact of the environmental pillar. Considerations on green investments could be due to a bank's preference for green assets, rather than risk considerations (Kacperczyk and Peydró, 2021).

Interestingly, *corporate governance* produce a differential effect in the two regions of our analysis. Corporate Governance score interacted with the region dummy (L.Corporate Governance #Europe) suggests that European banks that score high on the governance dimension also tolerate higher capital shortfalls, and vice versa for US banks. Anginer et al. (2018) find a positive relation between high corporate governance score and risk in countries when shareholder-friendly corporate governance is accompanied by higher financial safety nets provided by the state.

5.3 Subcategories

Finally, by zooming in on the individual score components, we can identify the micro-interactions between rating scores and risk measures.

5.3.1 Common Drivers

Table 8 presents even a more detailed picture of the relationship between CSR and risk. We find the strongest effects on risk for the following components: (i) Customer/product responsibility, (ii) Society/human rights, (iii) Training and development/policy, (iv) Board Compensation Policy, and (v) Profitability/shareholder loyalty.

Customer/product responsibility is strongly associated with lower risk in both systemic measures and in the market beta, producing, in particular, a 0.187 standard deviations decrease in contribution risk and a 0.292 decrease in systematic risk. Though, it has not significant effect on insolvency risk. All this direct effects are moderated but still significant, when interacted with bank size.

Similarly, *Society/human rights* are associated with significantly lower systemic impact. In particular, it has the strongest effect on SRISK among the categories considered, with a standard deviation decrease of 0.216. However, the human right score produces a negative effect on insolvency risk, decreasing the distance to default by 0.207 standard deviations. Again, the resiliency-enhancing effect is weaker for larger banks.

Policies related to the workforce, such as *Training and development, Health Safety and Employment Quality*, significantly reduce contribution risk, but has no significant effect on exposure risk. As before, workforce policies seems to appear more like a costs reducing distance to default and increasing systematic risk. Again, these effects are smaller for larger firms.

Some minor effects can also being seen in the corporate governance and the economic pillars. In the former, *board compensation policy* seems to play a role in decreasing the perceived systemic exposure of the banks, reducing SRISK by 0.099 standard deviations. In the economic pillar, interesting, *Profitability/shareholder loyalty* has a weak destabilizing effect on exposure risk, and it tends to increase systematic risk as well.

Interpreting the findings, it seems that proxies for longer management horizon tend to be associated with lower capital shortfall, such as *customer/product responsibility*, *society/human rights* and *training and development*. These variables positively contribute to charter value, which tends to be preserved by higher capital buffers. However, the positive contributions to resiliency are lower for larger banks. Our results in part confirm previous findings of a negative effect on individual firm risk of two dimensions in particular, Employee relations and Human Rights (Bouslah et al, 2013).

Profitability and shareholder loyalty, on the other hand tends to (weakly) increase exposure risk. This effect can be related to higher payout policies such as stock

repurchases and dividends that extract buffer stock capital form the bank.[19]

5.3.2 Transatlantic Comparison

It is also quite informative to compare the differential effects of ESG-subcategories on the different measures of resiliency between Europe and the US. By doing so, we find a number of interesting findings in the interaction terms with the region dummy, for the systemic risk measures of SRISK (column 1 in Tables) and Delta CoVaR (2), as well as Z-score of default risk (4) on: (i) Employment quality/policy, (ii) board of directors/board structure, (iii) integration/vision and strategy.

In the social pillars, various components have differential effects across the Atlantic., European banks seem to benefit more from socially-responsible investments compared to US banks in terms of their perceived exposure risk, while US firms benefit more in terms of reducing contribution risk. *Employment quality/policy* reduces exposure risk for European banks relative to US banks, while *Human Rights and Product responsibility* are more reducing-factors in US banks.

The corporate governance components seem to be more effective used by US firms. *The variable board of directors/board structure* has a significantly destabilizing differential effect in contribution risk for Europe, while *Integration/vision and strategy* has a strongly destabilizing effect in exposure risk for Europe, suggesting a higher capital shortfall in Europe for banks that score high in that dimensions.

Accordingly, the main differences in the transmission of ESG-indicators into systemic risk measures across the Atlantic seems to be related to the different organization of labor markets, and differences in bank governance. Interestingly, the different organization of labor markets makes European banks relatively more vulnerable with respect to contribution risk and US banks with respect to exposure risk. On the other hand, the fact that board structure is stabilizing European banks relatively more than US bank, but not board function, suggests that co-determination laws in Europe may play a stabilizing role by including arguably long-term oriented stakeholders more broadly.

Also, we observe that most of the transatlantic differences can be detected in the contribution to systematic risk, i.e. market beta (column 4). Here, we find substantial differences in the way the different ESG-indicators affect bank resiliency. Sources of relatively lower systematic risk for US banks can be found in resource reduction, product responsibility and human rights; while for the European banks important drivers are emission reduction, product innovation, health and safety policy, board structure and performance.

[19]See Gehrig and Iannino (2021) for empirical evidence on European banks and Gehrig and Iannino (2018) for insurance globally.

6 Impact of ESG on financial institutions based on an IV approach with both Asset 4 and Refinitiv data

The results in the previous section establish that ESG scores and riskiness are highly correlated. We resolve any simultaneity bias making use of the longitudinal dimension of our data. However, statements on causality require additional care. Thus, we propose an instrumental variable approach to reduce potential reverse causality in order to be able to determine the impact of ESG scores on the riskiness of the banks.

Since the implementation of a new measurement method of ESG scores in 2017, the pillars of ESG scores have been calculated and aggregated differently and retroactively updated. Therefore, in this subsection we present the impact of ESG measures on SRISK on European as well as U.S. financial institutions using the new ESG calculation regime as an instrument for the Asset 4 data available to the market participants at the time of their decisions.

Before looking at the results, we discuss the instruments used. We performed several tests for validity and identification, and we conclude that we have supportive evidence that the Refinitiv measures are strong and valid instruments for the Asset 4 ESG scores, in the regressions involving all risk measures. First-stage tests on the single endogenous variables are reported in Table 14, while tests on the equation are reported at the end of each table of results (Tables 9 to 13). [20]

First of all, we test for endogeneity of the Asset 4 ESG scores, as the difference of two Sargan-Hansen statistics where the regressors are treated as endogenous or exogenous. Rejecting the null hypothesis that the specified endogenous regressors can actually be treated as exogenous, we have evidence that ESG scores are in fact endogenous to the risk specifications.

Then, we can safely assume that our instruments are relevant and strong, i.e. highly correlated with the ESG Asset 4 scores. The small-sample first-stage F-tests as well as the Shea partial R-squared (Shea, 1997) show that all instruments chosen are strongly correlated with the endogenous ESG variables. Furthermore, we reject the null of the overall equations being underidentified (rank LM test) or weakly identified (Kleibergen-Paap Wald (2006) rank F statistic).

Using the Anderson-Rubin test (1949) and the Stock-Wright (2000) S statistic for weak-instrument robust-inference, e.i. testing jointly the significance of the endogenous regressors, we reject the null hypothesis that the coefficients of the endogenous regressors are jointly equal to zero and overidentifying restrictions are valid.

[20] First-stage test statistics as well as underidentification, weak-identification and weak-identification-robust test statistics are heteroskedasticity-robust.

We cannot perform a Sargan (1958) J test if our equations are exactly identified. as we construct our measures such that the Refinitiv variables exactly matches in number the Asset4 scores. Thus, we include an additional instrument as the relative negative news in the banking sector. We observe that the Sargan J tests are not rejecting the null of overidentification in most risk measures, supporting the validity of our IV approach.

Thus, we conclude that our instruments are relevant in all specification, and valid for all risk measures.

Inspecting the results, the 2SLS IV regressions confirm most of our previous findings on systemic risk. According to Table 9, aggregate social responsibility has a positive impact reducing systemic risk, both regarding exposure risk (SRISK, column 1) and contribution risk (Delta CoVaR, column 2). Moreover, this effect is larger for US and for smaller banks. Given the validity of our instruments this finding suggests that ESG investments indeed contribute to lowering systemic risk, both on the contribution as well as on the exposure dimension.

Interestingly, the positive effect on individual bank systematic risk is no longer significant in the IV regression suggesting the absence of any causal relations. Z-score was not affected by the aggregate ESG score even in the OLS regressions.

Also, looking at the three pillars (Table 10), we perform three separate regressions and confirm the positive impact of all three categories, Environmental, Social and Corporate Governance when looked separately. Looking at the standardized coefficients reported, we observe then that *social* and *corporate governance* dimensions still play a dominant role in contributing to systemic resiliency.

On the level of subcategories we find a slightly smaller number of causal relations in the IV regressions (Tables 11 to 13). Those that we identify confirm the earlier correlations. In particular we find that *product responsibility* and *vision and strategy* tend to reduce systemic riskiness (SRISK) as perceived by the market. The former particularly affects European banks, whereas US banks benefit strongly from an enhancement in *corporate governance*.

7 Impact of Refinitiv change in ESG scoring

Finally, we investigate whether ESG scores affect systemic risk by exploiting the unexpected change in the scoring technology. In 2017 the event per se was completely unexpected and, therefore, qualifies as an exogenous at the level of the individual banks. Therefore, this change could not affect their behaviour. Accordingly, we introduce in our regressions a time dummy equal to 1 on and after 2017. We identify treated institutions as the banks that have seen a drastic increase or decrease in their

ESG and pillar scores, such as a change between old Asset 4 and new Refinitiv higher than its 90th percentile (we refer to these institutions as Treated Plus) or lower than its 10th percentile (Treated Minus).

Tables 15 to 17 report the estimation results of the regressions of SRISK on the exogenous change in 2017, on treated dummy and on the interaction between the event dummy and the treated dummy. We are interested in the latter interaction terms, TimeTreated Plus and TimeTreated minus.

We observe in Table 15, that the banks that have experienced a drastic decrease in their ESG scores also experienced the next period a significant decrease in resiliency. We do not observe a similar significance for treated banks that experienced an increase in ESG scores. The same results appear for all pillars, with the exception of the Corporate Governance one. Thus, we can interpret this as evidence that the market updates its beliefs on systemic exposure and considers ESG as an important driver of riskiness: banks that have seen an expected reduction in ESG are, after 2017, perceived riskier in terms of systemic exposure. on the assumption that negative news tend to be more salient than positive news, do not see any effect of an increase of ESG scores on the perception of risk of the treated institutions.

Comparing European and USA banks (Tables 16 to 17), we observe that the above results are driven by European banks. All ESG pillars have the similar negative effects on riskiness once the European banks experience a downgrade (though the Social pillar is not significant). However, such effects do not occur for US banks. This seems to suggest that the reform of ESG screens was largely inconsequential for US banks.

We tried changing the time dummy of the event to investigate whether the market was aware of the change in methodology before 2017 or its reaction was delayed. Results are not significant if we define the time dummy as 2016, nor if we calculate the difference between scores in 2016. This insignificance supports our assumption that the market was not aware of the change in methodology before 2017.[21] However, results are very interesting if we consider 2018 as the time of the event. Table 18 reports the results for all regions, and we observe that the interacted Treated Plus dummy is now negative for all ESG score and pillars, and significant with the exception of Corporate Governance. The results imply that the market first incorporates into its risk perception the negative content of a downgrading, and only at a later stage accounts for the positive content of an upgrade in ESG.

8 Policy Implications

Our analysis suggests that various, but by no means all, of the constituent ESG factors are informative about the inherent risks of banks' business models. To the

[21] We do not report these results here given their insignificance, but they are available on request.

extent that these subscores contain information on planning horizon and long-term orientation they also affect banks' idiosyncratic and systemic risk exposure. Most of the significant factors that we identify contribute positively to bank resiliency as measured by market-based statistics, Z-score and SRISK. A major exception is the subscore on "shareholder loyalty", which impacts negatively on resiliency, but positively to overall ESG. The reason for this particular subscore relates to the definition of shareholder loyalty which includes stock repurchases, and therefore, unsurprisingly, contributes positively to capital shortfall and negatively to resiliency.

Based on these findings more refined recommendations can be given to financial supervisors and regulators. The factors that contribute positively to resiliency may be useful information for supervisors in the process of validating banks' internal models of credit risk. The higher the long-term orientation as signalled from the ESG factors the less would be supervisory concerns about capital shortfall. On the other hand, in line with our findings it would seem natural that banks with a more long-term perspective would apply less aggressive credit risk models. This result can be checked by supervisors on the individual bank level within the validation process.

To the extent that ESG-scores are informative about bank riskiness they also constitute useful input for regulatory purposes. In this sense our analysis provides recommendation on specific subcategories or pillars that might be particularly relevant. For example, according to the recommendations of the European Commission about reforming Basel III our analysis provides information about subcategories that might require extra risk weights or reductions in risk weights. In their preferred option, in providing proper incentives for bank management, our analysis could even direct policy makers' attention to the most effective subcategories.

All these recommendations, however, are based on the specific ESG-definitions applied in the screening process. Our analysis has concentrated on the Thomson Reuters screens and has found that some of their subscreens provide useful information for regulatory purposes. This does not mean that regulating ESG-reporting becomes superfluous. In particular, mandated scores should be manipulation-proof in order to prevent misrepresentation.[22] But having said this, our analysis suggests that the correlation of responses to the specific private scoring mechanism and market based resiliency measures are significant and economically plausible and, thus, alleviate such potential whitewashing concerns to some extent.

[22]The manipulation argument is particularly relevant for ESG-labels of financial products but may also affect less marketing sensitive ESG-reporting.

9 Conclusions

ESG matters! This is the strong evidence of our study on bank resiliency. We find that ESG has a stabilizing effect on systemic risk measures, both the exposure and the contribution measure, as well as individual risk measures for systematic risk and insolvency risk. In this sense, adherence to the UNEP Principles for Responsible Banking clearly enhances bank resiliency.

As predicted by theory, it is particularly measures related to long-term objectives, like customer and product responsibility, investments in social institutions and workforce training that are resiliency-enhancing, while measures related to short-term profitability tend to increase risk and, hence, reduce resiliency.

In the transatlantic comparison the relative effectiveness of ESG measures differs considerably between Europe and the US. European banks benefit more from labor market institutions and board structure in terms of systemic risk exposure, while US banks benefit from social/human rights, product responsibility and resource reduction.

Our results suggest that risk measures are the proper way to measure resiliency in the banking sector. We offer two main reasons: First, both measures of systemic risk as well as systematic risk and insolvency risk are significantly affected by ESG instruments. And second, the relation between risk measures and ESG scores is robust relative to the redefinition of the ESG measures from Asset 4 to TR ESG Refinitiv. This result contrasts with the findings of Albuquerque et al. (2020) and Berg et al. (2020), who find that standard performance measures in terms of returns and return volatility are significantly affected by the scoring method.[23] Their findings comprise all industries and are not tailored to the banking industry.

Based on our results, we would predict that banks with higher ESG ratings will perform better and impose less prudential concerns to supervisory authorities during the current pandemic crisis as well as the repercussions from the war in Ukraine.

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[23]Berg et al. (2020) argue that a reclassification has taken place in April 2020 even within the TR ESG Refinitiv classification. Our data refer to the classification of April 2020.

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10 Appendix

Table 1: Asset 4 ESG variables, 2018

Pillars	Name	Description
ESG score	Equal-Weighted ESG Rating	The Equal Weighted Rating reflects a balanced view of a company's performance in all four areas, economic, environmental, social and corporate governance
Corporate Governance	Corporate Governance	The corporate governance pillar measures a company's systems and processes, which ensure that its board members and executives act in the best interests of its long term shareholders. It reflects a company's capacity, through its use of best management practices, to direct and control its rights and responsibilities through the creation of incentives, as well as checks and balances in order to generate long term shareholder value.
	Board of Directors/Board Functions	The board of directors/board functions category measures a company's management commitment and effectiveness towards following best practice corporate governance principles related to board activities and functions. It reflects a company's capacity to have an effective board by setting up the essential board committees with allocated tasks and responsibilities.
	Board of Directors/Board Structure	The board of directors/board structure category measures a company's management commitment and effectiveness towards following best practice corporate governance principles related to a well balanced membership of the board. It reflects a company's capacity to ensure a critical exchange of ideas and an independent decision-making process through an experienced, diverse and independent board.
	Board of Directors/Compensation Policy	The board of directors/compensation policy category measures a company's management commitment and effectiveness towards following best practice corporate governance principles related to competitive and proportionate management compensation. It reflects a company's capacity to attract and retain executives and board members with the necessary skills by linking their compensation to individual or company-wide financial or extra-financial targets.
	Integration/Vision and Strategy	The integration/vision and strategy category measures a company's management commitment and effectiveness towards the creation of an overarching vision and strategy integrating financial and extra-financial aspects. It reflects a company's capacity to convincingly show and communicate that it integrates the economic (financial), social and environmental dimensions into its day-to-day decision-making processes.
	Shareholders /Shareholder Rights	The shareholders/shareholder rights category measures a company's management commitment and effectiveness towards following best practice corporate governance principles related to a shareholder policy and equal treatment of shareholders. It reflects a company's capacity to be attractive to minority shareholders by ensuring them equal rights and privileges and by limiting the use of anti-takeover devices.
Economic	Economic	The economic pillar measures a company's capacity to generate sustainable growth and a high return on investment through the efficient use of all its resources. It is reflection of a company's overall financial health and its ability to generate long term shareholder value through its use of best management practices.
	Margins /Performance	The margins/performance category measures a company's management commitment and effectiveness towards maintaining a stable cost base. It reflects a company's capacity to improve its margins by increasing its performance (production process innovations) or by maintaining a loyal and productive employee and supplier base.

	Profitability /Shareholder Loyalty	The profitability/shareholders loyalty category measures a company's management commitment and effectiveness towards generating a high return on investments. It reflects a company's capacity to maintain a loyal shareholder base by generating sustainable returns through a focused and transparent long-term communications strategy with its shareholders.
	Revenue /Client Loyalty	The revenue/client loyalty category measures a company's management commitment and effectiveness towards generating sustainable and long-term revenue growth. It reflects a company's capacity to grow, while maintaining a loyal client base through satisfaction programmes and avoiding anti-competitive behaviours and price fixing.
Environmental	Environmental	The environmental pillar measures a company's impact on living and non-living natural systems, including the air, land and water, as well as complete ecosystems. It reflects how well a company uses best management practices to avoid environmental risks and capitalize on environmental opportunities in order to generate long term shareholder value.
	Emission Reduction	The emission reduction category measures a company's management commitment and effectiveness towards reducing environmental emission in the production and operational processes. It reflects a company's capacity to reduce air emissions (greenhouse gases, F-gases, ozone-depleting substances, NOx and SOx, etc.), waste, hazardous waste, water discharges, spills or its impacts on biodiversity and to partner with environmental organisations to reduce the environmental impact of the company in the local or broader community.
	Product Innovation	The product innovation category measures a company's management commitment and effectiveness towards supporting the research and development of eco-efficient products or services. It reflects a company's capacity to reduce the environmental costs and burdens for its customers, and thereby creating new market opportunities through new environmental technologies and processes or eco-designed, dematerialized products with extended durability.
	Resource Reduction	The resource reduction category measures a company's management commitment and effectiveness towards achieving an efficient use of natural resources in the production process. It reflects a company's capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management.
Social	Social	The social pillar measures a company's capacity to generate trust and loyalty with its workforce, customers and society, through its use of best management practices. It is a reflection of the company's reputation and the health of its license to operate, which are key factors in determining its ability to generate long term shareholder value.
	Customer /Product Responsibility	The customer/product responsibility category measures a company's management commitment and effectiveness towards creating value-added products and services upholding the customer's security. It reflects a company's capacity to maintain its license to operate by producing quality goods and services integrating the customer's health and safety, and preserving its integrity and privacy also through accurate product information and labelling.
	Society /Community	The society/community category measures a company's management commitment and effectiveness towards maintaining the company's reputation within the general community (local, national and global). It reflects a company's capacity to maintain its license to operate by being a good citizen (donations of cash, goods or staff time, etc.), protecting public health (avoidance of industrial accidents, etc.) and respecting business ethics (avoiding bribery and corruption, etc.).

Society /Human Rights	The society/human rights category measures a company's management commitment and effectiveness towards respecting the fundamental human rights conventions. It reflects a company's capacity to maintain its license to operate by guaranteeing the freedom of association and excluding child, forced or compulsory labour.
Score - Diversity and Opportunity/Policy	Does the company have a work-life balance policy? AND Does the company have a diversity and equal opportunity policy?
Score - Employment Quality/Policy	Does the company have a competitive employee benefits policy or ensuring good employee relations within its supply chain? AND Does the company have a policy for maintaining long term employment growth and stability?
Score - Health & Safety /Policy	Does the company have a policy to improve employee health & safety within the company and its supply chain?
Score - Training and Development/Policy	Does the company have a policy to support the skills training or career development of its employees?

Table 1: The table reports the ESG variables used in the analysis, as classified by ASSET4 Equal Weighted Ratings (EWR). Data were downloaded in 2018, and are currently inactive variables, being substituted by a new TR categorization reported in Table 2. Data consists of 4 pillars: Environmental, Social, Governance and Economic performance. Each pillars reports the main categories of aggregation. Source: "ASSET4 ESG Data Glossary, February 2015".

Table 2: TR ESG variables, 2020

Pillars	Name	Description
Environmental	Resource use	The resource use score reflects a company's performance and capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management.
	Emissions reduction	The emission reduction score measures a company's commitment and effectiveness towards reducing environmental emissions in its production and operational processes.
	Innovation	The innovation score reflects a company's capacity to reduce the environmental costs and burdens for its customers, thereby creating new market opportunities through new environmental technologies and processes or eco-designed products.
Social	Workforce	The workforce score measures a company's effectiveness in terms of providing job satisfaction, a healthy and safe workplace, maintaining diversity and equal opportunities and development opportunities for its workforce.
	Human rights	The human rights score measures a company's effectiveness in terms of respecting fundamental human rights conventions.
	Community	The community score measures the company's commitment to being a good citizen, protecting public health and respecting business ethics.
	Product responsibility	The product responsibility score reflects a company's capacity to produce quality goods and services, integrating the customer's health and safety, integrity and data privacy.
Governance	Management	The management score measures a company's commitment and effectiveness towards following best practice corporate governance principles.
	Shareholders	The shareholders score measures a company's effectiveness towards equal treatment of shareholders and the use of anti-takeover devices.
	CSR strategy	The CSR strategy score reflects a company's practices to communicate that it integrates economic (financial), social and environmental dimensions into its day-to-day decision-making processes.

Table 2: The table reports the new categorization of ESG Pillars, as classified by TR after the change in methodology from ASSET4® Equal Weighted Ratings (EWR) to Thomson Reuters ESG Scores. Data were downloaded in 2020. Data consists of 3 pillars: Environmental, Social, and Governance performance. Each pillars reports the main categories of aggregation. Source: "Environmental, Social and Governance (ESG) scores from Refinitiv, April 2020".

Table 3: Summary statistics and correlation matrix between Asset4 ESG 2018 and TR Refinitiv 2020. Europe (obs=1,225)

	ESG 2018	ESG 2020	ENV 2018	ENV 2020	SOC 2018	SOC 2020	CG 2018	CG 2020
ESG 2018	1							
ESG 2020	0.8554	1						
ENV 2018	0.9008	0.8088	1					
ENV 2020	0.7793	0.8099	0.8552	1				
SOC 2018	0.9027	0.8226	0.8199	0.722	1			
SOC 2020	0.8329	0.9115	0.793	0.7708	0.8745	1		
CG 2018	0.7394	0.6821	0.5687	0.5337	0.5542	0.5541	1	
CG 2020	0.6007	0.8127	0.5061	0.4598	0.5063	0.5334	0.6521	1

	Asset4 2018				TR Refinitiv 2020				
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Diff
ESG-SCORE	64.43356	31.40516	2.57	98.32	50.39411	21.357	1.55	95.01	-14.04
ENV-SCORE	62.47882	31.37633	8.44	97.38	40.76698	32.1277	0	98.15	-21.71
SOC-SCORE	66.57168	29.05628	3.58	99.45	49.95678	23.7116	0.61	97.32	-16.61
CG-SCORE	56.63782	27.91034	1.24	97.88	53.94699	23.9218	1.67	97.17	-2.691

[a] The table reports the summary statistics and the correlation matrix between the scores in the two datasets for European banks: Asset4 ESG scores data downloaded in 2018 and TR Refinitiv data downloaded in 2020. We report each pair of variables: aggregate ESG scores (ESG), environmental scores (ENV), social (SOC), corporate governance scores (CG).

Table 4: Summary statistics and correlation matrix between Asset4 ESG 2018 and TR Refinitiv 2020. USA (obs=1,153)

	ESG 2018	ESG 2020	ENV 2018	ENV 2020	SOC 2018	SOC 2020	CG 2018	CG 2020
ESG 2018	1							
ESG 2020	0.7828	1						
ENV 2018	0.8121	0.7442	1					
ENV 2020	0.6952	0.75	0.891	1				
SOC 2018	0.8731	0.7062	0.6596	0.5717	1			
SOC 2020	0.7427	0.8157	0.6744	0.672	0.7836	1		
CG 2018	0.567	0.544	0.3826	0.3296	0.3772	0.2913	1	
CG 2020	0.4429	0.7577	0.359	0.3337	0.3046	0.2888	0.587	1

	Asset4 2018				TR Refinitiv 2020				
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Diff
ESG-SCORE	52.85121	25.52688	3.74	96.54	42.31527	15.8615	1.89	87.62	-10.54
ENV-SCORE	34.8479	30.33044	8.44	96.4	16.33992	25.5122	0	95.3	-18.51
SOC-SCORE	45.03046	25.0693	4.12	95.85	45.53673	17.9471	2.11	90.16	+0.51
CG-SCORE	71.24088	15.54694	5.06	97.25	48.97498	21.0569	1.46	93.02	-22.27

[a] The table reports the summary statistics and the correlation matrix between the scores in the two datasets for USA banks: Asset4 ESG scores data downloaded in 2018 and TR Refinitiv data downloaded in 2020. We report each pair of variables: aggregate ESG scores (ESG), environmental scores (ENV), social (SOC), corporate governance scores (CG).

Table 5: Other Variables

Variable	Description and Reference	Database
SRISK	Equation 13 (Brownlees and Engle, 2017, Acharya et al. 2012), where k=0.08.	Compustat Global, Datastream and Bundesbank, own calc.
Delta CoVaR	Equation 8, estimated by quantile regression and empirical quantile at alpha=0.05 (Adrian and Brunnermeier, 2017).	Compustat Global, Datastream and Bundesbank, own calc.
$ Delta CoVaR	Delta CoVaR * market capitalization	Compustat Global, own calc.
Z-score	Equation 15 (Lepetit and Strobel, 2013)	Compustat Global, own calc.
Beta	Conditional dynamic market beta: $\rho_{im}.*\sigma_i./\sigma_m$, where ρ_{im}, correlation coefficient between the bank's and the market returns, is estimated by Dynamic Conditional Correlation model (Engel, 2002), and the volatilities σ are estimated by asymmetric GJR GARCH model (Glosten, Jagananthan and Runkle, 1993)	Compustat Global and Datastream, own calc.
Market Return	MSCI Europe index	Datastream
Stock return	Bank's log stock return	Compustat Global own calc.
Market value	(stock price * shares outstanding) standardized	Compustat Global, own calc.
Total Liabilities	Reported total liabilities	Compustat Global
Total Assets (TA)	Reported total assets	Compustat Global
Leverage (LVG)	(Total liabilities + Market capitalization) / Market capitalization	Compustat Global, own calc.
Net Income (NI)	Net consolidated income	Compustat Global
Negative news	Relative number of negative news related to fraud and financial crime in the banking sector, in relation to all news coverage of the banking sector	Factiva

[a] This table reports detailed information on the data and variables used in the empirical analysis. It refers to the sources of the data and the data providers descriptions, when available.

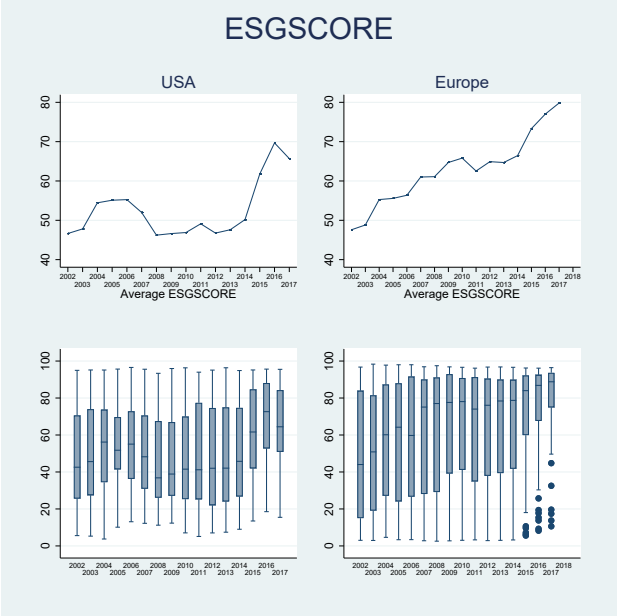

Figure 1: ESG scores in Europe and the USA. The Figure reports the average evolution (top frames) and box plots by year (bottom frames) of the ESG scores in Europe and the USA separately. Data: Asset4 2018.

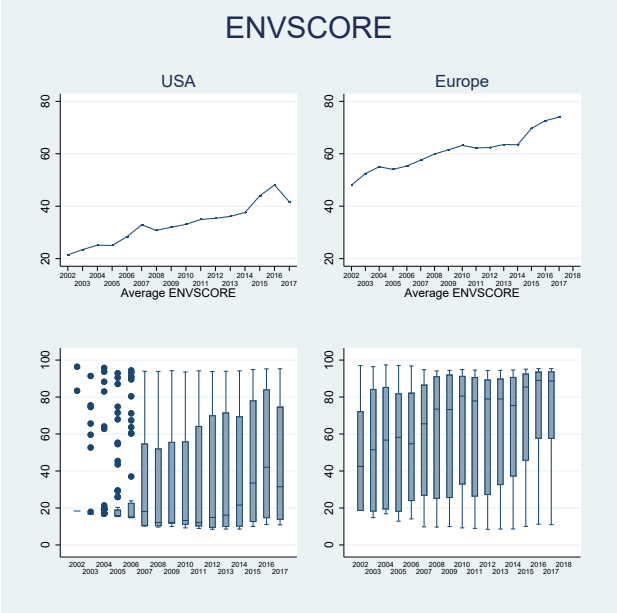

Figure 2: Environmental scores in Europe and the USA. The Figure reports the average evolution (top frames) and box plots by year (bottom frames) of the Environmental scores in Europe and the USA separately. Data: Asset4 2018.

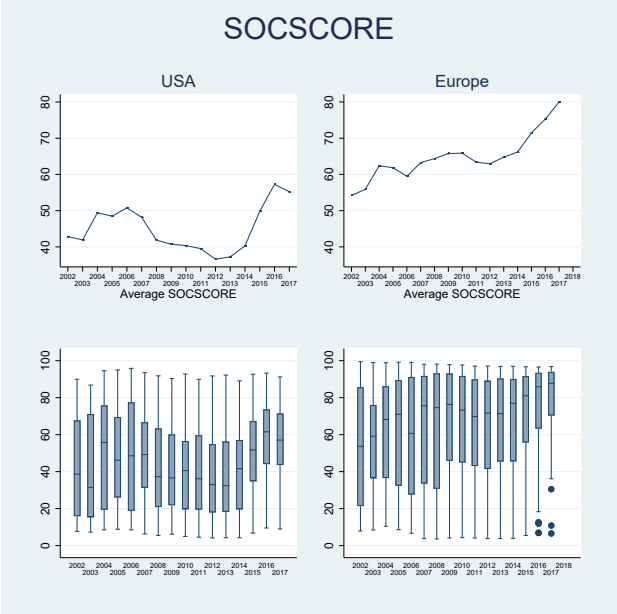

Figure 3: Social scores in Europe and the USA. The Figure reports the average evolution (top frames) and box plots by year (bottom frames) of the Social score in Europe and the USA separately. Data: Asset4 2018.

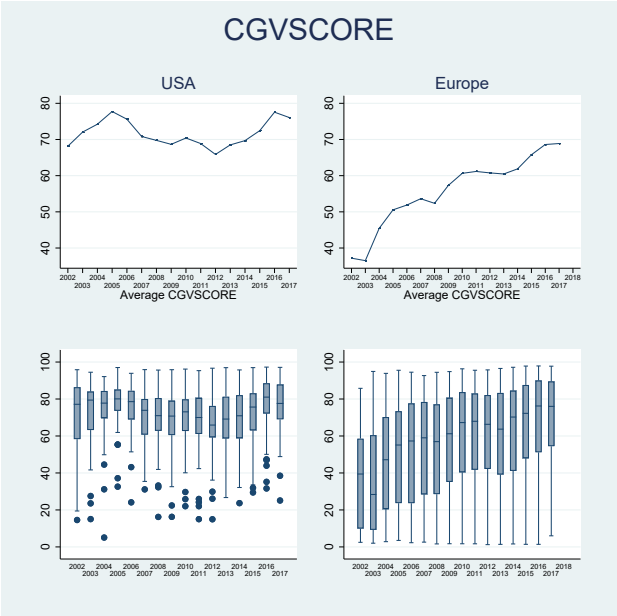

Figure 4: Corporate Governance scores in Europe and the USA. The Figure reports the average evolution (top frames) and box plots by year (bottom frames) of the Corporate Governance score in Europe and the USA separately. Data: Asset4 2018.

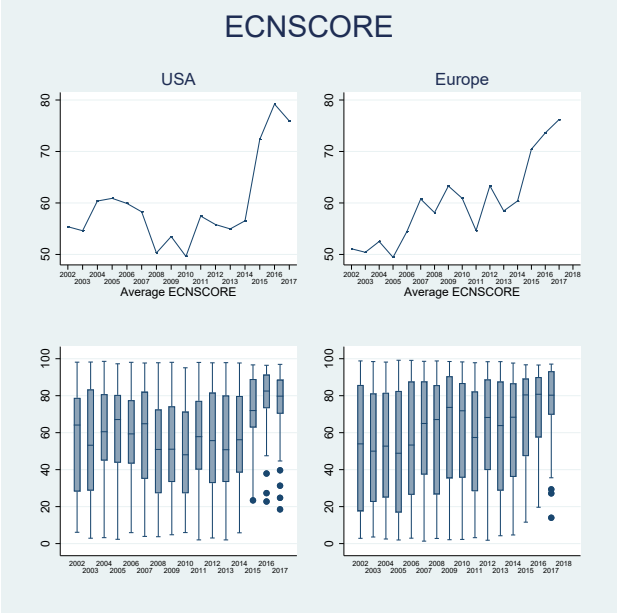

Figure 5: Economic scores in Europe and the USA. The Figure reports the average evolution (top frames) and box plots by year (bottom frames) of the Economic scores in Europe and the USA separately. Data: Asset4 2018.

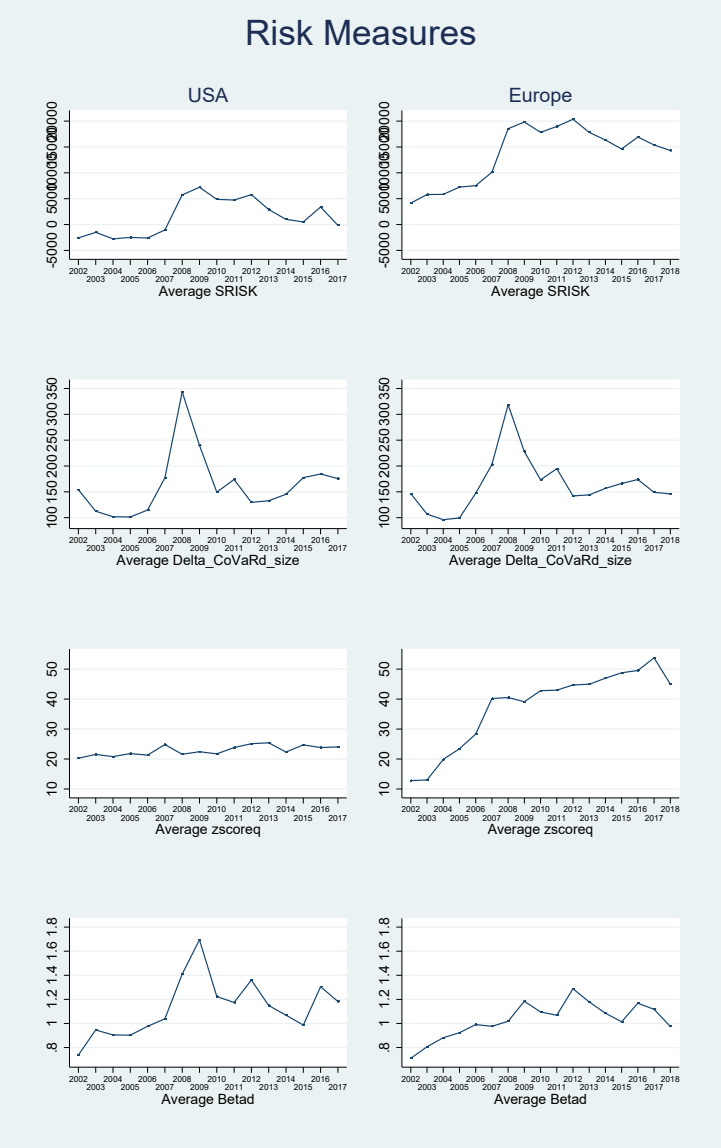

Figure 6: Risk measures in Europe and the USA. The Figure reports the average evolution of the risk measures used in the analysis: SRISK, Delta CoVaR, Z-score and market Beta.

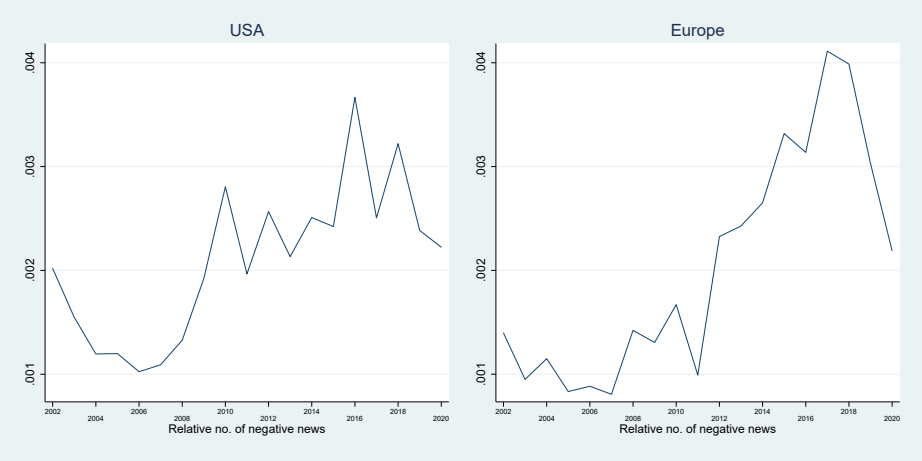

Figure 7: Relative number of negative news in the banking sector. The Figure reports the evolution of the number of negative news related to fraud and financial crime in the banking sector, in relation to all news coverage of the banking sector, 2004 to 2020.

Table 6: Panel data regressions on Equal-Weighted ESG score (Asset 4).

	(1) SRISK	(2) $ DeltaCoVaR	(3) Z-score	(4) Beta
L.Equal-Weighted Rating	-128.3***	-1.808***	0.0283	-0.00203*
	(48.69)	(0.623)	(0.0443)	(0.00104)
	-0.127	-0.180	0.0264	-0.153
L.Equal-Weighted Rating #Europe	52.14***	-0.0433	-0.00377	0.000231
	(14.48)	(0.230)	(0.0121)	(0.000436)
	0.0686	-0.00573	-0.00467	0.0233
L.Equal-Weighted Rating #c.ln(L.TA)	8.911*	0.202***	-0.00368	0.000218**
	(4.890)	(0.0575)	(0.00412)	(9.79e-05)
	0.121	0.276	-0.0471	0.227
Europe	-2,004**	7.028	7.196***	-0.0734
	(847.6)	(13.18)	(1.236)	(0.0644)
	-0.0318	0.0112	0.108	-0.0891
L.SRISK	0.931***			
	(0.0241)			
	0.919			
L. $Delta CoVaR		0.766***		
		(0.0483)		
		0.786		
L.Z-score	-20.24***	-0.102	0.880***	-0.000875***
	(4.931)	(0.0635)	(0.0213)	(0.000170)
	-0.0226	-0.0114	0.927	-0.0749
L.Beta	-737.0	-13.39*	2.255***	0.625***
	(518.2)	(7.805)	(0.614)	(0.0249)
	-0.00999	-0.0182	0.0288	0.648
ln(L.TA)	-401.7	-1.662	0.796***	0.00183
	(279.7)	(2.551)	(0.298)	(0.00697)
	-0.0295	-0.0123	0.0550	0.0103
L.LVG	57.85***	-0.0495	-0.0853***	0.00141***
	(16.03)	(0.109)	(0.0163)	(0.000541)
	0.0478	-0.00411	-0.0659	0.0891
L.NI	0.763***	0.0112***	5.94e-05	-6.24e-06**
	(0.183)	(0.00313)	(5.49e-05)	(2.53e-06)
	0.0853	0.126	0.00621	-0.0533
Constant	7,540**	-15.54	-11.20***	0.470***
	(2,933)	(28.67)	(2.973)	(0.0928)
Observations	2,084	2,084	2,080	2,084
Adjusted R2	0.940	0.893	0.906	0.653
F-test Year Effects	11.25***	17.22***	3.542***	22.78***
F-test Country Effects	1.534**	1.130	2.237***	3.442***

[a] The table reports the results of country-year fixed effects regressions of SRISK, $ Delta CoVaR, Beta and Z-score on the ESG aggregate scores, 2004 to 2017. We include the ESG score interacted with size (ln(TA)) and with a Europe=1 dummy. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Panel data regressions on the 4 ESG Pillars (Asset 4)

	(1) SRISK	(2) $ DeltaCoVaR	(3) Z-score	(4) Beta
L.Environmental	-19.03	-1.754**	-0.0145	-0.00110
	(52.57)	(0.733)	(0.0575)	(0.00151)
	-0.0212	-0.196	-0.0152	-0.0939
L.Social	-147.9***	-1.379**	0.0235	-0.000197
	(50.41)	(0.690)	(0.0765)	(0.00176)
	-0.146	-0.137	0.0218	-0.0149
L.Corporate Governance	-24.61	0.270	0.0119	0.000357
	(37.53)	(0.611)	(0.0576)	(0.00141)
	-0.0206	0.0227	0.00943	0.0229
L.Economic	0.197	0.679	-0.00797	-0.00138
	(35.48)	(0.488)	(0.0441)	(0.00124)
	0.000189	0.0653	-0.00717	-0.101
L.Environmental #Europe	15.83	-0.213	-0.0326	-0.000415
	(15.02)	(0.211)	(0.0200)	(0.000527)
	0.0205	-0.0277	-0.0396	-0.0410
L.Social #Europe	22.42	-0.258	0.0409*	-0.000392
	(14.61)	(0.233)	(0.0236)	(0.000805)
	0.0292	-0.0337	0.0502	-0.0390
L.Corporate Governance #Europe	49.67***	0.634**	0.00455	0.000775
	(17.27)	(0.247)	(0.0205)	(0.000774)
	0.0586	0.0751	0.00506	0.0699
L.Economic #Europe	-9.931	-0.0962	-0.0119	0.000330
	(14.35)	(0.183)	(0.0185)	(0.000615)
	-0.0125	-0.0122	-0.0141	0.0317
L.Environmental #c.ln(L.TA)	-0.475	0.190***	0.00124	7.60e-05
	(5.015)	(0.0686)	(0.00480)	(0.000138)
	-0.00705	0.284	0.0173	0.0863
L.Social #c.ln(L.TA)	13.68***	0.179***	-0.00436	8.81e-05
	(4.841)	(0.0683)	(0.00729)	(0.000179)
	0.185	0.243	-0.0555	0.0912
L.Corporate Governance #c.ln(L.TA)	-0.516	-0.0605	-0.00188	-5.41e-06
	(3.986)	(0.0647)	(0.00557)	(0.000121)
	-0.00567	-0.0668	-0.0195	-0.00454
L.Economic #c.ln(L.TA)	0.626	-0.0760	0.00187	0.000119
	(3.654)	(0.0509)	(0.00416)	(0.000110)
	0.00792	-0.0967	0.0222	0.115
Europe	-3,525***	-17.15	6.958***	-0.0841
	(1,221)	(15.85)	(1.734)	(0.0775)
	-0.0560	-0.0274	0.104	-0.102
L.SRISK	0.925***			
	(0.0261)			
	0.913			
L. $Delta CoVaR		0.748***		
		(0.0517)		
		0.768		
L.Z-score	-20.31***	-0.0520	0.881***	-0.000906***
	(5.178)	(0.0644)	(0.0214)	(0.000171)
	-0.0227	-0.00584	0.928	-0.0775
L.Beta	-724.8	-14.56*	2.301***	0.620***
	(514.3)	(7.858)	(0.617)	(0.0248)
	-0.00982	-0.0198	0.0294	0.642
ln(L.TA)	-604.6	-0.313	0.830**	0.000436
	(374.4)	(3.600)	(0.383)	(0.00845)
	-0.0444	-0.00231	0.0573	0.00245
L.LVG	57.25***	-0.168	-0.0831***	0.00145***
	(17.04)	(0.120)	(0.0170)	(0.000562)
	0.0473	-0.0140	-0.0642	0.0917
L.NI	0.756***	0.0114***	4.84e-05	-6.76e-06**
	(0.186)	(0.00322)	(5.43e-05)	(2.65e-06)
	0.0845	0.128	0.00506	-0.0578
Constant	10,422***	-1.603	-11.27***	0.467***
	(3,769)	(38.50)	(3.845)	(0.108)
Observations	2,084	2,084	2,080	2,084
Adjusted R2	0.941	0.894	0.905	0.654
F-test Year Effects	11***	14.61	3.441***	22.08***
F-test Country Effects	1.310*	0.911***	1.814***	3.382***

[a] The table reports the results of country-year fixed effects regressions of SRISK, $ Delta CoVaR, Beta and Z-score on the ESG pillars scores: Environmental, Social, Corporate Governance and Economic, 2004 to 2017. We include the ESG pillar scores interacted with size (ln(TA)) and with a Europe=1 dummy. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Panel data regressions on the ESG Subcategories (Asset 4).

	(1) SRISK	(2) $ DeltaCoVaR	(3) Z-score	(4) Beta
L.Emission Reduction	1.160	-0.487	0.0180	-0.00343*
	(63.76)	(0.852)	(0.194)	(0.00208)
	0.00129	-0.0543	0.0188	-0.291
L.Product Innovation	22.26	-0.854	-0.0142	0.000793
	(53.22)	(0.754)	(0.0852)	(0.00147)
	0.0228	-0.0880	-0.0137	0.0621
L.Resource Reduction	-27.04	-0.604	0.107	-0.00143
	(76.56)	(0.758)	(0.146)	(0.00199)
	-0.0313	-0.0703	0.116	-0.127
L.Customer /Product Responsibility	-134.4**	-1.801***	-0.0326	-0.00370***
	(54.14)	(0.592)	(0.0577)	(0.00128)
	-0.139	-0.187	-0.0318	-0.292
L.Society /Community	-11.51	0.735	0.0741	0.00181
	(68.89)	(0.612)	(0.0505)	(0.00134)
	-0.0110	0.0708	0.0669	0.133
L.Society /Human Rights	-217.2***	-2.437***	-0.221***	0.00110
	(54.20)	(0.821)	(0.0782)	(0.00157)
	-0.216	-0.243	-0.207	0.0835
L.Diversity and Opportunity/Policy	49.29	-0.111	0.103*	0.000583
	(41.86)	(0.500)	(0.0568)	(0.00133)
	0.0481	-0.0109	0.0948	0.0435
L.Employment Quality/Policy	52.65	-1.478**	0.0245	-0.00177
	(63.84)	(0.624)	(0.0757)	(0.00147)
	0.0496	-0.140	0.0217	-0.127
L.Health & Safety /Policy	22.56	0.514	-0.132**	0.00125
	(41.37)	(0.483)	(0.0585)	(0.00118)
	0.0250	0.0572	-0.137	0.105
L.Training and Development/Policy	0.0367	-0.875**	-0.0550	0.00238**
	(29.92)	(0.379)	(0.0433)	(0.00111)
	3.51e-05	-0.0839	-0.0495	0.174
L.Board of Directors/Board Functions	-38.37	-0.251	0.0486	-0.00257*
	(65.40)	(0.784)	(0.0767)	(0.00137)
	-0.0355	-0.0234	0.0424	-0.182
L.Board of Directors/Board Structure	88.86	0.0490	-0.00683	0.00192
	(60.55)	(0.724)	(0.0763)	(0.00130)
	0.0823	0.00456	-0.00596	0.136
L.Board of Directors/Compensation Policy	-119.6*	0.151	-0.00339	0.00211*
	(62.54)	(0.598)	(0.0581)	(0.00125)
	-0.0990	0.0125	-0.00264	0.133
L.Integration/Vision and Strategy	19.70	1.034	-0.0150	0.00280
	(52.21)	(0.733)	(0.0790)	(0.00178)
	0.0219	0.116	-0.0157	0.238
L.Shareholders /Shareholder Rights	-17.81	0.659	-0.0557	-0.00114
	(37.95)	(0.475)	(0.0435)	(0.000985)
	-0.0171	0.0636	-0.0503	-0.0840
L.Margins /Performance	19.53	0.982*	-0.0216	-0.00141
	(39.97)	(0.507)	(0.0460)	(0.00110)
	0.0198	0.100	-0.0207	-0.110
L.Profitability /Shareholder Loyalty	78.60*	0.273	-0.0237	0.00170*
	(45.80)	(0.466)	(0.0459)	(0.001000)
	0.0836	0.0292	-0.0237	0.138
L.Revenue /Client Loyalty	-44.53	0.663	0.0597	-0.00124
	(38.72)	(0.488)	(0.0485)	(0.00124)
	-0.0466	0.0698	0.0588	-0.0992
L.Emission Reduction #Europe	-3.540	-0.519	-0.0341	-0.00103
	(20.19)	(0.323)	(0.0386)	(0.000854)
	-0.00457	-0.0673	-0.0414	-0.101
L.Product Innovation #Europe	-17.14	-0.626*	-0.0222	-0.000793
	(17.82)	(0.343)	(0.0203)	(0.000777)
	-0.0207	-0.0759	-0.0252	-0.0731
L.Resource Reduction #Europe	-2.150	0.559	-0.0165	0.000934
	(21.24)	(0.369)	(0.0315)	(0.000801)
	-0.00290	0.0756	-0.0210	0.0962
L.Customer /Product Responsibility #Europe	25.27	0.651**	-0.00604	0.000546
	(18.92)	(0.263)	(0.0174)	(0.000563)
	0.0315	0.0814	-0.00708	0.0519
L.Society /Community #Europe	16.58	-0.0845	0.0121	-0.000236
	(15.97)	(0.255)	(0.0179)	(0.000573)
	0.0207	-0.0106	0.0142	-0.0225
L.Society /Human Rights #Europe	33.32	1.106**	-0.0312*	-0.000625
	(30.41)	(0.494)	(0.0179)	(0.000814)
	0.0396	0.132	-0.0349	-0.0567
L.Diversity and Opportunity/Policy #Europe	-2.149	-0.191	0.0634***	0.000350
	(10.92)	(0.177)	(0.0218)	(0.000649)
	-0.00288	-0.0257	0.0800	0.0358
L.Employment Quality/Policy #Europe	-34.81**	-0.349	0.0174	-0.000729
	(16.15)	(0.280)	(0.0212)	(0.000669)
	-0.0451	-0.0454	0.0213	-0.0722
L.Health & Safety /Policy #Europe	-1.338	-0.299*	-0.00422	0.000292
	(12.66)	(0.178)	(0.0161)	(0.000479)
	-0.00163	-0.0366	-0.00484	0.0272
L.Training and Development/Policy #Europe	-7.298	-0.0583	-0.00908	-0.00165***
	(9.060)	(0.132)	(0.0177)	(0.000467)
	-0.00920	-0.00739	-0.0108	-0.159
L.Board of Directors/Board Functions #Europe	0.854	-0.273	0.0154	-0.00142*
	(14.72)	(0.237)	(0.0278)	(0.000745)
	0.000941	-0.0302	0.0160	-0.120
L.Board of Directors/Board Structure #Europe	-1.557	0.477**	0.0171	0.00229***
	(16.74)	(0.215)	(0.0280)	(0.000790)
	-0.00169	0.0520	0.0175	0.190
L.Board of Directors/Compensation Policy #Europe	-14.60	0.00573	0.00753	0.000175
	(18.05)	(0.303)	(0.0182)	(0.000734)
	-0.0168	0.000663	0.00815	0.0154
L.Integration/Vision and Strategy #Europe	57.10***	0.163	0.0287	0.000859
	(21.66)	(0.342)	(0.0270)	(0.000817)
	0.0760	0.0218	0.0360	0.0874
L.Shareholders /Shareholder Rights #Europe	27.64**	0.165	-0.0143	-2.01e-05
	(12.64)	(0.185)	(0.0135)	(0.000468)
	0.0324	0.0195	-0.0158	-0.00180

L.Margins /Performance #Europe	1.049	-0.425**	-0.0102	-0.000111
	(11.63)	(0.181)	(0.0148)	(0.000498)
	0.00135	-0.0547	-0.0123	-0.0109
L.Profitability /Shareholder Loyalty #Europe	11.15	0.401*	0.00434	0.00103*
	(16.57)	(0.216)	(0.0148)	(0.000584)
	0.0123	0.0445	0.00452	0.0871
L.Revenue /Client Loyalty #Europe	-21.71	-0.0274	-0.0216	0.000155
	(14.52)	(0.224)	(0.0152)	(0.000519)
	-0.0294	-0.00373	-0.0276	0.0161
Europe	-1,484	-33.87	4.898**	-0.0718
	(1,997)	(26.80)	(2.210)	(0.0987)
	-0.0236	-0.0540	0.0733	-0.0871
L.Emission Reduction #c.ln(L.TA)	1.483	0.106	-0.00152	0.000410**
	(5.925)	(0.0818)	(0.0172)	(0.000176)
	0.0218	0.156	-0.0210	0.460
L.Product Innovation #c.ln(L.TA)	-1.273	0.129*	0.00318	-1.99e-05
	(5.023)	(0.0702)	(0.00756)	(0.000119)
	-0.0177	0.181	0.0417	-0.0212
L.Resource Reduction #c.ln(L.TA)	3.263	0.00978	-0.0104	5.75e-05
	(7.048)	(0.0729)	(0.0134)	(0.000177)
	0.0491	0.0148	-0.148	0.0662
L.Customer /Product Responsibility #c.ln(L.TA)	11.69**	0.142**	0.00196	0.000293***
	(5.218)	(0.0590)	(0.00536)	(0.000110)
	0.158	0.193	0.0250	0.303
L.Society /Community #c.ln(L.TA)	0.126	-0.0707	-0.00613	-8.12e-05
	(6.652)	(0.0610)	(0.00472)	(0.000124)
	0.00155	-0.0872	-0.0708	-0.0761
L.Society /Human Rights #c.ln(L.TA)	17.28***	0.132	0.0198***	-3.54e-05
	(4.712)	(0.0868)	(0.00649)	(0.000117)
	0.237	0.182	0.256	-0.0372
L.Diversity and Opportunity/Policy #c.ln(L.TA)	-4.770	0.0278	-0.0102*	-0.000118
	(4.147)	(0.0515)	(0.00555)	(0.000124)
	-0.0617	0.0362	-0.124	-0.117
L.Employment Quality/Policy #c.ln(L.TA)	-2.509	0.172**	-0.00332	0.000197
	(6.145)	(0.0676)	(0.00719)	(0.000138)
	-0.0327	0.226	-0.0407	0.196
L.Health & Safety /Policy #c.ln(L.TA)	-3.376	-0.0281	0.0113**	-0.000188*
	(3.810)	(0.0470)	(0.00519)	(0.000101)
	-0.0456	-0.0381	0.144	-0.194
L.Training and Development/Policy #c.ln(L.TA)	1.210	0.110***	0.00494	-8.49e-05
	(3.051)	(0.0394)	(0.00423)	(0.000103)
	0.0147	0.135	0.0565	-0.0789
L.Board of Directors/Board Functions #c.ln(L.TA)	4.003	0.0462	-0.00742	0.000342***
	(6.784)	(0.0773)	(0.00762)	(0.000125)
	0.0467	0.0542	-0.0816	0.305
L.Board of Directors/Board Structure #c.ln(L.TA)	-8.841	-0.0361	0.000658	-0.000295***
	(5.819)	(0.0683)	(0.00730)	(0.000114)
	-0.0942	-0.0386	0.00660	-0.241
L.Board of Directors/Compensation Policy #c.ln(L.TA)	12.13*	-0.0191	0.000627	-0.000176
	(6.335)	(0.0666)	(0.00548)	(0.000124)
	0.119	-0.0189	0.00579	-0.132
L.Integration/Vision and Strategy #c.ln(L.TA)	-7.142	-0.115	0.00148	-0.000340**
	(4.775)	(0.0710)	(0.00684)	(0.000150)
	-0.104	-0.170	0.0204	-0.380
L.Shareholders /Shareholder Rights #c.ln(L.TA)	0.142	-0.0623	0.00513	0.000126
	(3.792)	(0.0498)	(0.00404)	(9.01e-05)
	0.00167	-0.0736	0.0568	0.114
L.Margins /Performance #c.ln(L.TA)	-2.923	-0.0856	0.00361	9.56e-05
	(3.877)	(0.0524)	(0.00424)	(9.45e-05)
	-0.0375	-0.110	0.0437	0.0938
L.Profitability /Shareholder Loyalty #c.ln(L.TA)	-8.299*	-0.0567	0.00320	-0.000189**
	(4.443)	(0.0472)	(0.00434)	(8.77e-05)
	-0.104	-0.0715	0.0378	-0.182
L.Revenue /Client Loyalty #c.ln(L.TA)	6.587*	-0.0580	-0.00566	0.000145
	(3.920)	(0.0479)	(0.00443)	(0.000106)
	0.0900	-0.0796	-0.0728	0.152
L.SRISK	0.918***			
	(0.0293)			
	0.906			
L. $Delta CoVaR		0.736***		
		(0.0540)		
		0.755		
L.Z-score	-16.26***	0.0318	0.875***	-0.000845***
	(5.447)	(0.0656)	(0.0210)	(0.000175)
	-0.0182	0.00358	0.922	-0.0723
L.Beta	-792.7	-18.48**	2.073***	0.594***
	(519.5)	(8.140)	(0.646)	(0.0243)
	-0.0107	-0.0252	0.0265	0.615
ln(L.TA)	-783.7	-5.289	0.523	0.0105
	(525.2)	(5.358)	(0.556)	(0.0128)
	-0.0576	-0.0390	0.0362	0.0592
L.LVG	61.37***	-0.153	-0.0734***	0.00168***
	(18.28)	(0.134)	(0.0149)	(0.000557)
	0.0507	-0.0127	-0.0567	0.106
L.NI	0.794***	0.0118***	3.74e-05	-6.76e-06***
	(0.199)	(0.00322)	(5.71e-05)	(2.48e-06)
	0.0887	0.133	0.00391	-0.0578
Constant	12,342**	76.63	-6.462	0.345**
	(5,472)	(56.35)	(5.604)	(0.155)
Observations	2,084	2,084	2,080	2,084
Adjusted R2	0.941	0.896	0.907	0.663
F-test Year Effects	10.48***	14.57	3.254***	20.80***
F-test Country Effects	1.348*	1.135***	1.535**	2.975***

[a] The table reports the results of country-year fixed effects regressions of SRISK, $ Delta CoVaR, Beta and Z-score on the ESG Subcategories in each Pillars scores as listed in Table 1, 2004 to 2017. We include the ESG subcategories scores interacted with size (ln(TA)) and with a Europe=1 dummy. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

Table 9: IV regressions on the ESG score

	(1) SRISK	(2) $ DeltaCoVaR	(3) Z-score	(4) Beta
L.Equal-Weighted Rating	-315.1***	-2.889***	-0.0258	-0.00151
	(84.22)	(1.099)	(0.0586)	(0.00160)
	-0.235	-0.220	-0.0211	-0.0974
L.Equal-Weighted Rating #Europe	78.18***	-0.223	-0.0513***	-0.000748
	(28.00)	(0.446)	(0.0164)	(0.000710)
	0.0889	-0.0258	-0.0635	-0.0736
L.Equal-Weighted Rating #c.ln(L.TA)	27.77***	0.353***	0.00441	0.000376***
	(8.704)	(0.110)	(0.00502)	(0.000145)
	0.308	0.400	0.0537	0.361
Europe	-3,310**	14.67	7.555***	-0.0727
	(1,438)	(23.26)	(1.437)	(0.0733)
	-0.0499	0.0226	0.123	-0.0950
L.SRISK	0.863***			
	(0.0225)			
	0.854			
L. $Delta CoVaR		0.740***		
		(0.0447)		
		0.747		
L.Z-score	-16.88***	-0.0911	0.957***	-0.000500**
	(6.292)	(0.0843)	(0.0162)	(0.000214)
	-0.0152	-0.00836	0.941	-0.0390
L.Beta	-778.2	-10.57	2.219***	0.618***
	(574.8)	(8.894)	(0.651)	(0.0359)
	-0.00938	-0.0130	0.0282	0.645
ln(L.TA)	-1,470***	-10.46*	-0.0969	-0.0286***
	(479.9)	(5.439)	(0.333)	(0.00939)
	-0.0968	-0.0703	-0.00702	-0.163
L.LVG	104.1***	-0.0656	-0.0244**	0.00257***
	(26.99)	(0.150)	(0.0110)	(0.000772)
	0.0723	-0.00466	-0.0186	0.154
L.NI	0.709***	0.0119***	1.74e-05	-5.45e-06**
	(0.194)	(0.00326)	(4.94e-05)	(2.69e-06)
	0.0788	0.135	0.00206	-0.0524
Constant	17,085***	102.3*	-4.794	0.593***
	(4,481)	(53.06)	(3.631)	(0.124)
Observations	1,748	1,748	1,675	1,748
Adjusted R2	0.940	0.895	0.927	0.619
Stock-Wright LM S statistic	186.4	97.18	204.2	193.3
p-value	0.000	0.000	0.000	0.000
Anderson-Rubin Wald F test	228.6	74.05	514.2	47.16
p-value	0.000	0.000	0.000	0.000
Anderson-Rubin Wald Chi2 test	1186	384.3	2671	244.6
p-value	0.000	0.000	0.000	0.000
Kleibergen-Paap Wald rk F statistic	379.8	73.65	316.0	75.70
Kleibergen-Paap rk LM statistic	432.7	222.6	378.2	234.3
p-value	0.000	0.000	0.000	0.000
Endogeneity test	12.30	2.910	10.01	13.52
p-value	0.0153	0.573	0.0402	0.00898
Hansen J stat	2.359	1.549	1.714	0.106
p-value	0.125	0.213	0.190	0.745

[a] The table reports the results of 2SLS-IV regressions of SRISK, $ Delta CoVaR, Beta and Z-score on the Asset 4 ESG aggregate scores, 2004 to 2017, instrumented by Refinitiv ESG score and news sentiment. We include the ESG score interacted with size (ln(TA)) and with a Europe=1 dummy. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis, and tests of weak-instrument robust-inference, under-identification, endogeneity and over-identification, with their corresponding p-values. *** p<0.01, ** p<0.05, * p<0.1.

Table 10: IV regressions on the ESG pillars

	(1) SRISK	(2) $ DeltaCoVaR	(3) Z-score	(4) Beta	(5) SRISK	(6) $ DeltaCoVaR	(7) Z-score	(8) Beta	(9) SRISK	(10) $ DeltaCoVaR	(11) Z-score	(12) Beta
L.Environmental	-181.4*	-2.453**	0.0143	-0.00118								
	(98.58)	(1.044)	(0.0457)	(0.00136)								
	-0.190	-0.263	0.0164	-0.107								
L.Environmental #Europe	43.07**	0.0145	-0.0445***	0.000624								
	(19.26)	(0.322)	(0.0134)	(0.000468)								
	0.0529	0.00182	-0.0596	0.0664								
L.Environmental #c.ln(L.TA)	14.79	0.207**	0.00114	0.000173								
	(9.666)	(0.0945)	(0.00396)	(0.000128)								
	0.210	0.301	0.0177	0.214								
L.Social					-302.7***	-2.797***	0.0320	-0.00361**				
					(79.47)	(1.037)	(0.0521)	(0.00149)				
					-0.277	-0.262	0.0321	-0.286				
L.Social #Europe					30.92	-0.674**	-0.0302**	-0.00103				
					(19.78)	(0.323)	(0.0145)	(0.000636)				
					0.0383	-0.0852	-0.0408	-0.110				
L.Social #c.ln(L.TA)					29.53***	0.345***	-0.00196	0.000552***				
					(8.291)	(0.109)	(0.00494)	(0.000144)				
					0.376	0.449	-0.0274	0.609				
L.Corporate Governance									-282.8**	-2.068*	-0.121	-0.000153
									(114.9)	(1.193)	(0.0744)	(0.00222)
									-0.216	-0.161	-0.103	-0.0102
L.Corporate Governance #Europe									122.3***	0.511	-0.0529**	-0.000429
									(38.98)	(0.686)	(0.0237)	(0.00128)
									0.134	0.0573	-0.0640	-0.0413
L.Corporate Governance #c.ln(L.TA)									21.53*	0.168	0.0140**	0.000135
									(12.15)	(0.130)	(0.00684)	(0.000204)
									0.220	0.175	0.159	0.121
Europe	-78.04	28.96**	6.219***	-0.122*	-1,016	38.64**	6.487***	-0.0553	-7,426***	-19.03	8.184***	-0.0284
	(1,232)	(13.64)	(1.211)	(0.0678)	(1,146)	(17.09)	(1.343)	(0.0702)	(2,697)	(47.42)	(1.987)	(0.114)
	-0.00118	0.0446	0.101	-0.159	-0.0153	0.0595	0.105	-0.0722	-0.111	-0.0291	0.133	-0.0372
L.SRISK	0.876***				0.866***				0.870***			
	(0.0252)				(0.0218)				(0.0222)			
	0.866				0.857				0.860			
L. $Delta CoVaR		0.721***				0.712***				0.732***		
		(0.0469)				(0.0457)				(0.0435)		
		0.727				0.718				0.739		
L.Z-score	-18.29***	-0.203**	0.958***	-0.000498**	-19.48***	-0.248***	0.956***	-0.000578***	-15.84***	-0.229***	0.957***	-0.000516**
	(6.991)	(0.0827)	(0.0162)	(0.000211)	(6.199)	(0.0812)	(0.0162)	(0.000216)	(6.020)	(0.0808)	(0.0166)	(0.000219)
	-0.0165	-0.0187	0.941	-0.0388	-0.0175	-0.0228	0.940	-0.0450	-0.0141	-0.0208	0.940	-0.0403
L.Beta	-724.9	-22.83**	2.197***	0.625***	-808.7	-25.68***	2.216***	0.616***	-793.7	-23.61**	2.292***	0.631***
	(586.3)	(9.731)	(0.650)	(0.0365)	(589.6)	(9.829)	(0.654)	(0.0363)	(597.6)	(10.17)	(0.652)	(0.0352)
	-0.00873	-0.0281	0.0279	0.652	-0.00974	-0.0316	0.0282	0.643	-0.00947	-0.0288	0.0291	0.658
ln(L.TA)	-485.8	8.522*	0.0421	-0.0125*	-1,561***	-5.468	0.233	-0.0365***	-1,210	4.555	-0.821*	-0.00528
	(419.7)	(4.530)	(0.272)	(0.00725)	(491.8)	(5.802)	(0.338)	(0.00960)	(775.3)	(7.489)	(0.444)	(0.0140)
	-0.0320	0.0573	0.00305	-0.0715	-0.103	-0.0368	0.0169	-0.208	-0.0790	0.0304	-0.0595	-0.0302
L.LVG	96.68***	-0.256	-0.0225**	0.00243***	101.0***	-0.204	-0.0243**	0.00245***	111.0***	-0.145	-0.0222**	0.00250***
	(26.21)	(0.162)	(0.0110)	(0.000779)	(26.42)	(0.165)	(0.0109)	(0.000758)	(30.19)	(0.165)	(0.0111)	(0.000786)
	0.0672	-0.0182	-0.0171	0.146	0.0702	-0.0145	-0.0185	0.147	0.0771	-0.0103	-0.0170	0.152
L.NI	0.749***	0.0152***	1.46e-05	-4.46e-06	0.712***	0.0150***	3.97e-05	-5.50e-06**	0.736***	0.0153***	7.59e-06	-3.93e-06
	(0.215)	(0.00385)	(5.11e-05)	(2.75e-06)	(0.192)	(0.00386)	(5.15e-05)	(2.73e-06)	(0.183)	(0.00393)	(4.68e-05)	(2.46e-06)
	0.0832	0.172	0.00173	-0.0429	0.0791	0.170	0.00471	-0.0529	0.0818	0.173	0.000909	-0.0382
Constant	6,458	-36.95	-6.033**	0.512***	17,371***	77.00	-7.868**	0.705***	17,717***	25.78	2.407	0.366**
	(4,444)	(45.65)	(2.973)	(0.110)	(4,878)	(56.26)	(3.745)	(0.128)	(6,826)	(69.80)	(4.931)	(0.168)
Observations	1,747	1,747	1,674	1,747	1,747	1,747	1,674	1,747	1,724	1,724	1,654	1,724
Adjusted R2	0.940	0.869	0.927	0.616	0.940	0.870	0.927	0.618	0.939	0.868	0.925	0.611
Stock-Wright LM S statistic	205.8	98.59	204.4	198.2	166.1	112.4	205.0	197.0	148.9	57.73	9.410e+09	177.1
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Anderson-Rubin Wald F test	238.2	52.74	452.0	44.10	228.4	59.02	488.4	49.38	195.2	42.50	504.9	35.05
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Anderson-Rubin Wald Chi2 test	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
p-value	1236	271.5	2348	228.7	1185	303.8	2537	256.1	1014	218.9	2625	181.9
Kleibergen-Paap Wald rk F statistic	170.3	55.47	426.8	80.12	157.3	117.9	230.8	78.61	59.94	54.55	61.68	67.98
Kleibergen-Paap rk LM statistic	286.5	145.8	492.7	239.2	231.6	203.4	325.5	238.6	176.0	179.5	162.3	185.2
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Endogeneity test	16.07	20.56	6.434	23.21	20.30	12.08	10.06	24.20	9.949	11.88	6.275	6.669
p-value	0.00292	0.000387	0.169	0.000115	0.000435	0.0168	0.0395	7.28e-05	0.0413	0.0182	0.180	0.154
Hansen J stat	1.197	30.88	1.664	0.299	1.700	37.84	1.883	0.0578	2.762	35.19	2.503	0.234
p-value	0.274	2.74e-08	0.197	0.585	0.192	7.67e-10	0.170	0.810	0.0965	3.00e-09	0.114	0.629

[a] The table reports the results of 2SLS-IV regressions of SRISK, $ Delta CoVaR, Beta and Z-score on the Asset 4 ESG Pillars scores, 2004 to 2017, instrumented by Refinitiv ESG corresponding pillar score, and news sentiment. We include the ESG scores interacted with size (ln(TA)) and with a Europe=1 dummy. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis, and tests of weak-instrument robust-inference, under-identification, endogeneity and over-identification, with their corresponding p-values. *** p<0.01, ** p<0.05, * p<0.1.

Table 11: IV regressions on the ESG subcategories: Environmental score

	(1) SRISK	(2) $ DeltaCoVaR	(3) Z-score	(4) Beta
L.Emission Reduction	-93.63	2.616	0.111	-0.00739**
	(170.6)	(2.529)	(0.191)	(0.00369)
	-0.0980	0.279	0.127	-0.670
L.Product Innovation	-80.29	-5.318**	-0.0314	0.00482*
	(200.4)	(2.193)	(0.100)	(0.00270)
	-0.0774	-0.523	-0.0331	0.403
L.Resource Reduction	-99.92	-0.274	-0.0739	0.00543*
	(174.0)	(2.218)	(0.177)	(0.00327)
	-0.109	-0.0304	-0.0877	0.512
L.Emission Reduction #Europe	20.47	-0.0739	-0.0926*	-0.00108
	(49.31)	(0.755)	(0.0495)	(0.00139)
	0.0250	-0.00923	-0.124	-0.115
L.Product Innovation #Europe	25.43	0.135	0.00772	-0.000429
	(53.91)	(1.155)	(0.0251)	(0.00138)
	0.0290	0.0157	0.00964	-0.0424
L.Resource Reduction #Europe	-1.202	-0.205	0.0402	0.00164
	(46.32)	(0.934)	(0.0450)	(0.00132)
	-0.00154	-0.0268	0.0561	0.182
L.Emission Reduction #c.ln(L.TA)	11.74	-0.194	-0.0101	0.000886***
	(16.09)	(0.244)	(0.0167)	(0.000324)
	0.166	-0.280	-0.156	1.085
L.Product Innovation #c.ln(L.TA)	5.226	0.503**	0.00356	-0.000250
	(19.07)	(0.215)	(0.00840)	(0.000214)
	0.0699	0.686	0.0522	-0.289
L.Resource Reduction #c.ln(L.TA)	6.012	-0.0241	0.00782	-0.000771**
	(16.87)	(0.238)	(0.0159)	(0.000307)
	0.0865	-0.0354	0.123	-0.961
Europe	-180.9	33.41*	6.910***	-0.0874
	(1,309)	(20.05)	(1.260)	(0.0673)
	-0.00273	0.0514	0.112	-0.114
L.SRISK	0.867***			
	(0.0269)			
	0.857			
L. $Delta CoVaR		0.732***		
		(0.0453)		
		0.738		
L.Z-score	-16.84***	-0.152*	0.958***	-0.000646***
	(6.477)	(0.0905)	(0.0168)	(0.000217)
	-0.0152	-0.0139	0.941	-0.0503
L.Beta	-772.7	-8.045	2.333***	0.611***
	(566.5)	(8.735)	(0.685)	(0.0372)
	-0.00931	-0.00989	0.0297	0.637
ln(L.TA)	-856.9**	3.585	0.155	0.00536
	(427.6)	(4.793)	(0.278)	(0.00854)
	-0.0564	0.0241	0.0112	0.0306
L.LVG	99.93***	-0.264	-0.0286**	0.00229***
	(28.38)	(0.173)	(0.0115)	(0.000768)
	0.0694	-0.0187	-0.0218	0.138
L.NI	0.702***	0.0118***	2.74e-05	-5.28e-06*
	(0.217)	(0.00319)	(5.11e-05)	(2.84e-06)
	0.0781	0.134	0.00326	-0.0508
Constant	10,427**	-6.708	-7.359**	0.324***
	(4,491)	(55.26)	(3.184)	(0.114)
Observations	1,747	1,747	1,674	1,747
Adjusted R2	0.940	0.891	0.926	0.610
Stock-Wright LM S statistic	230.5	101.5	210.7	216.0
p-value	0	0	0	0
Anderson-Rubin Wald F test	134.0	33.98	217.1	23.96
p-value	0	0	0	0
Anderson-Rubin Wald Chi2 test	1535	389.4	2491	274.4
p-value	0	0	0	0
Kleibergen-Paap Wald rk F statistic	18.44	16.66	20.64	21.59
Kleibergen-Paap rk LM statistic	143.9	124.8	151.6	157.4
p-value	0	0	0	0
Endogeneity test	29.12	22.34	16.03	29.83
p-value	0.00119	0.0135	0.0989	0.000914
Hansen J stat	1.163	1.794	1.217	0.273
p-value	0.281	0.180	0.270	0.601

[a] The table reports the results of 2SLS-IV regressions of SRISK, $ Delta CoVaR, Beta and Z-score on the Asset 4 ESG components of the Environmental pillar, 2004 to 2017, instrumented by Refinitiv corresponding components and news sentiment. We include the ESG scores interacted with size (ln(TA)) and with a Europe=1 dummy. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis, and tests of weak-instrument robust-inference, under-identification, endogeneity and over-identification, with their corresponding p-values. *** p<0.01, ** p<0.05, * p<0.1.

Table 12: IV regressions on the ESG subcategories: Social score

	(1) SRISK	(2) $ DeltaCoVaR	(3) Z-score	(4) Beta
L.Customer /Product Responsibility	-339.5**	-6.785**	0.395	-0.0151*
	(168.7)	(3.057)	(0.348)	(0.00772)
	-0.326	-0.664	0.416	-1.252
L.Society /Community	-509.4	-8.905	1.611*	-0.0298
	(562.7)	(8.900)	(0.930)	(0.0212)
	-0.450	-0.802	1.551	-2.275
L.Society /Human Rights	-210.0	-2.007	0.385*	-0.00491
	(142.4)	(2.410)	(0.232)	(0.00526)
	-0.200	-0.195	0.404	-0.405
L.Workforce Average	585.3	13.85	-2.262*	0.0423
	(781.1)	(12.58)	(1.368)	(0.0303)
	0.400	0.966	-1.689	2.506
L.Customer /Product Responsibility #Europe	19.39	1.024	-0.221**	0.000167
	(57.87)	(0.939)	(0.102)	(0.00244)
	0.0228	0.123	-0.284	0.0170
L.Society /Community #Europe	49.45	0.298	-0.122	0.00484*
	(70.75)	(1.092)	(0.114)	(0.00289)
	0.0580	0.0357	-0.156	0.492
L.Society /Human Rights #Europe	10.75	0.240	-0.0884*	-0.000604
	(41.53)	(0.636)	(0.0454)	(0.00116)
	0.0123	0.0279	-0.111	-0.0598
L.Workforce Average #Europe	-76.59	-2.536	0.455*	-0.00811
	(144.2)	(2.305)	(0.241)	(0.00586)
	-0.0845	-0.286	0.545	-0.775
L.Customer /Product Responsibility #c.ln(L.TA)	31.47**	0.612**	-0.0234	0.00140**
	(13.70)	(0.243)	(0.0265)	(0.000597)
	0.401	0.797	-0.328	1.544
L.Society /Community #c.ln(L.TA)	49.07	0.805	-0.143*	0.00267
	(51.92)	(0.813)	(0.0834)	(0.00190)
	0.562	0.940	-1.796	2.650
L.Society /Human Rights #c.ln(L.TA)	17.88	0.138	-0.0304	0.000531
	(12.09)	(0.210)	(0.0195)	(0.000442)
	0.239	0.188	-0.448	0.616
L.Workforce Average #c.ln(L.TA)	-55.37	-1.136	0.188	-0.00365
	(67.42)	(1.075)	(0.115)	(0.00256)
	-0.561	-1.175	2.091	-3.205
Europe	368.5	52.45*	5.025*	0.0100
	(1,753)	(28.30)	(2.767)	(0.0857)
	0.00556	0.0807	0.0816	0.0131
L.SRISK	0.888***			
	(0.0323)			
	0.878			
L. $Delta CoVaR		0.791***		
		(0.0516)		
		0.798		
L.Z-score	-20.83***	-0.166	0.956***	-0.000673**
	(7.201)	(0.109)	(0.0187)	(0.000288)
	-0.0187	-0.0152	0.939	-0.0524
L.Beta	-1,215**	-19.82**	2.825***	0.617***
	(595.0)	(9.269)	(0.947)	(0.0394)
	-0.0146	-0.0244	0.0359	0.644
ln(L.TA)	-1,695**	-6.084	-0.0657	-0.0280
	(725.6)	(8.470)	(0.935)	(0.0206)
	-0.112	-0.0409	-0.00476	-0.159
L.LVG	114.7***	0.267	-0.0756**	0.00354***
	(28.39)	(0.359)	(0.0333)	(0.00103)
	0.0797	0.0189	-0.0576	0.213
L.NI	0.668***	0.0106***	0.000190	-8.42e-06**
	(0.187)	(0.00346)	(0.000141)	(3.61e-06)
	0.0743	0.120	0.0225	-0.0810
Constant	23,067***	145.5	-12.25	0.778***
	(7,009)	(91.78)	(9.747)	(0.238)
Observations	1,747	1,747	1,674	1,747
Adjusted R2	0.936	0.871	0.865	0.465
Stock-Wright LM S statistic	189.8	117.6	243.9	203.7
p-value	0	0	0	0
Anderson-Rubin Wald F test	89.27	29.61	183.0	21.46
p-value	0	0	0	0
Anderson-Rubin Wald Chi2 test	1304	432.6	2676	313.4
p-value	0	0	0	0
Kleibergen-Paap Wald rk F statistic	0.591	0.493	0.281	0.378
Kleibergen-Paap rk LM statistic	8.459	7.027	4.050	5.382
p-value	0.0146	0.0298	0.132	0.0678
Endogeneity test	23.86	34.93	18.73	31.96
p-value	0.0324	0.000869	0.132	0.00244
Hansen J stat	1.306	0.642	0.0949	0.393
p-value	0.253	0.423	0.758	0.531

[a] The table reports the results of 2SLS-IV regressions of SRISK, $ Delta CoVaR, Beta and Z-score on the Asset 4 ESG components of the Social pillar, 2004 to 2017, instrumented by Refinitiv corresponding components and news sentiment. In particular, Workforce Average is the equal-weighted average of Asset 4 L.Diversity and Opportunity/Policy, L.Employment Quality/Policy, L.Health Safety /Policy, and L.Training and Development/Policy, and instrumented by Refinitiv Workforce component. We include the ESG scores interacted with size (ln(TA)) and with a Europe=1 dummy. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis, and tests of weak-instrument robust-inference, under-identification, endogeneity and over-identification, with their corresponding p-values. *** p<0.01, ** p<0.05, * p<0.1.

Table 13: IV regressions on the ESG subcategories: Corporate Governance

	(1) SRISK	(2) $ DeltaCoVaR	(3) Z-score	(4) Beta
L.Management Average	131.9	-2.985	0.453	-0.00311
	(455.7)	(5.085)	(0.486)	(0.0120)
	0.0901	-0.208	0.340	-0.184
L.Integration/Vision and Strategy	-265.9***	-0.398	0.0819	-0.000882
	(87.61)	(1.227)	(0.0636)	(0.00168)
	-0.280	-0.0428	0.0940	-0.0804
L.Shareholders /Shareholder Rights	-333.2	-1.709	-0.582*	-0.000838
	(380.4)	(3.755)	(0.311)	(0.00672)
	-0.298	-0.156	-0.570	-0.0649
L.Management Average #Europe	60.83	0.453	0.0756	-0.00387
	(64.60)	(1.091)	(0.0882)	(0.00264)
	0.0589	0.0448	0.0796	-0.324
L.Integration/Vision and Strategy #Europe	41.44	0.367	-0.0984	0.00165
	(67.55)	(0.829)	(0.0610)	(0.00170)
	0.0523	0.0473	-0.135	0.180
L.Shareholders /Shareholder Rights #Europe	-96.64	-1.279	-0.205	0.00433
	(113.2)	(1.488)	(0.128)	(0.00350)
	-0.107	-0.144	-0.248	0.415
L.Management Average #c.ln(L.TA)	-13.48	0.321	-0.0453	0.000573
	(45.11)	(0.518)	(0.0478)	(0.00120)
	-0.114	0.277	-0.420	0.419
L.Integration/Vision and Strategy #c.ln(L.TA)	23.17***	0.0292	-0.00187	1.17e-05
	(8.325)	(0.122)	(0.00653)	(0.000193)
	0.327	0.0420	-0.0289	0.0143
L.Shareholders /Shareholder Rights #c.ln(L.TA)	39.74	0.251	0.0670*	-0.000191
	(44.59)	(0.458)	(0.0366)	(0.000843)
	0.442	0.285	0.820	-0.184
Europe	407.3	37.45	13.88**	-0.0733
	(7,625)	(99.14)	(6.076)	(0.209)
	0.00614	0.0576	0.225	-0.0957
L.SRISK	0.855***			
	(0.0249)			
	0.846			
L. $Delta CoVaR		0.763***		
		(0.0434)		
		0.769		
L.Z-score	-19.51**	-0.123	0.946***	-0.000359
	(9.873)	(0.113)	(0.0173)	(0.000302)
	-0.0175	-0.0113	0.930	-0.0280
L.Beta	-342.5	-7.151	2.411***	0.629***
	(729.1)	(11.15)	(0.735)	(0.0356)
	-0.00413	-0.00879	0.0307	0.656
ln(L.TA)	-2,347	-24.59	-0.600	-0.0250
	(1,606)	(17.06)	(1.325)	(0.0363)
	-0.155	-0.165	-0.0434	-0.143
L.LVG	99.89***	-0.0352	-0.0369**	0.00261***
	(30.01)	(0.218)	(0.0168)	(0.000940)
	0.0694	-0.00249	-0.0281	0.157
L.NI	0.658***	0.0119***	-2.98e-05	-3.67e-06
	(0.186)	(0.00330)	(7.83e-05)	(2.96e-06)
	0.0731	0.135	-0.00354	-0.0353
Constant	23,069	215.2	-2.189	0.583
	(15,349)	(165.9)	(14.66)	(0.415)
Observations	1,747	1,747	1,674	1,747
Adjusted R2	0.932	0.885	0.907	0.595
Stock-Wright LM S statistic	183.5	93.25	228.3	185.9
p-value	0	0	0	0
Anderson-Rubin Wald F test	104.4	31.20	202.8	18.04
p-value	0	0	0	0
Anderson-Rubin Wald Chi2 test	1196	357.5	2326	206.6
p-value	0	0	0	0
Kleibergen-Paap Wald rk F statistic	0.509	0.550	0.511	0.568
Kleibergen-Paap rk LM statistic	5.975	6.269	5.896	6.480
p-value	0.0504	0.0435	0.0524	0.0392
Endogeneity test	26.98	14.15	22.59	16.56
p-value	0.00262	0.166	0.0124	0.0848
Hansen J stat	1.225	1.357	0.360	0.664
p-value	0.268	0.244	0.549	0.415

[a] The table reports the results of 2SLS-IV regressions of SRISK, $ Delta CoVaR, Beta and Z-score on the Asset 4 ESG components of the Corporate Governance pillar, 2004 to 2017, instrumented by Refinitiv corresponding components and news sentiment. In particular, Management Average is the equal-weighted average of Asset 4 L.Board of Directors/Board Functions, L.Board of Directors/Board Structure, and L.Board of Directors/Compensation Policy, and instrumented by Refinitiv Management component. We include the ESG scores interacted with size (ln(TA)) and with a Europe=1 dummy. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis, and tests of weak-instrument robust-inference, under-identification, endogeneity and over-identification, with their corresponding p-values. *** p<0.01, ** p<0.05, * p<0.1.

Table 14: First stage tests

Variable	Shea Partial R2	Partial R2	First-stage robust F	P-value
L.Equal-Weighted Rating	0.5886	0.5761	505.99	0.000
L.Equal-Weighted Rating #Europe	0.6974	0.6813	849.72	0.000
L.Equal-Weighted Rating #c.ln(L.TA)	0.5919	0.5885	516.51	0.000
L.Environmental	0.5898	0.6325	526.53	0.000
L.Environmental #Europe	0.7385	0.6579	622.45	0.000
L.Environmental #c.ln(L.TA)	0.5717	0.6264	494.89	0.000
L.Social	0.4921	0.594	485.76	0.000
L.Social #Europe	0.6725	0.6743	638.23	0.000
L.Social #c.ln(L.TA)	0.4811	0.5703	440.06	0.000
L.Corporate Governance	0.2504	0.3514	166.43	0.000
L.Corporate Governance #Europe	0.3570	0.4133	199.96	0.000
L.Corporate Governance #c.ln(L.TA)	0.2245	0.3686	166.31	0.000
L.Emission Reduction	0.2770	0.7533	477.18	0.000
L.Product Innovation	0.2858	0.5384	207.3	0.000
L.Resource Reduction	0.3179	0.7691	500.25	0.000
L.Emission Reduction #Europe	0.3412	0.7522	435.03	0.000
L.Product Innovation #Europe	0.3187	0.5889	273.69	0.000
L.Resource Reduction #Europe	0.3584	0.7499	398.1	0.000
L.Emission Reduction #c.ln(L.TA)	0.2687	0.7464	436.23	0.000
L.Product Innovation #c.ln(L.TA)	0.2897	0.5561	211.3	0.000
L.Resource Reduction #c.ln(L.TA)	0.2989	0.7525	439.29	0.000
L.Customer /Product Responsibility	0.0920	0.4495	107.98	0.000
L.Society /Community	0.0115	0.3719	80.64	0.000
L.Society /Human Rights	0.3143	0.6171	186.68	0.000
L.Workforce (Average)	0.0160	0.5185	122.43	0.000
L.Customer /Product Responsibility #Europe	0.0790	0.4906	117.99	0.000
L.Society /Community #Europe	0.0681	0.432	77.9	0.000
L.Society /Human Rights #Europe	0.4262	0.608	228.57	0.000
L.Workforce (Average) #Europe	0.0425	0.5901	143.2	0.000
L.Customer /Product Responsibility #c.ln(L.TA)	0.1138	0.4346	100.38	0.000
L.Society /Community #c.ln(L.TA)	0.0118	0.3364	72.88	0.000
L.Society /Human Rights #c.ln(L.TA)	0.3130	0.6313	211.26	0.000
L.Workforce (Average) #c.ln(L.TA)	0.0182	0.4865	107.97	0.000
L.Management (Average)	0.0312	0.4082	99.09	0.000
L.Integration/Vision and Strategy	0.5319	0.6376	276.85	0.000
L.Shareholders /Shareholder Rights	0.0292	0.1304	23.63	0.000
L.Board of directors (Average) #Europe	0.2220	0.4222	82.43	0.000
L.Integration/Vision and Strategy #Europe	0.1031	0.6136	210.01	0.000
L.Shareholders /Shareholder Rights #Europe	0.0212	0.1541	27.36	0.000
L.Management (Average) #c.ln(L.TA)	0.0247	0.3841	84.47	0.000
L.Integration/Vision and Strategy #c.ln(L.TA)	0.4645	0.6333	259.46	0.000
L.Shareholders /Shareholder Rights #c.ln(L.TA)	0.0158	0.1244	23.45	0.000

[a] The table reports first-stage F-stat heteroskedasticity-robust statistics for each instrumented variables in the analysis.

Table 15: Impact of Refinitiv change in ESG scoring

	(1) ESG DD+	(2) ESG DD-	(3) CG DD+	(4) CG DD-	(5) EN DD+	(6) EN DD-	(7) SO DD+	(8) SO DD-
Time = 1 (year $\geq$ 2017)	2,273	2,066*	2,890**	2,289*	2,894**	2,406*	2,300	2,240
	(1,440)	(1,228)	(1,464)	(1,234)	(1,453)	(1,402)	(1,469)	(1,448)
	0.0431	0.0391	0.0548	0.0434	0.0548	0.0456	0.0436	0.0424
Treated Plus = 1 (change above its 90th pc)	-1,231**		-470.4		-28.09		-1,055*	
	(552.2)		(651.1)		(655.7)		(539.8)	
	-0.0240		-0.00917		-0.000548		-0.0206	
1.Time#1.Treated Plus	747.0		-956.0		-792.1		736.1	
	(949.1)		(1,015)		(991.8)		(971.7)	
	0.0102		-0.0131		-0.0108		0.0100	
Treated Minus = 1 (change below its 10th pc)		-339.3		-88.28		-1,354**		-1,794***
		(939.5)		(1,037)		(583.2)		(613.1)
		-0.00351		-0.000893		-0.0137		-0.0188
1.Time#1.Treated Minus		3,500**		3,044		2,151**		2,147**
		(1,533)		(1,889)		(851.4)		(876.2)
		0.0235		0.0191		0.0135		0.0148
L.Equal-Weighted Rating	-8.497	-8.320						
	(12.60)	(12.41)						
	-0.00733	-0.00718						
L. Corporate Governance			-9.235	-5.859				
			(11.09)	(10.41)				
			-0.00809	-0.00513				
L. Environmental					-2.250	-2.992		
					(9.542)	(9.840)		
					-0.00287	-0.00381		
L. Social							-12.91	-9.364
							(11.71)	(11.59)
							-0.0131	-0.00950
L. SRISK	0.888***	0.890***	0.891***	0.892***	0.891***	0.891***	0.889***	0.890***
	(0.0236)	(0.0235)	(0.0239)	(0.0234)	(0.0239)	(0.0238)	(0.0235)	(0.0235)
	0.946	0.948	0.948	0.950	0.949	0.949	0.946	0.948
L. Z-score	0.487	0.298	0.119	1.381	0.634	0.789	0.701	2.804
	(9.118)	(9.292)	(8.943)	(9.290)	(9.183)	(9.252)	(9.173)	(9.489)
	0.000639	0.000391	0.000156	0.00181	0.000833	0.00104	0.000922	0.00369
L. Beta	-1,407	-1,287	-1,506	-1,387	-1,313	-1,205	-1,262	-1,141
	(1,211)	(1,173)	(1,174)	(1,212)	(1,235)	(1,196)	(1,207)	(1,167)
	-0.0199	-0.0182	-0.0213	-0.0197	-0.0186	-0.0171	-0.0179	-0.0162
ln(L.TA)	560.6**	590.9**	543.7**	527.3**	530.6**	526.3**	591.7**	548.7**
	(255.9)	(261.5)	(225.5)	(220.1)	(255.7)	(260.4)	(256.3)	(252.8)
	0.0467	0.0493	0.0453	0.0440	0.0442	0.0439	0.0493	0.0457
L. LVG	4.047	2.661	3.222	2.769	3.506	3.470	3.628	2.874
	(6.632)	(6.764)	(7.049)	(6.680)	(6.536)	(6.554)	(6.662)	(6.784)
	0.00543	0.00357	0.00432	0.00371	0.00470	0.00465	0.00487	0.00385
L. NI	0.0722	0.0985	0.0909	0.120	0.0907	0.101	0.0840	0.103
	(0.906)	(0.906)	(0.912)	(0.902)	(0.919)	(0.915)	(0.905)	(0.904)
	0.00257	0.00350	0.00323	0.00428	0.00323	0.00358	0.00298	0.00365
Constant	-3,154*	-4,135**	-2,975	-3,476*	-3,871*	-3,812*	-3,450*	-3,535*
	(1,905)	(2,038)	(1,944)	(2,077)	(2,115)	(2,091)	(1,957)	(1,939)
Year Effects	yes	yes	yes	yes	yes	yes	yes	yes
Country/State Effects	yes	yes	yes	yes	yes	yes	yes	yes
Observations	547	547	547	547	547	547	547	547
R2 Adjusted	0.958	0.958	0.958	0.958	0.958	0.958	0.958	0.958

[a] The table reports the results of country-year fixed effects regressions of SRISK on Refinitiv ESG scores, including the methodological shock in 2017. We include all banks headquartered in Europe or USA. The specification includes a dummy variable for the event (1: on and after 2017), a dummy variable identifying the treated banks, and an interaction dummy identifying treated banks after 2017. Treated banks are considered banks who had a change in ESG scores higher than the 90th percentile (Treated Plus) or lower than the 10th percentile (Treated Minus) of the difference in old and new scores in 2017. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

Table 16: Impact of Refinitiv change in ESG scoring: Europe.

	(1) ESG DD+	(2) ESG DD-	(3) CG DD+	(4) CG DD-	(5) EN DD+	(6) EN DD-	(7) SO DD+	(8) SO DD-
Time = 1 (year ≥ 2017)	2,533*	2,404**	2,345	2,328**	2,668*	2,811**	2,546*	2,754*
	(1,442)	(1,105)	(1,437)	(1,122)	(1,464)	(1,331)	(1,295)	(1,424)
	0.0409	0.0388	0.0378	0.0376	0.0430	0.0453	0.0411	0.0444
Treated Plus = 1 (change above its 90th pc)	-1,563**		-1,799**		-1,036		-186.8	
	(714.8)		(699.0)		(660.1)		(781.0)	
	-0.0258		-0.0298		-0.0171		-0.00310	
1.Time#1.Treated Plus	743.1		1,025		536.3		884.1	
	(1,165)		(1,163)		(1,151)		(1,210)	
	0.00867		0.0122		0.00626		0.0106	
Treated Minus = 1 (change below its 10th pc)		-945.4		-2,682		-1,394		-952.6
		(1,404)		(1,809)		(1,076)		(753.9)
		-0.00744		-0.0228		-0.0103		-0.00845
1.Time#1.Treated Minus		5,946**		5,929*		2,616**		1,326
		(2,961)		(3,103)		(1,220)		(1,126)
		0.0306		0.0325		0.0114		0.00810
L.Equal-Weighted Rating	-13.51	-8.551						
	(14.46)	(13.96)						
	-0.0102	-0.00645						
L. Corporate Governance			-15.72	-11.56				
			(13.57)	(12.86)				
			-0.0131	-0.00960				
L. Environmental					-5.262	-5.773		
					(10.77)	(10.91)		
					-0.00505	-0.00555		
L. Social							-3.052	-0.912
							(11.38)	(12.20)
							-0.00262	-0.000782
L. SRISK	0.897***	0.901***	0.901***	0.903***	0.900***	0.901***	0.902***	0.902***
	(0.0214)	(0.0218)	(0.0220)	(0.0218)	(0.0223)	(0.0222)	(0.0216)	(0.0218)
	0.959	0.962	0.963	0.964	0.962	0.963	0.964	0.964
L. Z-score	5.992	6.340	7.265	8.236	6.485	6.274	8.099	7.537
	(13.35)	(14.01)	(13.26)	(14.15)	(13.87)	(13.72)	(13.45)	(13.91)
	0.00331	0.00350	0.00401	0.00455	0.00358	0.00346	0.00447	0.00416
L. Beta	-2,415	-2,152	-2,535	-2,085	-2,322	-2,073	-2,134	-2,187
	(1,866)	(1,785)	(1,890)	(1,798)	(1,867)	(1,832)	(1,849)	(1,780)
	-0.0312	-0.0278	-0.0327	-0.0269	-0.0300	-0.0268	-0.0276	-0.0282
ln(L.TA)	563.6**	543.2**	523.8**	519.1**	528.8**	523.1**	484.8**	466.6*
	(256.6)	(255.5)	(231.5)	(234.2)	(253.0)	(258.9)	(243.2)	(241.8)
	0.0436	0.0420	0.0405	0.0401	0.0409	0.0404	0.0375	0.0361
L. LVG	0.706	-0.861	0.287	-1.108	0.939	0.190	0.184	0.519
	(7.702)	(7.747)	(7.650)	(7.912)	(7.320)	(7.473)	(7.352)	(7.812)
	0.00105	-0.00128	0.000426	-0.00165	0.00139	0.000283	0.000273	0.000772
L. NI	1.343*	1.420*	1.270*	1.438*	1.314*	1.422*	1.427*	1.416*
	(0.710)	(0.729)	(0.700)	(0.732)	(0.713)	(0.737)	(0.727)	(0.734)
	0.0298	0.0315	0.0282	0.0319	0.0292	0.0316	0.0317	0.0314
Constant	-2,564	-3,588*	-1,660	-3,006	-3,169	-3,699*	-3,424*	-3,269*
	(1,974)	(1,883)	(2,004)	(1,964)	(2,041)	(2,021)	(1,960)	(1,852)
Year Effects	yes	yes	yes	yes	yes	yes	yes	yes
Country/State Effects	yes	yes	yes	yes	yes	yes	yes	yes
Observations	290	290	290	290	290	290	290	290
R2 Adjusted	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973

[a] The table reports the results of country-year fixed effects regressions of SRISK on Refinitiv ESG scores, including the methodological shock in 2017. We only include banks headquartered in Europe. The specification includes a dummy variable for the event (1: on and after 2017), a dummy variable identifying the treated banks, and an interaction dummy identifying treated banks after 2017. Treated banks are considered banks who had a change in ESG scores higher than the 90th percentile (Treated Plus) or lower than the 10th percentile (Treated Minus) of the difference in old and new scores in 2017. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

Table 17: Impact of Refinitiv change in ESG scoring: USA.

	(1) ESG DD+	(2) ESG DD-	(3) CG DD+	(4) CG DD-	(5) EN DD+	(6) EN DD-	(7) SO DD+	(8) SO DD-
Time = 1 (year $\geq$ 2017)	-2,866***	-2,807***	-2,928***	-2,872***	-1,902**	-2,915***	-2,938***	-3,002***
	(900.8)	(702.3)	(986.0)	(727.7)	(924.3)	(714.2)	(927.6)	(770.9)
	-0.0919	-0.0900	-0.0938	-0.0920	-0.0610	-0.0934	-0.0941	-0.0962
Treated Plus = 1 (change above its 90th pc)	-747.9		-584.6		274.3		-264.2	
	(956.4)		(1,007)		(1,168)		(869.9)	
	-0.0247		-0.0192		0.00907		-0.00873	
1.Time#1.Treated Plus	273.7		158.9		-2,362		225.9	
	(1,485)		(1,541)		(1,608)		(1,554)	
	0.00617		0.00354		-0.0533		0.00510	
Treated Minus = 1 (change below its 10th pc)		730.0		1,122		-852.2		-1,778
		(1,488)		(1,755)		(1,054)		(1,399)
		0.0127		0.0196		-0.0136		-0.0285
1.Time#1.Treated Minus		620.4		-5.339		1,613		2,383
		(1,823)		(1,938)		(1,468)		(1,450)
		0.00640		-5.51e-05		0.0152		0.0225
L.Equal-Weighted Rating	29.13	21.88						
	(22.86)	(22.01)						
	0.0373	0.0280						
L. Corporate Governance			-10.23	-10.30				
			(16.92)	(16.71)				
			-0.0127	-0.0128				
L. Environmental					18.01	15.55		
					(16.45)	(14.92)		
					0.0382	0.0330		
L. Social							8.318	10.94
							(19.86)	(19.51)
							0.0123	0.0161
L. SRISK	0.810***	0.810***	0.810***	0.811***	0.813***	0.813***	0.811***	0.812***
	(0.0874)	(0.0881)	(0.0883)	(0.0874)	(0.0870)	(0.0859)	(0.0875)	(0.0856)
	0.867	0.867	0.867	0.868	0.870	0.870	0.868	0.869
L. Z-score	0.652	1.268	0.838	1.114	0.159	1.070	-0.196	0.714
	(10.81)	(11.03)	(11.38)	(11.45)	(10.39)	(10.71)	(10.35)	(10.68)
	0.00166	0.00322	0.00213	0.00283	0.000405	0.00272	-0.000498	0.00181
L. Beta	895.6	873.4	896.5	835.1	596.7	785.5	888.9	789.8
	(986.3)	(965.5)	(997.1)	(953.1)	(1,019)	(998.2)	(1,067)	(1,040)
	0.0195	0.0191	0.0196	0.0182	0.0130	0.0171	0.0194	0.0172
ln(L.TA)	-0.803	9.194	253.1	284.4	39.55	24.73	143.8	109.5
	(355.2)	(362.8)	(376.0)	(370.6)	(341.7)	(342.8)	(393.4)	(386.7)
	-9.87e-05	0.00113	0.0311	0.0350	0.00486	0.00304	0.0177	0.0135
L. LVG	195.1	194.3	184.5	179.8	196.6	193.2	190.1	194.8
	(130.4)	(130.6)	(128.3)	(124.2)	(133.1)	(127.3)	(132.8)	(131.3)
	0.0806	0.0802	0.0762	0.0742	0.0812	0.0798	0.0785	0.0804
L. NI	0.0685	0.155	0.154	0.171	0.0719	0.0847	0.132	0.115
	(1.502)	(1.528)	(1.494)	(1.499)	(1.527)	(1.504)	(1.498)	(1.496)
	0.00507	0.0114	0.0114	0.0126	0.00531	0.00626	0.00972	0.00853
Constant	-4,586	-4,290	-4,952	-5,223	-4,121	-3,423	-4,959	-4,629
	(3,973)	(4,010)	(4,162)	(4,276)	(4,046)	(3,816)	(4,207)	(4,216)
Year Effects	yes	yes	yes	yes	yes	yes	yes	yes
Country/State Effects	yes	yes	yes	yes	yes	yes	yes	yes
Observations	257	257	257	257	257	257	257	257
R2 Adjusted	0.874	0.874	0.874	0.874	0.876	0.874	0.874	0.874

[a] The table reports the results of country-year fixed effects regressions of SRISK on Refinitiv ESG scores, including the methodological shock in 2017. We only include banks headquartered in the USA. The specification includes a dummy variable for the event (1: on and after 2017), a dummy variable identifying the treated banks, and an interaction dummy identifying treated banks after 2017. Treated banks are considered banks who had a change in ESG scores higher than the 90th percentile (Treated Plus) or lower than the 10th percentile (Treated Minus) of the difference in old and new scores in 2017. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

Table 18: Impact of Refinitiv change in ESG scoring: Event time = 2018

	(1) ESG DD+	(2) ESG DD-	(3) CG DD+	(4) CG DD-	(5) EN DD+	(6) EN DD-	(7) SO DD+	(8) SO DD-
Time = 1 (year ≥ 2018)	3,729**	1,694	3,852**	1,621	4,281**	2,840*	3,802**	2,990*
	(1,830)	(1,125)	(1,925)	(1,030)	(1,947)	(1,477)	(1,854)	(1,705)
	0.0298	0.0135	0.0308	0.0129	0.0342	0.0227	0.0304	0.0239
Treated Plus = 1 (change above its 90th pc)	-771.6		-602.4		-47.27		-586.4	
	(507.7)		(612.0)		(604.4)		(505.5)	
	-0.0150		-0.0117		-0.000922		-0.0114	
1.Time#1.Treated Plus	-3,382*		-3,154		-4,363**		-3,518*	
	(1,844)		(2,039)		(1,947)		(1,863)	
	-0.0162		-0.0168		-0.0221		-0.0168	
Treated Minus = 1 (change below its 10th pc)		533.6		384.0		-317.8		-699.2
		(822.0)		(944.5)		(551.4)		(585.7)
		0.00553		0.00389		-0.00321		-0.00733
1.Time#1.Treated Minus		4,899		10,355		-3,137**		-1,849
		(5,151)		(8,171)		(1,407)		(1,712)
		0.0166		0.0249		-0.00753		-0.00700
L.Equal-Weighted Rating	-7.673	-10.27						
	(12.51)	(12.36)						
	-0.00662	-0.00887						
L. Corporate Governance			-9.944	-7.387				
			(10.98)	(9.890)				
			-0.00871	-0.00647				
L. Environmental					-3.219	-3.773		
					(9.497)	(9.844)		
					-0.00410	-0.00481		
L. Social							-10.22	-12.51
							(11.38)	(11.30)
							-0.0104	-0.0127
L. SRISK	0.888***	0.890***	0.891***	0.891***	0.890***	0.891***	0.889***	0.891***
	(0.0236)	(0.0236)	(0.0239)	(0.0235)	(0.0238)	(0.0238)	(0.0235)	(0.0235)
	0.946	0.947	0.948	0.949	0.948	0.949	0.946	0.948
L. Z-score	-0.0803	-0.134	-0.247	0.381	-0.0378	0.854	0.0555	3.691
	(9.150)	(9.503)	(9.088)	(9.428)	(9.292)	(9.256)	(9.190)	(9.501)
	-0.000105	-0.000177	-0.000325	0.000500	-4.96e-05	0.00112	7.29e-05	0.00485
L. Beta	-1,372	-1,333	-1,457	-1,397	-1,226	-1,222	-1,254	-1,116
	(1,206)	(1,185)	(1,186)	(1,214)	(1,223)	(1,198)	(1,193)	(1,178)
	-0.0194	-0.0189	-0.0206	-0.0198	-0.0174	-0.0173	-0.0178	-0.0158
ln(L.TA)	557.7**	619.2**	543.2**	545.3**	535.7**	525.0**	577.0**	554.9**
	(255.2)	(266.5)	(224.7)	(221.7)	(256.3)	(260.7)	(255.3)	(254.6)
	0.0465	0.0516	0.0453	0.0455	0.0447	0.0438	0.0481	0.0463
L. LVG	3.818	2.110	2.890	1.914	3.309	3.411	3.472	2.712
	(6.677)	(6.732)	(7.032)	(6.555)	(6.381)	(6.525)	(6.672)	(6.772)
	0.00512	0.00283	0.00388	0.00257	0.00444	0.00457	0.00466	0.00364
L. NI	0.0607	0.0885	0.109	0.107	0.0831	0.108	0.0690	0.111
	(0.908)	(0.909)	(0.910)	(0.905)	(0.916)	(0.917)	(0.907)	(0.906)
	0.00216	0.00314	0.00388	0.00379	0.00295	0.00384	0.00245	0.00394
Constant	-3,373*	-4,259**	-2,916	-3,511*	-3,920*	-3,812*	-3,637*	-3,575*
	(1,925)	(2,040)	(1,931)	(2,070)	(2,133)	(2,092)	(1,975)	(1,945)
Year Effects	yes	yes	yes	yes	yes	yes	yes	yes
Country/State Effects	yes	yes	yes	yes	yes	yes	yes	yes
Observations	547	547	547	547	547	547	547	547
R2 Adjusted	0.958	0.958	0.958	0.959	0.958	0.958	0.958	0.958

[a] The table reports the results of country-year fixed effects regressions of SRISK on Refinitiv ESG scores, including the methodological shock in 2017. The specification includes a dummy variable for the event (1: on and after 2018), a dummy variable identifying the treated banks, and an interaction dummy identifying treated banks after 2018. Treated banks are considered banks who had a change in ESG scores higher than the 90th percentile (Treated Plus) or lower than the 10th percentile (Treated Minus) of the difference in old and new scores in 2017. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

11 Appendix: Asset 4 OLS regressions by pillars

Table 19: Panel data regressions on the ESG Subcategories: separate regressions per pillar (Asset 4).

	(1) SRISK$	(2) DeltaCoVaR	(3) Z-score	(4) Beta	(5) SRISK$	(6) DeltaCoVaR	(7) Z-score	(8) Beta	(9) SRISK$	(10) DeltaCoVaR	(11) Z-score	(12) Beta	(13) Beta	(14) SRISK$	(15) DeltaCoVaR	(16) Z-score
L.Environmental	-118.1**	-2.251***	0.00284	-0.00190*												
	(49.89)	(0.725)	(0.0443)	(0.00105)												
	-0.131	-0.252	0.00298	-0.162												
L.Environmental #Europe	47.05***	-0.0773	-0.0137	0.000120												
	(14.42)	(0.216)	(0.0107)	(0.000386)												
	0.0608	-0.0100	-0.0167	0.0119												
L.Environmental #c.ln(L.TA)	7.648	0.240***	-0.00101	0.000164*												
	(4.763)	(0.0650)	(0.00370)	(9.53e-05)												
	0.114	0.358	-0.0141	0.186												
L.Social					-166.3***	-2.106***	0.0294	-0.00183*								
					(48.29)	(0.649)	(0.0495)	(0.00106)								
					-0.164	-0.209	0.0273	-0.138								
L.Social #Europe					40.65***	-0.140	0.00860	-0.000158								
					(13.91)	(0.240)	(0.0138)	(0.000515)								
					0.0529	-0.0184	0.0105	-0.0157								
L.Social #c.ln(L.TA)					13.84***	0.242***	-0.00436	0.000225**								
					(4.777)	(0.0602)	(0.00475)	(0.000103)								
					0.187	0.329	-0.0555	0.233								
L.Corporate Governance									-77.65**	-0.837	0.0145	-0.00104				
									(38.30)	(0.621)	(0.0398)	(0.00116)				
									-0.0651	-0.0705	0.0114	-0.0669				
L.Corporate Governance #Europe									73.08***	0.518**	-0.00215	0.000568				
									(16.38)	(0.228)	(0.0158)	(0.000633)				
									0.0862	0.0614	-0.00239	0.0512				
L.Corporate Governance #c.ln(L.TA)									3.093	0.0580	-0.00230	0.000142				
									(3.888)	(0.0625)	(0.00389)	(9.96e-05)				
									0.0340	0.0640	-0.0238	0.119				
L.Economic													-81.22**	-0.558	0.0122	-0.00191*
													(35.35)	(0.474)	(0.0424)	(0.00102)
													-0.0776	-0.0536	0.0110	-0.140
L.Economic #Europe													26.72**	0.0778	-0.00883	0.000316
													(13.00)	(0.209)	(0.0144)	(0.000459)
													0.0336	0.00983	-0.0105	0.0304
L.Economic #c.ln(L.TA)													6.523*	0.0504	-0.000904	0.000190**
													(3.615)	(0.0456)	(0.00403)	(9.00e-05)
													0.0825	0.0641	-0.0108	0.184
Europe	-468.7	7.663	7.755***	-0.0479	-1,453*	9.993	6.559***	-0.0543	-4,531***	-22.96	6.826***	-0.0912	-1,060	8.535	7.125***	-0.0700
	(690.7)	(10.71)	(1.241)	(0.0613)	(810.0)	(12.93)	(1.293)	(0.0648)	(1,260)	(17.07)	(1.448)	(0.0752)	(858.8)	(13.64)	(1.248)	(0.0665)
	-0.00744	0.0122	0.116	-0.0582	-0.0231	0.0159	0.0981	-0.0659	-0.0719	-0.0366	0.102	-0.111	-0.0168	0.0136	0.107	-0.0850
L.SRISK	0.931***				0.927***				0.937***				0.939***			
	(0.0256)				(0.0236)				(0.0223)				(0.0218)			
	0.919				0.915				0.925				0.927			
L. $Delta CoVaR		0.753***				0.765***				0.782***				0.785***		
		(0.0509)				(0.0480)				(0.0486)				(0.0461)		
		0.772				0.785				0.802				0.805		
L.Z-score	-19.62***	-0.0505	0.880***	-0.000835***	-19.65***	-0.103	0.880***	-0.000881***	-21.46***	-0.125*	0.880***	-0.000913***	-21.82***	-0.126**	0.880***	-0.000911***
	(5.156)	(0.0642)	(0.0212)	(0.000171)	(4.866)	(0.0636)	(0.0214)	(0.000169)	(4.928)	(0.0641)	(0.0215)	(0.000172)	(4.971)	(0.0643)	(0.0215)	(0.000168)
	-0.0220	-0.00567	0.928	-0.0714	-0.0220	-0.0116	0.927	-0.0754	-0.0240	-0.0140	0.928	-0.0781	-0.0244	-0.0142	0.928	-0.0779
L.Beta	-700.0	-12.93*	2.221***	0.627***	-667.9	-13.49*	2.243***	0.626***	-793.8	-12.78	2.219***	0.624***	-805.1	-12.38	2.181***	0.626***
	(517.1)	(7.735)	(0.611)	(0.0250)	(514.0)	(7.795)	(0.612)	(0.0247)	(519.7)	(7.833)	(0.624)	(0.0247)	(532.0)	(7.927)	(0.610)	(0.0247)
	-0.00949	-0.0176	0.0284	0.650	-0.00905	-0.0184	0.0286	0.648	-0.0108	-0.0174	0.0283	0.647	-0.0109	-0.0169	0.0279	0.649
ln(L.TA)	-203.6	-0.414	0.670***	0.0104*	-679.5**	-3.956	0.805***	0.00206	-123.0	6.985**	0.667**	0.00596	-308.4	8.071**	0.555*	0.00524
	(188.8)	(1.879)	(0.230)	(0.00557)	(269.1)	(2.653)	(0.299)	(0.00739)	(282.5)	(3.484)	(0.327)	(0.00729)	(278.6)	(3.506)	(0.295)	(0.00664)
	-0.0150	-0.00306	0.0463	0.0587	-0.0499	-0.0292	0.0556	0.0116	-0.00903	0.0516	0.0461	0.0335	-0.0227	0.0596	0.0384	0.0294
L.LVG	55.07***	-0.122	-0.0832***	0.00137**	57.54***	-0.0751	-0.0850***	0.00139**	56.99***	-0.0500	-0.0850***	0.00139**	59.85***	-0.0309	-0.0859***	0.00148***
	(16.09)	(0.112)	(0.0162)	(0.000556)	(16.05)	(0.110)	(0.0164)	(0.000547)	(16.39)	(0.108)	(0.0164)	(0.000545)	(16.65)	(0.109)	(0.0169)	(0.000544)
	0.0455	-0.0101	-0.0642	0.0868	0.0475	-0.00624	-0.0656	0.0876	0.0471	-0.00415	-0.0657	0.0879	0.0494	-0.00256	-0.0663	0.0936
L.NI	0.773***	0.0112***	4.81e-05	-5.72e-06**	0.747***	0.0113***	5.44e-05	-5.96e-06**	0.781***	0.0116***	4.50e-05	-5.81e-06**	0.762***	0.0115***	3.95e-05	-6.08e-06**
	(0.186)	(0.00310)	(5.43e-05)	(2.55e-06)	(0.178)	(0.00311)	(5.43e-05)	(2.42e-06)	(0.176)	(0.00319)	(5.51e-05)	(2.32e-06)	(0.173)	(0.00325)	(5.30e-05)	(2.42e-06)
	0.0865	0.126	0.00503	-0.0489	0.0835	0.127	0.00569	-0.0510	0.0874	0.131	0.00470	-0.0497	0.0852	0.130	0.00413	-0.0520
Constant	4,513**	-16.11	-10.20***	0.389***	9,771***	3.690	-11.02***	0.456***	6,541**	-80.45**	-9.589***	0.414***	5,918**	-108.9***	-9.091***	0.437***
	(2,077)	(24.13)	(2.406)	(0.0839)	(2,830)	(28.46)	(3.018)	(0.0913)	(2,889)	(36.40)	(3.313)	(0.0999)	(2,912)	(32.97)	(2.945)	(0.0929)
Observations	2,084	2,084	2,080	2,084	2,084	2,084	2,080	2,084	2,084	2,084	2,080	2,084	2,084	2,084	2,080	2,084
Adjusted R2	0.940	0.894	0.906	0.652	0.941	0.893	0.906	0.653	0.940	0.892	0.906	0.654	0.940	0.891	0.905	0.653
F-test Year Effects	11.27***	15.83	3.539***	22.89***	10.90***	16.95	3.501***	22.84***	11.38**	16.36	3.489***	22.77***	11.23***	18.82***	3.462***	22.89***
F-test Country Effects	1.517**	1.060***	2.235***	3.391**	1.517**	1.059***	2.223***	3.348***	1.526***	1.155***	1.957***	3.583***	1.563**	1.194	2.218***	3.318***

[a] The table reports the results of country-year fixed effects regressions of SRISK, $ Delta CoVaR, Beta and Z-score on the ESG pillars scores: Environmental, Social, Corporate Governance and Economic, 2004 to 2017. We include the ESG pillar scores interacted with size (ln(TA)) and with a Europe=1 dummy. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

Table 20: Panel data regressions on ESG Subcategories: Environmental

	(1) SRISK	(2) $ DeltaCoVaR	(3) Z-score	(4) Beta
L.Emission Reduction	-58.11	-0.890	0.0225	-0.00160
	(58.21)	(0.752)	(0.167)	(0.00180)
	-0.0645	-0.0992	0.0235	-0.136
L.Product Innovation	-37.05	-1.353*	-0.0615	0.000444
	(46.31)	(0.812)	(0.0786)	(0.00140)
	-0.0380	-0.139	-0.0593	0.0347
L.Resource Reduction	-47.11	-0.317	0.0137	-0.000615
	(58.30)	(0.704)	(0.145)	(0.00181)
	-0.0546	-0.0369	0.0149	-0.0544
L.Emission Reduction #Europe	33.94*	-0.202	-0.0231	-0.000646
	(20.32)	(0.318)	(0.0330)	(0.000847)
	0.0438	-0.0261	-0.0281	-0.0637
L.Product Innovation #Europe	17.82	-0.201	-0.0141	-0.000552
	(19.59)	(0.363)	(0.0175)	(0.000739)
	0.0215	-0.0244	-0.0160	-0.0509
L.Resource Reduction #Europe	3.690	0.226	0.0172	0.00107
	(15.93)	(0.280)	(0.0307)	(0.000792)
	0.00497	0.0306	0.0219	0.110
L.Emission Reduction #c.ln(L.TA)	3.384	0.122*	-0.00309	0.000218
	(5.471)	(0.0711)	(0.0149)	(0.000154)
	0.0497	0.180	-0.0428	0.245
L.Product Innovation #c.ln(L.TA)	1.818	0.150**	0.00666	2.86e-06
	(4.465)	(0.0748)	(0.00689)	(0.000111)
	0.0254	0.210	0.0875	0.00305
L.Resource Reduction #c.ln(L.TA)	4.138	0.00634	-0.00228	-4.48e-05
	(5.483)	(0.0685)	(0.0131)	(0.000165)
	0.0623	0.00958	-0.0324	-0.0516
Europe	-863.9	10.09	8.269***	-0.0429
	(782.9)	(11.85)	(1.287)	(0.0628)
	-0.0137	0.0161	0.124	-0.0520
L.SRISK	0.929***			
	(0.0263)			
	0.917			
L. $Delta CoVaR		0.747***		
		(0.0525)		
		0.766		
L.Z-score	-19.32***	-0.0522	0.881***	-0.000837***
	(5.194)	(0.0647)	(0.0208)	(0.000172)
	-0.0216	-0.00587	0.929	-0.0716
L.Beta	-664.2	-13.33*	2.182***	0.625***
	(512.4)	(7.756)	(0.618)	(0.0249)
	-0.00900	-0.0182	0.0279	0.647
ln(L.TA)	-299.5	-1.603	0.649**	0.00976
	(222.7)	(2.222)	(0.265)	(0.00612)
	-0.0220	-0.0118	0.0448	0.0548
L.LVG	55.75***	-0.132	-0.0840***	0.00138**
	(16.06)	(0.115)	(0.0159)	(0.000554)
	0.0461	-0.0110	-0.0649	0.0871
L.NI	0.769***	0.0111***	4.09e-05	-6.00e-06**
	(0.187)	(0.00311)	(5.36e-05)	(2.54e-06)
	0.0860	0.125	0.00428	-0.0513
Constant	5,766**	-6.467	-9.946***	0.391***
	(2,449)	(29.73)	(2.713)	(0.0901)
Observations	2,084	2,084	2,080	2,084
Adjusted R2	0.940	0.894	0.906	0.652
F-test Year Effects	11.16***	15.91***	3.726***	22.74***
F-test Country Effects	1.490**	1.074	2.121***	3.292***

[a] The table reports the results of country-year fixed effects regressions of SRISK, $ Delta CoVaR, Beta and Z-score on the ESG Subcategories in the Environmental pillar as listed in Table 1, 2004 to 2017. We include the ESG subcategories scores interacted with size (ln(TA)) and with a Europe=1 dummy. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

Table 21: Panel data regressions on ESG Subcategories: Social

	(1) SRISK	(2) $ DeltaCoVaR	(3) Z-score	(4) Beta
L.Customer /Product Responsibility	-116.2**	-1.297**	-0.0239	-0.00293**
	(47.88)	(0.550)	(0.0514)	(0.00114)
	-0.120	-0.135	-0.0233	-0.232
L.Society /Community	-28.29	1.126**	0.0953**	0.00101
	(63.37)	(0.564)	(0.0453)	(0.00126)
	-0.0271	0.108	0.0861	0.0741
L.Society /Human Rights	-241.8***	-1.838**	-0.192***	-0.000499
	(58.22)	(0.896)	(0.0605)	(0.00151)
	-0.240	-0.184	-0.180	-0.0380
L.Diversity and Opportunity/Policy	77.30**	-0.105	0.118**	0.000145
	(36.05)	(0.458)	(0.0555)	(0.00128)
	0.0754	-0.0103	0.108	0.0108
L.Employment Quality/Policy	37.48	-1.357**	0.0646	-0.00254*
	(57.60)	(0.555)	(0.0670)	(0.00132)
	0.0353	-0.128	0.0573	-0.183
L.Health & Safety /Policy	2.033	0.503	-0.0915*	0.00109
	(33.23)	(0.422)	(0.0484)	(0.00116)
	0.00225	0.0560	-0.0954	0.0927
L.Training and Development/Policy	-6.446	-1.050***	-0.0458	0.00182*
	(28.11)	(0.366)	(0.0423)	(0.00107)
	-0.00615	-0.101	-0.0412	0.133
L.Customer /Product Responsibility #Europe	26.32	0.635**	-0.0175	0.000762
	(18.08)	(0.247)	(0.0160)	(0.000524)
	0.0328	0.0795	-0.0205	0.0725
L.Society /Community #Europe	19.86	-0.0756	0.00522	-2.20e-05
	(13.22)	(0.191)	(0.0167)	(0.000531)
	0.0248	-0.00948	0.00614	-0.00210
L.Society /Human Rights #Europe	63.06**	0.621	-0.0414***	-0.000427
	(29.89)	(0.393)	(0.0157)	(0.000644)
	0.0749	0.0742	-0.0463	-0.0388
L.Diversity and Opportunity/Policy #Europe	3.777	-0.220	0.0602***	0.000749
	(10.87)	(0.169)	(0.0214)	(0.000599)
	0.00506	-0.0296	0.0759	0.0766
L.Employment Quality/Policy #Europe	-23.87	-0.269	0.00616	-0.000424
	(15.06)	(0.279)	(0.0195)	(0.000664)
	-0.0309	-0.0350	0.00752	-0.0420
L.Health & Safety /Policy #Europe	0.991	-0.352*	-0.0132	0.000301
	(12.23)	(0.183)	(0.0154)	(0.000464)
	0.00121	-0.0431	-0.0152	0.0281
L.Training and Development/Policy #Europe	-9.128	-0.154	-0.0147	-0.00169***
	(8.472)	(0.117)	(0.0173)	(0.000450)
	-0.0115	-0.0195	-0.0175	-0.163
L.Customer /Product Responsibility #c.ln(L.TA)	10.16**	0.0992*	0.00150	0.000229**
	(4.665)	(0.0561)	(0.00476)	(9.89e-05)
	0.137	0.135	0.0192	0.237
L.Society /Community #c.ln(L.TA)	1.729	-0.109*	-0.00828**	-1.19e-05
	(6.155)	(0.0563)	(0.00419)	(0.000116)
	0.0212	-0.135	-0.0957	-0.0112
L.Society /Human Rights #c.ln(L.TA)	17.02***	0.120	0.0176***	9.64e-05
	(4.934)	(0.0900)	(0.00506)	(0.000112)
	0.234	0.165	0.228	0.101
L.Diversity and Opportunity/Policy #c.ln(L.TA)	-7.931**	0.0288	-0.0114**	-0.000103
	(3.537)	(0.0457)	(0.00524)	(0.000113)
	-0.102	0.0373	-0.139	-0.101
L.Employment Quality/Policy #c.ln(L.TA)	-1.966	0.153**	-0.00652	0.000244**
	(5.655)	(0.0612)	(0.00627)	(0.000122)
	-0.0256	0.200	-0.0800	0.243
L.Health & Safety /Policy #c.ln(L.TA)	-1.569	-0.0212	0.00788*	-0.000172*
	(3.083)	(0.0403)	(0.00433)	(0.000103)
	-0.0212	-0.0287	0.100	-0.177
L.Training and Development/Policy #c.ln(L.TA)	1.896	0.136***	0.00452	-3.69e-05
	(2.881)	(0.0372)	(0.00408)	(9.81e-05)
	0.0230	0.166	0.0518	-0.0343
Europe	-2,399**	1.399	6.662***	-0.0285
	(1,179)	(19.24)	(1.593)	(0.0719)
	-0.0381	0.00223	0.0997	-0.0346
L.SRISK	0.922***			
	(0.0260)			
	0.911			
L. $Delta CoVaR		0.755***		
		(0.0519)		
		0.774		
L.Z-score	-17.64***	-0.0276	0.877***	-0.000874***
	(4.759)	(0.0668)	(0.0208)	(0.000171)
	-0.0197	-0.00310	0.925	-0.0747
L.Beta	-751.1	-14.57*	2.038***	0.614***
	(502.2)	(7.748)	(0.631)	(0.0242)
	-0.0102	-0.0199	0.0260	0.636
ln(L.TA)	-624.2**	-11.91***	0.695*	0.00423
	(281.9)	(3.547)	(0.391)	(0.00915)
	-0.0458	-0.0879	0.0480	0.0238
L.LVG	61.48***	-0.0827	-0.0788***	0.00157***
	(16.50)	(0.121)	(0.0147)	(0.000546)
	0.0508	-0.00687	-0.0609	0.0989
L.NI	0.761***	0.0115***	5.09e-05	-5.83e-06**
	(0.188)	(0.00307)	(5.57e-05)	(2.40e-06)
	0.0851	0.130	0.00532	-0.0499
Constant	11,241***	101.6***	-9.438**	0.434***
	(3,013)	(37.94)	(3.931)	(0.107)
Observations	2,084	2,084	2,080	2,084
Adjusted R2	0.941	0.895	0.908	0.658
F-test Year Effects	11.21**	15.57***	3.054***	22.26***
F-test Country Effects	1.554***	1.144	2.109***	3.293***

[a] The table reports the results of country-year fixed effects regressions of SRISK, $ Delta CoVaR, Beta and Z-score on the ESG Subcategories in the Social pillar as listed in Table 1, 2004 to 2017.

Table 22: Panel data regressions on ESG Subcategories: Corporate Governance

	(1) SRISK	(2) $ DeltaCoVaR	(3) Z-score	(4) Beta
L.Board of Directors/Board Functions	-34.04	-0.952	0.0332	-0.00261**
	(58.79)	(0.794)	(0.0645)	(0.00132)
	-0.0315	-0.0887	0.0289	-0.185
L.Board of Directors/Board Structure	95.27*	0.264	0.0423	0.00161
	(55.02)	(0.727)	(0.0634)	(0.00125)
	0.0883	0.0245	0.0370	0.114
L.Board of Directors/Compensation Policy	-111.2*	-0.0161	-0.0293	0.00202*
	(64.18)	(0.590)	(0.0528)	(0.00120)
	-0.0920	-0.00134	-0.0229	0.128
L.Integration/Vision and Strategy	-101.1**	-1.573**	0.00775	-0.000775
	(40.94)	(0.683)	(0.0409)	(0.000957)
	-0.113	-0.176	0.00813	-0.0660
L.Shareholders /Shareholder Rights	-27.80	0.709	-0.0566	-0.00112
	(37.98)	(0.461)	(0.0413)	(0.000987)
	-0.0267	0.0684	-0.0512	-0.0824
L.Board of Directors/Board Functions #Europe	2.039	-0.364	0.0192	-0.00148**
	(14.61)	(0.231)	(0.0240)	(0.000684)
	0.00225	-0.0404	0.0200	-0.125
L.Board of Directors/Board Structure #Europe	-0.421	0.354	0.0270	0.00179**
	(16.12)	(0.225)	(0.0257)	(0.000786)
	-0.000456	0.0386	0.0275	0.148
L.Board of Directors/Compensation Policy #Europe	-7.735	0.189	-0.00874	0.000218
	(17.23)	(0.295)	(0.0184)	(0.000744)
	-0.00890	0.0219	-0.00946	0.0192
L.Integration/Vision and Strategy #Europe	61.77***	0.223	-0.0158	0.000112
	(15.21)	(0.207)	(0.0126)	(0.000454)
	0.0822	0.0298	-0.0198	0.0114
L.Shareholders /Shareholder Rights #Europe	29.40**	0.250	-0.0151	1.38e-05
	(12.32)	(0.179)	(0.0139)	(0.000460)
	0.0345	0.0295	-0.0167	0.00124
L.Board of Directors/Board Functions #c.ln(L.TA)	3.205	0.118	-0.00566	0.000362***
	(5.897)	(0.0794)	(0.00626)	(0.000115)
	0.0374	0.139	-0.0622	0.323
L.Board of Directors/Board Structure #c.ln(L.TA)	-9.159*	-0.0453	-0.00415	-0.000229**
	(5.250)	(0.0691)	(0.00601)	(0.000109)
	-0.0976	-0.0486	-0.0416	-0.187
L.Board of Directors/Compensation Policy #c.ln(L.TA)	11.40*	-0.0189	0.00359	-0.000160
	(6.429)	(0.0655)	(0.00503)	(0.000121)
	0.112	-0.0187	0.0332	-0.120
L.Integration/Vision and Strategy #c.ln(L.TA)	4.703	0.144**	-7.98e-07	5.45e-05
	(3.879)	(0.0624)	(0.00347)	(8.76e-05)
	0.0688	0.211	-1.10e-05	0.0609
L.Shareholders /Shareholder Rights #c.ln(L.TA)	0.852	-0.0770	0.00517	0.000123
	(3.761)	(0.0477)	(0.00383)	(8.97e-05)
	0.0100	-0.0911	0.0573	0.111
Europe	-2,263	-23.72	5.210***	-0.0873
	(1,642)	(23.03)	(1.811)	(0.0899)
	-0.0359	-0.0379	0.0780	-0.106
L.SRISK	0.929***			
	(0.0253)			
	0.917			
L. $Delta CoVaR		0.765***		
		(0.0534)		
		0.785		
L.Z-score	-19.43***	-0.0800	0.880***	-0.000898***
	(5.019)	(0.0605)	(0.0210)	(0.000169)
	-0.0217	-0.00900	0.928	-0.0768
L.Beta	-618.4	-11.99	2.073***	0.618***
	(510.9)	(7.814)	(0.616)	(0.0249)
	-0.00838	-0.0163	0.0265	0.640
ln(L.TA)	-498.8	4.901	0.629	0.0108
	(449.6)	(5.042)	(0.399)	(0.0106)
	-0.0366	0.0362	0.0435	0.0604
L.LVG	58.10***	-0.0756	-0.0838***	0.00140**
	(15.92)	(0.112)	(0.0163)	(0.000547)
	0.0480	-0.00628	-0.0647	0.0886
L.NI	0.790***	0.0116***	4.33e-05	-6.05e-06**
	(0.187)	(0.00321)	(5.40e-05)	(2.35e-06)
	0.0883	0.130	0.00453	-0.0517
Constant	8,799*	-58.28	-8.193**	0.328**
	(4,675)	(53.04)	(4.105)	(0.134)
Observations	2,084	2,084	2,080	2,084
Adjusted R2	0.941	0.892	0.905	0.655
F-test Year Effects	11.20**	15.40***	3.678***	22.19***
F-test Country Effects	1.409***	1.004	1.650***	3.441***

[a] The table reports the results of country-year fixed effects regressions of SRISK, $ Delta CoVaR, Beta and Z-score on the ESG Subcategories in the Corporate Governance pillar as listed in Table 1, 2004 to 2017. We include the ESG subcategories scores interacted with size (ln(TA)) and with a Europe=1 dummy. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

Table 23: Panel data regressions on ESG Subcategories: Economic

	(1) SRISK	(2) $ DeltaCoVaR	(3) Z-score	(4) Beta
L.Margins /Performance	-18.16	0.199	-0.00983	-0.000683
	(32.77)	(0.419)	(0.0377)	(0.00101)
	-0.0184	0.0203	-0.00940	-0.0530
L.Profitability /Shareholder Loyalty	60.31	0.0365	-0.0146	0.000676
	(39.46)	(0.447)	(0.0361)	(0.000944)
	0.0642	0.00391	-0.0146	0.0550
L.Revenue /Client Loyalty	-112.1***	-0.839*	0.0390	-0.00191*
	(36.94)	(0.498)	(0.0488)	(0.00101)
	-0.117	-0.0882	0.0384	-0.153
L.Margins /Performance #Europe	21.29**	-0.322*	0.000307	-0.000317
	(10.27)	(0.194)	(0.0137)	(0.000451)
	0.0273	-0.0415	0.000371	-0.0311
L.Profitability /Shareholder Loyalty #Europe	6.698	0.352	0.00758	0.000934
	(14.87)	(0.216)	(0.0138)	(0.000603)
	0.00740	0.0390	0.00789	0.0789
L.Revenue /Client Loyalty #Europe	6.537	0.197	-0.0145	-6.69e-05
	(13.02)	(0.208)	(0.0142)	(0.000472)
	0.00887	0.0269	-0.0185	-0.00694
L.Margins /Performance #c.ln(L.TA)	-0.546	-0.00100	0.00161	5.69e-05
	(3.167)	(0.0438)	(0.00352)	(8.95e-05)
	-0.00701	-0.00129	0.0195	0.0559
L.Profitability /Shareholder Loyalty #c.ln(L.TA)	-6.315	-0.0334	0.00205	-9.37e-05
	(3.900)	(0.0444)	(0.00346)	(7.89e-05)
	-0.0793	-0.0422	0.0243	-0.0899
L.Revenue /Client Loyalty #c.ln(L.TA)	11.39***	0.0752*	-0.00440	0.000228***
	(3.627)	(0.0422)	(0.00450)	(8.55e-05)
	0.156	0.103	-0.0565	0.238
Europe	-740.0	-9.756	7.163***	-0.0704
	(1,121)	(17.27)	(1.431)	(0.0772)
	-0.0117	-0.0156	0.107	-0.0855
L.SRISK	0.935***			
	(0.0220)			
	0.924			
L. $Delta_CoVaR		0.782***		
		(0.0461)		
		0.802		
L.Z-score	-19.93***	-0.120*	0.878***	-0.000886***
	(5.065)	(0.0652)	(0.0217)	(0.000170)
	-0.0223	-0.0135	0.926	-0.0758
L.Beta	-807.9	-14.42*	2.211***	0.621***
	(545.7)	(8.009)	(0.611)	(0.0249)
	-0.0109	-0.0196	0.0282	0.643
ln(L.TA)	-205.3	8.230*	0.576*	0.00298
	(347.8)	(4.277)	(0.345)	(0.00814)
	-0.0151	0.0607	0.0398	0.0167
L.LVG	54.79***	-0.0683	-0.0798***	0.00149***
	(17.78)	(0.115)	(0.0174)	(0.000555)
	0.0453	-0.00567	-0.0616	0.0940
L.NI	0.784***	0.0117***	3.30e-05	-5.72e-06**
	(0.175)	(0.00328)	(5.42e-05)	(2.42e-06)
	0.0876	0.131	0.00345	-0.0489
Constant	4,803	-89.34**	-9.594***	0.464***
	(3,540)	(39.72)	(3.554)	(0.111)
Observations	2,084	2,084	2,080	2,084
Adjusted R2	0.940	0.892	0.906	0.654
F-test Year Effects	10.78**	17.38	3.413***	22.35***
F-test Country Effects	1.505***	1.081***	2.007***	3.125***

[a] The table reports the results of country-year fixed effects regressions of SRISK, $ Delta CoVaR, Beta and Z-score on the ESG Subcategories in the Economic pillar as listed in Table 1, 2004 to 2017. We include the ESG subcategories scores interacted with size (ln(TA)) and with a Europe=1 dummy. As control variables we include the lagged dependent variables, and lagged bank-level information such as: market beta, Z-score, log of total assets (ln(TA)), leverage ratio (LVG) and net income (NI). We report robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

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