# *A Comprehensive Analysis of the Decline in the Market-to-Book Ratio of European Banks*

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## *Abstract*

*We analyse a sample of 215 European banks and find that their M/B ratio has declined substantially since the GFC. To assess what accounts for this, bank- and country-specific indicators are used, including, for the first time for European banks, ESG variables. Fundamentals, such as ROE and volatility, as well as size for the larger banks, were found to be important determinants of bank valuation. Different ESG sub-pillars appear to affect valuation differently; we find a positive relationship between duality and valuation, particularly for large banks, and a negative one for environmental engagement, this being suggestive of the 'over-investment' hypothesis.*

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## 1. Introduction

The stocks of European banks have been substantially discounted since the GFC of 2007-2008 and the Euro sovereign debt crisis that followed (2009-2012). Actually, more than a decade after the GFC, the "average" European bank trades at a market-to-book (M/B) ratio that is less than one, which means that investors are doubting whether banks may utilise their balance sheets to create value. This paper aims to track the factors behind this persistent and interesting phenomenon.

The decline of the M/B ratio is effectively synonymous to a decline in the "franchise value" of a bank, which is derived from various sources of rents or quasi-rents. According to Demsetz et al. (1996), these rents may come from market-related sources, for example, limits in competition that may be created by regulation and innovation, or bank-related ones, such as good management, which may lead to operational efficiencies and profitable long-term relationships with clients. It is also possible that, depending on the balance sheet structure and the composition of income, bank profitability may be affected differently when interest rates change; for example, banks whose earnings are more dependent on interest income – as opposed to fee income – may be more vulnerable when interest rates fall. Moreover, the erosion of bank "franchise value" may also be related to the size of a bank; consider for instance the regulatory changes that occurred after the GFC and the asymmetric burden imposed on larger banks (in return for more safety), which, as a result, may have suffered a greater decline in their "franchise value". Furthermore, it is also possible that differences between bank valuations may be due to different country and banking sector profiles, as well as due to variation in the structure of the banking system of each country, in terms of efficiency, concentration, aggregate size and the relative weight of foreign branches and subsidiaries. Finally, it would also be interesting to examine whether variation in the M/B ratio of banks can be traced to their (E)nvironmental, (S)ocial, and (G)overnance (ESG) engagement, in other words, is it plausible that more (less) ESG engagement would result in higher (lower) 'franchise value'; although this is a potentially interesting question, surprisingly, no prior study has addressed it thus far for European banks.

We believe that the persistent decline in the M/B ratio of European banks during the period 2006-2020 is indeed an intriguing phenomenon, given that before the GFC it "served" as an important catalyst for the generation of profits and the bolstering of market values. In effect, this franchise value was another "form of capital" that banks could utilise to absorb losses, and, in this sense, its deterioration acts in an offsetting manner to the increases in the book value of capital brought about by regulatory changes that followed the GFC. These two effects are possibly related on some instances; for example, during the GFC several European banks sold foreign subsidiaries to deleverage, which meant that, on the one hand, measured capital went up, while on the other, there was loss of future cash flows and profits, i.e., an erosion of franchise value. This view is supported by Calomiris and Nissim (2014), who documented that declines in bank M/B ratios after the GFC do indeed reflect the erosion of future profits.

To address this phenomenon, research thus far has focused on the financial determinants of the M/B ratio of mostly large banks. Ferretti et al. (2018) addressed this issue for 47 large European

banks, Bogdanova et al. (2018) for 72 large international banks, and Simoens and Vennet (2021) for 112 European and US banks; these studies find that certain sets of bank-specific and macroeconomic factors account for differences in M/B ratios. Our work focuses entirely on European banks and aims to augment existing research along two important dimensions, firstly, our analysis uses, in addition to financial and macroeconomic factors, variables that are related to the (E)nvironmental, (S)ocial, and (G)overnance (ESG) engagement of banks, and secondly, our sample is substantially greater (215 banks) and, in contrast to the above studies, is not confined only to large banks. Within this framework, we ask the following three questions: 1) Which are the factors that had a prominent role in the determination of the M/B ratio over the period 2006-2020, and did ESG-related factors had any significant role during this period? 2) Which of the four groups of factors that are used [bank fundamentals; size and business mix; macroeconomic and banking sector; ESG] accounts for differences in the M/B ratio more? 3) Are there any differences in the factors explaining the evolution of the M/B ratio between larger and smaller banks over the period examined?

To address questions 1 and 3, we use the panel data methodology while, in the case of question 2, as in Ferretti et al. (2018) we perform a Shapley-Owen decomposition. Within this context, we employ four groups of potential determinants of banks' M/B ratios. The first group are bank fundamentals and contains ROE and risk, while the second group includes size, and business mix variables, such as the proportion of interest income, the level of trading assets and non-performing loans. The third group covers macroeconomic factors and the characteristics of national banking sectors and includes GDP growth, banking sector concentration, employee productivity, the extent of foreign banking ownership within national banking systems, and the size of the banking sector relative to GDP. The fourth group includes ESG variables where, for (E)nvironment we focus on whether the bank has a certified environmental management system and whether it is involved in partnerships or other initiatives that are focused on improving environmental issues; for (S)ociety, we use the code of conduct of the bank (if it strives to maintain the highest level of ethics) and its human rights policy; and for (G)overnance whether the CEO also chairs the board (duality) and whether the bank's NPL ratio is above or below the average NPL ratio of the full sample each year.

The inclusion of this last set of potential M/B ratio determinants is a novelty of our work, given that no other study so far has focused on the possible effect of ESG engagement on the valuation of European banks. This is a potentially important consideration given that in recent time ESG has gained significant acceptance across all stakeholders. There are two theories at play here, the neoclassical and the stakeholder one. On the one hand, the former argues that ESG investments lead to competitive disadvantage due to misallocation of resources and as such, are likely to negatively affect financial performance (Gholami et al., 2022) and market value. On the other hand, the latter theory posits that, apart from creating value for its shareholders, the firm should also focus on other stakeholders, such as employees, customers, and the environment (Miralles-Quirós, M.M., 2019) and that this balance could result in the enhancement of the bank's reputation, its attractiveness and retainment of employees, as well as it being a more appealing proposition to investors. Moreover, it may also result in better monitoring of management's possible excessive risk-taking behavior, and eventually result in

greater value. Within this context, Lins et al. (2017) document that during the GFC, firms with high 'social capital' had stock returns that were higher than firms with low 'social capital', as well as higher profitability and growth. In addition to the above, one should also note the significant developments related to ESG engagement that have occurred on the institutional front in the past few years; for example, the EU in 2014 adopted the Non-Financial Reporting Directive (NFRD), which requires large firms to disclose information regarding the way they manage social/environmental challenges. More specific to the banking sector, are the discussion paper on the management and supervision of ESG risks for credit institutions and investment firms issued by the European Banking Authority in October 2020 and the announcement by the ECB in November 2020 that stress tests will include consideration of climate-related risks. Given these, banks have increasingly perceived sustainability as a possible way to increase their reputation and promote trust and credibility (Schultz et al. 2013; Park et al. 2014). Along these lines, we should note that there is a growing body of studies that point out that there is a positive impact of such practices on banking profitability (e.g., Gangi et al. 2019; Nizam et al. 2019), as well as enhancement of bank stability (e.g., Chiaramonte et al. 2021). However, unlike our work, the scope of these studies does not appear to extend to bank valuation.

Our findings suggest that bank fundamentals, and in particular ROE and volatility contribute significantly towards explaining the decline of the M/B ratio. Moreover, bank size seems to also exercise a negative influence on the M/B ratio, but only in the case of large banks. We find GDP growth to be positively related to the M/B ratio and also banks based in countries with large banking sectors having higher 'franchise value'. As far as ESG is concerned, we find that different sub-pillars affect the M/B ratio differently; more specifically, we find a positive relationship between [CEO and Chairman] duality and bank valuation, particularly for large banks, and a negative one between environmental engagement and bank valuation, this being suggestive of the 'over-investment' hypothesis. A Shapley-Owen decomposition confirmed the importance of bank fundamentals in the determination of the M/B ratio and also highlighted the importance of macroeconomic and banking sector variables, but to a lesser extent. It moreover indicated that out of the three ESG pillars, the last one (Governance) is the most important one.

The remainder of the paper unfolds as follows, section 2 presents an "anatomy" and a discussion of the M/B ratio as well as a brief literature review; section 3 presents our sample and comprehensibly describes and analyses the data and the variables used; section 4 presents our methodology and results; and section 5 concludes.

## 2. "Anatomy" of the market-to-book ratio and literature review

The M/B ratio of a bank is the ratio of its market value of equity relative to its book value, as shown in the balance sheet. It is commonly used in bank valuation and can be associated with bank 'franchise value', in the sense that it reflects the expectations of investors regarding the

ability of the management of the bank to utilise its balance sheet to create value. The fundamentals driving the M/B ratio can be traced to the standard Dividend Discount Model[1]:

$$M_i/B_i = \frac{E(ROE_i)-E(g_i)}{E(k_i)-E(g_i)} \quad \text{(Eq. 1)}$$

Where:
$E(ROE_i)$ = expected return on equity of bank i
$E(g_i)$ = expected growth of bank i's dividend
$E(k_i)$ = expected bank i's cost of equity

It may be observed from equation 1 that if $E(ROE_i) > E(K_i)$, the M/B ratio will be greater than one, and vice versa. On the basis of this, the market value of a bank $(M_i)$ can be expressed as its book value $(B_i)$ plus a premium (or minus a discount). This premium is the market value added $(MVA_i)$ of the bank and it reflects its capability to create shareholder value:

$$M_i = B_i + MVA_i \quad \text{(Eq. 2)}$$

Dividing both sides of Equation 2 by *Bi*:

$$M/B_i = 1 + \frac{MVA_i}{B_i} \quad \text{(Eq. 3)}$$

The second term of the RHS of Equation 3 is the "franchise value" of the bank which, according to Demsetz et al. (1996), can be thought to be the present value of its future profits, after adjusting for the bank's cost of capital.

Although an important issue, not many studies have analyzed the evolution and determinants of the M/B ratio of banks, and in particular European ones, after the GFC. As noted in section 1, we located three studies that are mostly related to our work, nonetheless, only one of them focuses entirely on European banks. This is the work of Ferretti et al. (2018) who examined the M/B ratios of 47 large listed European banks (total assets more than 50 billion Euros), during the period 2006-2015, and found that differences can be attributed to bank fundamentals capturing performance and volatility, as well as country-specific variables. The authors did not find any significance in business mix variables but, interestingly, documented a negative relationship between bank size and M/B ratios. The second paper, Bogdanova et al. (2018) analysed the M/B ratio of 72 international banks from several jurisdictions during the period 2000-2016 documenting that this is well explained by traditional factors and in particular ROE, non-performing loans and factors linked to the intangible components of the activities of a bank (e.g., cross-selling of financial services). The last one, Simoens and Vennet (2021), investigated the M/B ratio of 112 European and US banks during the period 2007-2017 and

[1] Here we are implicitly assuming that the cash flows of the bank are perpetual and will grow at a constant growth rate $E(g_i)$, as well as that the bank's expected cost of equity $E(K_i)$ will always be greater than this expected growth rate $E(g_i)$.

found evidence of a marked diversion; in particular, they documented that higher US valuations were a result of better profitability and cost efficiency, whereas lower European valuations were associated with declines in net interest margins and lower policy rates, as well as inadequate treatment of NPLs.

One parameter believed to be related to bank value is size, where the too-big-to-fail (TBTF) argument posits that larger banks may be "valued more" due to the fact that, if they fail, the government is likely to bail them out, thus providing them with an important indirect "subsidy" that may enhance their value through, for example, access to funding at a lower cost. This hypothesis is supported by a number of studies; for example, the IMF in a 2014 study pointed out that "banks may also seek to grow faster and larger than justified by economies of scale and scope to reap the benefits of the implicit funding subsidy granted to TBTF institutions". Moreover, Santos (2014) found that investors require a lower return for holding bonds of large banks in the US while Kolaric et al. (2017) documented that the effect of rating changes on the CDS spreads of a sample of international banks seems to be "biased" by the TBTF status of a bank. In contrast, Demirgüç-Kunt and Huizinga (2013) found the M/B ratio to be negatively related to size for a sample of international banks, while Minton et al. (2019) investigated listed U.S. banks over the period 1987-2015 and found a negative relation between bank valuation and total assets, documenting, moreover, that shareholders lose when large banks cross a TBTF threshold through acquisitions.

Another relevant point of reference in the discussion of bank value creation is the business mix of banks, how diversified it is, and whether this diversification creates or destroys value; on the one hand, value creation could be the result of synergies stemming from diversified revenue streams, while, on the other hand, the opposite could be the result of the costs and risks arising from running a complicated organization. The literature is divided on this front, on the one hand, studies such as Stiroh (2004), Stiroh & Rumble (2006), and Laeven and Levine (2007) find little evidence of benefits from revenue diversification, while Calomiris and Nissim (2014) point out that since the GFC the possible value stemming from revenue diversification has declined substantially. On the other hand, studies such as Kohler (2015) and Saunders et al. (2016) documented that banks with more diversified revenue streams are more stable and profitable, while Markoulis et al. (2021) find that they also face a lower probability of distress.

Beyond the above financial factors, another potential determinant of bank valuation could be ESG engagement, where thus far research has mostly focused on the relationship between ESG and bank financial performance and risk, and not so much on valuation. For example, Wu and Shen (2013), Shen et al. (2016), Brogi & Lagasio (2019) and Nizam et al. (2019) document a positive impact of ESG on bank profitability, while Gangi et al. (2019) and Neitzert and Petras (2019) find that ESG activity reduces bank default risk. In a more recent study, Chiaramonte et al. (2021) investigated the (E)nvironmental, (S)ocial, and (G)overnance scores on bank stability during the period 2005–2017 finding that the ESG score, as well as its sub-pillars, reduces bank fragility. Although the above findings could be argued to point to a positive relationship between ESG engagement and bank value through enhanced profitability and potentially lower cost of capital, this has scarcely been documented in the literature; the only

study we came across which examines the issue in the US, is that of Bolton (2013), who reports a positive relationship between ESG and the banks' Tobin's Q-score. Moreover, it is also possible that such a positive relationship could be stronger and possibly more important during periods of negative events (e.g., a financial crisis), where greater investment in corporate social responsibility may enhance the 'moral capital' among stakeholders and thus lead to higher bank valuation (the stakeholder theory). Towards this direction, Lins et al. (2017) document that during the 2008–2009 financial crisis, firms with high social capital, as measured by corporate social responsibility (CSR) intensity, had stock returns that were significantly higher than firms with low social capital. However, on the other hand, it is also possible that banks may 'overinvest' in this area, e.g., managers investing for their private benefit and personal reputation (Barnea and Rubin 2010), or to gain support from activists (Cespa and Cestone 2007). This could be viewed as a form of agency cost, where such 'overinvestment' could lead to misallocation of resources and eventually have a detrimental effect on their financial performance and valuation (the neoclassical theory).

## 3. Data and Descriptive Statistics

### 3.1 Data

Our sample comprises of 215 European listed banks, for which we collected consolidated financial data[2] for the period 2006-2020. We exclude banks with missing data related to key financial data (total assets, equity, total loans, interest income, and profitability), as well as banks which did not have available data for at least 3 years. In contrast to other studies such as Ferretti et al. (2018) and Bogdanova (2018), we include smaller and medium-sized banks in our analysis and thus aim to potentially draw conclusions on a larger and broader dataset, as well as assess whether differences in the M/B of larger banks are driven by a different set of factors, when compared to those of smaller banks.

Table 1 presents the variables used in our work. Our dependent variable is the M/B ratio of each bank collected from Thomson Reuters DataStream. Our explanatory variables are grouped into four categories, bank-fundamentals, size and business mix, macroeconomic and banking-sector, and ESG. The first group comprises of ROE and price volatility; the second of size (LN(TA)), net interest income over revenue (INT), trading assets over total assets (TRAD), and the ratio of NPLs to total loans; the third of GDP growth, a sectoral concentration index (C5), the ratio of banking total assets to GDP (BTA_TO_GDP) and the percentage of foreign controlled subsidiaries and branches relative to the overall banking sector assets (FOREIGN_BANKING); and the fourth of Environmental Certificate and Environmental Partnership (for the (E)nvironment pillar of ESG), Code of Conduct and Human Rights Policy (for the (S)ocial pillar of ESG) and Duality and NPL benchmark (for the (G)overnance pillar of ESG). In relation to the second group of variables, we also created a dummy variable to capture possible differences in the M/B ratios of very large banks (total assets in excess of €50

[2] We use consolidated financial statements for the following reasons: 1) Banks often tend to carry out non-traditional activities through subsidiaries and 2) Financial holding companies represent the relevant units which are assessed by the regulators, in order to determine the level of the systematic risk of the organisation.

billion[3]) when compared to those of smaller ones (SIZE_BIG). Data regarding bank fundamentals, size, and business mix and ESG were collected from Thomson Reuters and data regarding macroeconomic and banking sector variables from Eurostat and ECB Data Warehouse.

***<INSERT TABLE 1 HERE>***

The above variables are potential determinants of the "franchise value" of a bank, as they are likely, one way or another, to work themselves in the equations presented in section 2; for example, ROE appears directly in equation 1, as does volatility through the cost of capital. Bank size and business mix variables are also likely to influence the potential to generate and maintain "franchise value", and thus may have a role to play in the determination of the M/B ratio through equations 2 and 3. Likewise, GDP growth is also likely to affect profitability, thus the numerator of equation 1 and it is also plausible that other banking sector variables may also affect the equations in section 2. It would also be particularly interesting to assess whether ESG variables may also work their way through those equations, for example through increased profitability and decreased risk, thus further enhancing bank franchise value, or vice versa.

**3.2 Descriptive Statistics**

Table 2 presents descriptive statistics of the M/B ratio, bank fundamentals, size and business mix variables. The median M/B ratio follows a downward trend, from 1.79 in 2006 to 0.63 in 2020; the erosion of bank "franchise value" is clear. Return on Equity also exhibits a substantial decline, from 14.7% in 2006 to 6.1% in 2020. The stock price volatility reaches its highest levels during the period 2008-2013 (23.1% - 26.5%), declining modestly thereafter to 21.2% in 2020. Median total assets do not appear to follow a specific trend in the earlier years of our analysis, including the crisis years; however, since then they show a rising trend, which reaches 13,7 billion Euros by 2020. As might be expected, non-performing loans rise substantially during (and after) the crisis years reaching 3.0% in 2013; since then, they have been following a modest downward trend, reaching 2.5% by 2020. It is also interesting to note that trading assets as a percentage of total assets, decreased substantially from over 3.0% in 2006 to 0.7% in 2020 while, the percentage of revenue generated by net interest income increased from 34.4% to 50.2% during the same period.

***<INSERT TABLE 2 HERE>***

Table 3 presents median values of the macroeconomic, banking-sector, and ESG variables used in our analysis. We observe a decrease in median GDP growth during 2006 - 2013 and a modest increase, thereafter, reaching 1.8% in 2019 before dropping to -2.8% in 2020. The concentration of banking assets ranged between 47%-52% during 2006-2013, rising steadily thereafter to 55% by 2020, thus reflecting the consolidation that occurred after the GFC. The size of the European banking sector relative to GDP follows a modest downward trend after

[3] The €50 billion threshold was chosen in line with the work of Ferretti et al. (2018), who included in their sample European banks with total assets of more than €50 billion.

the crisis years, from a maximum level of 3.4 in 2008, to 2.8 by 2020. The proportion of foreign banking assets declines steadily during (and after) the crisis years, reaches its lowest level of 8% in 2017, reflecting the deleveraging that occurred in the European banking sector (banks disposing foreign subsidiaries), and rises thereafter to 13.5% by 2020. The table also shows the median ESG Combined Score, which seems to decline during the crisis years, probably reflecting less ESG-related investment, and rises from 46 in 2013 to 55 in 2020; it is worth noting that the rising level of ESG coincides with the adoption by the EU in 2014 of the Non-Financial Reporting Directive that requires large firms, including banks, to disclose information regarding the way they operate and manage environmental and social issues.

***<INSERT TABLE 3 HERE>***

In the next table we present the median values of each independent variable, sorted by quartile of the M/B ratio. As can be seen from table 4A, ROE is positively related to the M/B ratio, while stock price volatility and the level of non-performing loans are negatively related to it. Bank size appears to be negatively related to the M/B ratio, while a higher proportion of trading relative to total assets is accompanied by a higher M/B ratio; it should be noted, however, that neither of these relationships are monotonic. Regarding the macroeconomic and banking sector characteristics (table 4B), we observe a positive relationship between GDP growth and the level of foreign banking and the M/B ratio and a negative one with banking total assets relative to GDP. Regarding ESG, although there does not appear to be any distinct relationship between the ESG score and the M/B ratio, we note with interest that the top M/B ratio quartile is related to lower ESG.

***<INSERT TABLES 4A AND 4B HERE>***

## 4. Methodology and Results

This section presents the methodology and the findings of our analysis. In the first sub-section we introduce the regression methodology used and then, in sub-section 4.2 we present the first set of our results, which focuses on the effect of bank fundamentals, size and business mix, and macroeconomic and banking sector variables on the M/B ratio. This is followed by sub-section 4.3, which specifically examines whether ESG variables have any significant effect on the M/B ratio. Sub-section 4.4 enriches our analysis further by carrying out a Shapley-Owen decomposition to assess the relative importance of each set of variables employed towards explaining differences in the M/B ratio and, finally, sub-section 5 examines whether the determinants of the M/B ratio differ between larger and smaller banks.

### 4.1 Methodology

We initially use the following econometric specification in a panel data context to evaluate the multi-faceted aspects of the evolution of the M/B ratios of European banks over the period 2006-2020:

$$PricetoBookratio_{i,t} = \alpha_{i,t} + \beta_1 * ReturnonEquity_{i,t} + \beta_2 * PriceVolatility_{i,t} + \beta_3 * LnTA_{i,t}\beta_1 + \beta_4 * INT_{i,t} + \beta_5 * Nonperformingloans_{i,t} + \beta_6 * TRAD_{i,t} + \beta_7 * SIZE_{BIG}{}_{i,t} + \beta_8 * RealGDPGrowth_{j,t} + +\beta_9 * C5_{j,t} + \beta_{10} * FOREIGN_{BANKING}{}_{j,t} + \beta_{11} * BTAtoGDP_{j,t} \quad + \delta_T * timeTt + \varepsilon_{i,t}$$

(Eq. 4)

Where:
*i* refers to individual bank-observations (*i = 1, 2, 3, …*)
*j* refers to country *j* where bank *i* is based
*t* identifies the time dimension (*t = 2006, 2007, …, 2020*)
*βs* are the coefficients to be estimated
$\delta_T$ captures the time fixed effects, and
$\varepsilon_{i,t}$ is the error term

To decide upon the model specification, we used the Hausman (1978) test to check whether there is correlation between the unique errors and the regressors in the model; the null hypothesis is that the more appropriate model is random effects. The test suggested rejection of the null hypothesis and thus we use the fixed-effects model. Moreover, the reported standard errors have been clustered by bank, therefore by also including year fixed effects, we address correlation issues when - as in our case - the panel data is characterized by more banks than years (see Petersen, 2009[4]).

**4.2 Results**

Table 5 presents our results from the estimation of equation 4. We start with a simple model that contains only bank fundamentals and then add the remaining variables, block by block; as such, we then add size and business mix, and then include macroeconomic and banking sector variables. Therefore, model 1 contains ROE (ReturnonEquity) and risk (PriceVolatility), then we add size (LnTA), net interest income over revenue (INT), trading assets over total assets (TRAD) and non-performing loans over total loans (NonPerformLoans_TotalLoans) (model 2), and then further augment the model to include GDP growth (RealGPGrowth), total assets of largest 5 banks relative to total country's bank assets (C5), the ratio of the country's banking assets relative to GDP (BTA_TO_GDP) and the total assets owned by foreign banks as a percentage of the total banking assets (FOREIGN_BANKING) (model 4). We also run a variant of model 2 (model 3), where we add a dummy variable for large banks (SIZE_BIG); these are defined to be banks with total assets of more than 50 billion Euros during the period 2006-2020[5].

***<INSERT TABLE 5 HERE>***

Results are well aligned with our expectations in model 1 since both return on equity and volatility of stock returns come out as statistically significant, the former having a positive sign

[4] Petersen (2009) contrasts various methods for panel data on financial firms, where there is a concern about both within firm correlation (over time) and across firm correlation due to common shocks.
[5] We use the benchmark of 50 billion Euros to categorise large banks as in Ferretti et al. (2018).

and the latter having a negative one. This finding "connects" well with equation 1 in section 2 of the paper, which clearly shows that the market-to-book ratio is positively related to expected return on equity and negatively related to expected cost of capital. To put it another way, higher return on equity and lower volatility seem to lead to the generation of greater "franchise value" for the bank (equation 3). We note that, although their level of significance varies, both variables remain significant in all four models in table 5.

In the next model (and the ones that follow), we include bank size, which comes out as insignificant thus suggesting, at first sight, that it does not affect the M/B ratio. However, when we include the SIZE_BIG variable (models 3 and 4) we observe that it is significant and negatively related to the M/B ratio; thus, banks with total assets over 50 billion Euros tend to have lower valuations. This finding connects well with recent literature (see for example Minton et al., 2017) and is interesting as it contradicts the perception that larger banks might be valued more highly, as a result of expectations that they are likely to be bailed out in case the need arises. It is also aligned with the findings of Markoulis et al. (2020) who examined banks designed as G-SIBs and documented negative wealth effects upon the announcement of additional capital surcharges for these banks.

The business mix variables, as in the earlier work of Ferretti et al. (2018), do not appear to be significant determinants of the M/B ratio. This may be considered to be a somewhat surprising finding, since business mix variables may be argued to provide a longer-term perspective of the business fundamentals of the bank that could complement the shorter-term profile, given by return, risk, and size. For instance, one might expect that the market should be "penalizing" banks with inferior asset quality (Bogdanova et al. 2018) and probably banks with a higher proportion of trading assets (Rungporn et al. 2017); our results do not offer any support for this. The only exception is the significant result regarding the proportion of interest income relative to revenue (INT) in model 4, which suggests that banks with less diversified revenue streams tend to be related with lower M/B ratios.

Regarding macroeconomic and banking-sector variables (model 4), we find a positive and significant relationship between GDP growth and the M/B ratio. This is an expected result since bank profitability tends to go "hand-in-hand" with economic activity; higher growth leads to a lower probability of both household and corporate default, as well as provide easier access to funding for the bank, which may then be transformed into profitable transactions. We also observe a positive relationship between the country's banking-sector total assets over GDP (BTA_TO_GDP), which implies that banks that are based in countries with relatively large banking sectors are associated with higher M/B ratios. Finally, we find some evidence of a negative relationship between bank concentration (C_5) and the M/B ratio; banks operating in countries with more concentrated banking systems appear to exhibit lower valuations.

### 4.3 ESG variables

In this section we focus on ESG variables and aim to uncover whether they have any significant effect on the M/B ratio of European banks over the period examined. To do this, we maintain a baseline model that includes the bank fundamental variables (ReturnonEquity and

PriceVolatility), which have been found to be significant across all models in section 4.2 and also control for size (LnTA and SIZE_BIG), while we introduce firstly, an ESG score (ESGCombinedScore) that aims to assess the joint effects of Environmental, Social and Governance score on bank valuation and then, given that each ESG pillar has its own identity[6] (Oikonomou et al., 2012; Bouslah et al., 2013), we repeat our analysis by breaking down the overall score into its three sub pillars; as proxies for (E)nvironment, we use Envir_Certificate and Environmental_Partnerships; for (S)ocial, Code_of_Conduct and Human_rights_policy; and for (G)overnance, Duality and NPL_bench (exact definitions for these variables can be found in table 1).

The general econometric model used in this section is:

$$PricetoBookratio_{i,t} = \alpha_{i,t} + \beta_1 * ReturnonEquity_{i,t} + \beta_2 * PriceVolatility_{i,t} + \beta_3 * LnTA_{i,t}\beta_1 + \beta_4 * SIZE_{BIG}{}_{i,t} + \beta_5 * ESG_{i,t} + \delta_T * timeTt + \varepsilon_{i,t} \quad \text{(Eq. 5)}$$

We also run three sub-versions of the above equation, each representing one ESG sub-pillar (Eq. 6-8 below).

$$PricetoBookratio_{i,t} = \alpha_{i,t} + \beta_1 * ReturnonEquity_{i,t} + \beta_2 * PriceVolatility_{i,t} + \beta_3 * LnTA_{i,t}\beta_1 + \beta_4 * SIZE_{BIG}{}_{i,t} + \beta_5 * Envir\_Certificate_{i,t} + \beta_6 * Envir\_Partnerships_{i,t} + \delta_T * timeTt + \varepsilon_{i,t} \quad \text{(Eq. 6)}$$

$$PricetoBookratio_{i,t} = \alpha_{i,t} + \beta_1 * ReturnonEquity_{i,t} + \beta_2 * PriceVolatility_{i,t} + \beta_3 * LnTA_{i,t}\beta_1 + \beta_4 * SIZE_{BIG}{}_{i,t} + \beta_5 * Code\_of\_Conduct_{i,t} + \beta_6 * Human\_rights\_policy_{i,t} + \delta_T * timeTt + \varepsilon_{i,t} \quad \text{(Eq. 7)}$$

$$PricetoBookratio_{i,t} = \alpha_{i,t} + \beta_1 * ReturnonEquity_{i,t} + \beta_2 * PriceVolatility_{i,t} + \beta_3 * LnTA_{i,t}\beta_1 + \beta_4 * SIZE_{BIG}{}_{i,t} + \beta_5 * Duality_{i,t} + \beta_5 * NPL\_bench_{i,t} + \delta_T * timeTt + \varepsilon_{i,t} \quad \text{(Eq. 8)}$$

Where:
*i* refers to individual bank-observations (*i = 1, 2, 3, …*)
*t* identifies the time dimension (*t = 2006, 2007, …, 2020*)
*βs* are the coefficients to be estimated
$\delta_T$ captures the time fixed effects, and
$\varepsilon_{i,t}$ is the error term

[6] For example, it may be the case that the market considers investments related to (E)nvironment and/or (S)ocial causes to be misallocation of resources and thus penalize the valuation of the bank, while adherence of certain principles of (G)overnance might be rewarded.

The Hausman (1978) specification test suggested use of the fixed-effects model, while, as in the previous section, reported standard errors have been clustered by bank. Our results are summarised in table 6.

***<INSERT TABLE 6 HERE>***

In all models results regarding bank fundamentals and size variables remain broadly as before; ROE and volatility are positively (negatively) related to the M/B ratio, while size is not significant in any of the models.

In model 1, the overall bank score (ESGCombinedScore) does not come out as significant, thus suggesting that at the aggregate ESG level, there does not seem to be any evidence that more engagement by banks in ESG has an effect on their valuation, either positive or negative. Within this context, it has been suggested in the literature (e.g., Lins et al, 2017; Chiaramonte et al., 2021) that ESG investment might be particularly important in times of economic crisis, where, by being involved in such engagements, banks may enhance their 'moral capital' and possibly their valuation. As such, we also focused on the GFC and Euro Sovereign Debt crisis years (2007-2012) and examined whether the ESGCombinedScore had any positive effect on the M/B ratio; our results (untabulated) did not reveal any such evidence.

We next focus on each ESG pillar separately, aiming to assess its effect – if any - on the M/B ratio. As such, in the second model, we examine whether the (E)nvironmental proxies exert any influence on the M/B ratio. Our results indicate that there is evidence of a negative relationship between Environmental_Partnerships and the M/B ratio, which suggests that the over-investment hypothesis may be at play here; more specifically, the market seems to believe that banks might be investing more than they should on partnerships or other initiatives that are focused on improving environmental issues and as such is penalizing their valuation.

The third model does not yield any significant results, thus suggesting that the (S)ocial pillar variables do not have a significant effect on the M/B ratio. In contrast, the fourth model, which incorporates (G)overnance proxies, points to a negative relationship between duality and the M/B ratio, i.e., if the CEO simultaneously chairs the board, then the ratio is higher. This is a particularly interesting result which suggests that this one person filling both roles would be able to take quicker decisions, establish strong leadership and promote an image of stability for the bank, both internally in the eyes of employees and externally with other stakeholders. Moreover, it may also be argued that possible clashes between the two positions would be avoided, thus preventing confusion and lack of clarity (Dalton and Dalton, 2005). It should be noted, however, that the aforementioned is one side of the argument, the other is that CEO duality may exacerbate risky and self-serving behavior (Reinhart and Rogoff, 2009) and have a negative impact on performance (Duru et al., 2016). The literature regarding the issue provides mixed evidence; our results align more with studies such as Yang et al. (2014), who studied the relationship between firm duality and performance and found that duality firms outperform non-duality ones by 3-4% and Carty and Weiss (2012), who examined the correlation between CEO duality and bank failure, finding no evidence of such. It is also worth

pointing out that the above result points in a rather different direction than the one taken by regulators and governance activists, especially after the GFC, who have been putting pressure on firms to abolish CEO duality. Within this context we must stress out that under no circumstances should the need for absolute accountability be jeopardised; rather, if the benefits of consolidated leadership outweigh its negative aspects, then those should be managed, and mitigated, through more vigilance at the board level.

**4.4 Shapley – Owen Decomposition**

We next focus on the relative importance of each set of variables towards explaining the heterogeneity of the M/B ratio among European banks over the period 2006-2020. We utilize the Shapley decomposition method (Shapley, 1953; Chevan & Sutherland, 1991; Stufken, 1992), which aims at distributing the goodness-of-fit measure of our model among the different regressor variables; we adopt as goodness-of-fit measure the $R^2$-value.

The Shapley value (Shapley, 1953) is an idea developed in the context of game theory, and represents for a player, in a cooperative game, the fair expected payoff. Assume that there is a set *N* (of *n* players) and a function *v*, which maps subsets of players to the real numbers: $v : 2^N \rightarrow R$, with $v(\emptyset) = 0$, where $\emptyset$ is the empty set. *v* is the characteristic function and has the following meaning: assuming *S* to be a coalition of players, then *v(S)* describes the total expected sum of payoffs the members of the coalition may obtain by cooperating. Given this setup, the Shapley value is a way to distribute the total gains to the players, under the assumption that they all collaborate; according to this value, the amount that player *i* would get in the game is given by:

$$\varphi_{i(v)} = \sum_{|S| \leq k, v \in S} \frac{|S|!\,(N - |S| - 1)!}{N!} [v(S \cup \{i\}) - v(S)]$$

(Eq. 9)

where *N* is the total number of players, and the sum extends over all subsets *S* of *N* not containing player *i*. The above formula can be interpreted as follows: assume that the coalition of players is formed one player at a time, with each demanding their contribution $(S \cup \{i\}) - (S)$ as a fair compensation, and then each player taking the average of this contribution over the number of possible different permutations in which S can be formed.

Extending the above logic to our model, for each variable *v* in the model ($v = 1,2, \ldots, k$), the expected contribution $C_V$ may be defined as follows:

$$C_V = \sum_{|S| \leq k, v \in S} \frac{|S|!\,(k - |S| - 1)!}{k!} [R^2(S \cup \{v\}) - R^2(S)]$$

(Eq. 10)

Where:
*S* is a sub-model of the full model presented in equation 10,
|*S*| is the number of variables in the sub-model *S* and
*k* is the number of regressor variables *v* of the full model.

According to the efficiency axiom: $\sum_{v=1}^{k} C_v = R^2$, hence $C_v$ can be interpreted as the marginal contribution of variable *v* to the total $R^2$-value (Coleman, 2017).

We should note that this idea has been used in other areas of economics before, for example, it has been used to identify groups of factors affecting income inequality (Chantreuil and Trannoy, 2013 and Shorrocks 2013) and has also been used in the banking sector by Ferretti et al. (2018).

As already discussed, the potential determinants of the market-to-book ratio we use belong to groups of variables; this enables us to use a generalization of the Shapley value, the Owen value (Owen, 1977), which provides for decomposition, in case of grouped regressors (see Shorrocks, 2013). This value takes the implied restrictions on the set of possible sub-models into account (see Huettner & Sunder, 2012). As such, in the resulting process, the goodness-of-fit measure is distributed to each group of variables as a whole and then its members "negotiate" the group's contribution between themselves. Young (1985) and Khmelnitskaya & Yanovskaya (2007) showed that both the Sharpley and Owen values are solutions that satisfy three desirable properties: the equal treatment of groups' property, efficiency, and monotonicity. To calculate the Shapley value decomposition of the $R^2$, the Stata module "rego" is used, which was developed by Huettner & Sunder (2012).

Our results are presented in Table 7 and show the decomposition of the $R^2$ value for the models presented in sections 4.2 and 4.3. We begin with a baseline model containing only bank fundamentals and then add the other groups of variables one by one, in order to assess the relative contribution of each group. In particular, the groups of variables used are:

1. Bank Fundamentals (BF); includes ReturnonEquity and PriceVolatility
2. Bank size (SIZE) and Business mix (BM); includes LnTA; SIZE_BIG; INT; TRAD; and NonPerformLoans_TotalLoans
3. Macroeconomic (MACRO) and Banking system characteristics (BK); includes RealGDPGrowth; C5; BTA_TO_GDP; and FOREIGN_BANKING.
4. ESG sub-pillars, which include the variables used to capture (E)nvironmental (Envir_Certificate, EnvironmentalPartnership); (S)ocial (Code_of_Conduct, Human_rights_policy); and (G)overnance (Duality, NPL_bench) characteristics of each bank.

***<INSERT TABLE 7 HERE>***

The results of the Owen value decomposition indicate that more than 70% of the overall $R^2$ of the first model can be attributed to the Bank Fundamentals group (the remaining proportion is attributable to time fixed effects); BF remain the most important group of factors since they

are "responsible" for a substantial portion of the $R^2$ in the remaining models too (explain around 65% of $R^2$ in all models except model 4 where it drops to 42%). To a lesser extent, another important group are the macroeconomic and banking system characteristics, which seem to explain around 30% of the $R^2$ of model 3; interestingly, this proportion seems to be 'taken' from BF. Size and business mix variables seem to account for a modest 10%-11.5% of the $R^2$ in models 2 and 3. Finally, in regard to the ESG sub-pillars, (G)overnance has the highest score, as it accounts for roughly 8% of the $R^2$, while, the corresponding figures for (S)ocial and (E)nvironmental variables are 6.3% and 3.7%, respectively.

**4.5 Large vs. Smaller Banks**

In this section we add a final layer of research to our work by examining potential differences in the evolution of the M/B ratios between the larger and smaller banks in our sample. In line with the earlier discussion in this paper and the definition of the variables SIZE_BIG, as in Ferretti et al. (2018) we set a threshold of 50 billion Euros and categorize banks with total assets in excess of that as large and the rest as smaller ones. Our results are depicted in table 8 below where we report, for both sets of banks, models 2 (bank fundamentals and size and business mix variables) and 4 (also adds macroeconomic and banking sector variables) from section 4.2, plus one model containing bank fundamentals and size plus the ESG combined score and one containing, again, bank fundamentals and size, plus the variables representing the three sub-pillars of ESG. So, apart from focusing on differences in the set of financial, macroeconomic, and banking sector factors potentially affecting the M/B ratios of larger and smaller banks, our analysis also provides for possible differences related to ESG factors.

***<INSERT TABLE 8 HERE>***

Starting with bank fundamentals, we observe that their impact is much more prevalent for the smaller banks, with coefficients for both return on equity and volatility being both of a higher absolute magnitude and significance in most of the models; actually, it is worth noting that price volatility does not come out as significant in any of the models that are related to the large banks.

The natural logarithm of Total Assets is significant only in one of the four models, in the case of the smaller banks, where it comes out with a negative sign. Regarding the other business mix variables, there do not appear to be any significant results for smaller banks, while for large ones, there is some evidence that the proportion of trading relative to total assets exerts a negative effect on the M/B ratio; large banks holding relatively more trading assets appear to be penalized by the market.

The next interesting observation is related to the country banking sector characteristics where for large banks they do not seem to have any effect on the M/B ratio, while, in the case of the smaller ones, the results are strikingly different; more specifically, it appears that the valuation of smaller banks is relatively lower in countries with high banking sector concentration and

higher in countries where the size of the banking sector is larger (in terms of GDP) and where there is stronger presence of foreign banks.

Turning now to the models that incorporate the ESG-related variables and in particular the model with the proxies for ESG sub-pillars, in the case of the larger banks we find duality to be significant, and as in the case of our full sample (section 4.3), with a negative sign; therefore, large banks that do not have the same person as CEO and Chairman/Chairwoman have a lower M/B ratio. For smaller banks, we find some evidence of a negative relationship between human rights policy and the M/B ratio, which seems to be suggestive of the 'over-investment' hypothesis. Finally, as far as the ESG combined score is concerned, in line with our results for the full sample, it does not come out as significant.

## 5. Conclusion

So, what are the reasons behind the substantial and persistent decline of the M/B ratio of European banks after the GFC? In alignment with the conceptual model of the M/B ratio, we find that ROE and volatility contribute significantly towards explaining this phenomenon. Bank size seems to exert a negative influence on the M/B ratio, but only for large banks; this is an interesting finding that contradicts the "too-big-to fail" argument. We also find GDP growth to be positively related to the M/B ratio and that banks that are based in countries with large banking sectors tend to have higher valuations.

When adding ESG variables in our analysis, results suggest that although the overall score does not seem to play an important role in the determination of the M/B ratio, its sub-pillars do. Our most important finding here is in relation to the third pillar, (G)overnance, where our results suggest that banks that have the same person as CEO and chairing the board are associated with higher valuations. This result is more prevalent for larger banks and suggests that, on balance, the market seems to value more the establishment of strong leadership, clarity, and stability, rather than potential self-serving behavior, which in any case should be adequately scrutinized at the level of the Board of Directors. Beyond governance, our results also point to some evidence of the 'over-investment' hypothesis, particularly regarding the (E)nvironmental engagement of banks, as well as, in the case of the smaller banks, their (S)ocial engagement.

A Shapley-Owen decomposition revealed that out of the four blocks of factors used, bank fundamentals and, to a lesser extent, macroeconomic and banking sector variables have the most significant role in explaining bank valuation. It moreover verified that out of the three ESG sub-pillars, (G)overnance is the most prominent one.

To conclude, persistently low M/B ratios indicate continuous erosion in the "franchise value" of European banks, which reflects disbelief by investors towards their ability to generate value. It also raises questions regarding how safer European banks are today, relative to before the GFC; they are indeed better capitalized, but the decline in franchise value could make them more vulnerable to adverse shocks. However, our analysis has indicated that there are factors which may differentiate one bank from another, in terms of valuation. Banks that are in a position to generate higher ROE and exhibit stability are likely to be rewarded with higher

valuation; this may call for better cost management (e.g., more utilization of financial technology), or finding other sources of revenue (e.g., participation in financial ecosystems or platforms). Moreover, large banks contemplating to engage further in M&A activity with the aim of becoming larger, are not likely to be rewarded with higher "franchise value"; on the contrary, it seems that nowadays, investors tend to penalize such banks. Finally, regarding ESG, although it seems that there is some way to go before it becomes a prime determinant of valuation, banks need to be aware of 'overinvesting' in this, while, at the same time, they also need to get their governance right; given the competing hypotheses related to ESG, it is possible that each pillar may have different effects on valuation. All things considered, European banks appear to be at a point where they need to switch from "recovery mode" to "action mode", if at some point in the future they wish to recover their lost "franchise value".

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**Table 1: Variable Names, Definitions and Data Sources**

| Variable Name | Definition | Source |
|---|---|---|
| PriceBookValueRatio | Market Value to Book Value of Equity | Thomson Reuters |
| ReturnonEquity | Net Income divided by average equity | Thomson Reuters |
| PriceVolatility | Measure of a stock's average annual price movement to a high and low from a mean price for each year. . | Thomson Reuters |
| LN(TA) | The natural logarithm of Total Assets in Euro thousands. | Thomson Reuters |
| SIZE_BIG | A bank with average Total Assets more than €50 billion during the 2006-2017 period equals 1, otherwise 0 | Dummy Variable – Constructed |
| INT | Net Interest Income over Revenue | Thomson Reuters |
| TRAD | Trading Account Securities as percentage of total assets | Thomson Reuters |
| NonPerformingLoansTotal Loans | Non-performing loans as percentage of total loans | Thomson Reuters |
| RealGDPGrowth | Real growth rate of GDP | Eurostat |
| C5 | Total assets of largest 5 institutions over country's Total Assets | ECB Data Warehouse |
| BTA_TO_GDP | Ratio of country's banking sector total assets over GDP | ECB Data Warehouse |
| FOREIGN_BANKING | Total Assets of foreign controlled subsidiaries and branches as percentage of country's total banking assets | ECB Data Warehouse |
| ESGCombinedScore | Thomson Reuters ESG Combined Score is an overall company score based on the reported information in the environmental, social and corporate governance pillars (ESG Score) with an ESG Controversies overlay. | Thomson Reuters |
| Envir_Certificate | If the Company claims to have a certified Environmental Management System equals 1, otherwise 0. | Thomson Reuters |
| EnviromentalPartnership | If the Company reports on partnerships or initiatives with specialized NGOs, industry organizations, governmental or supra-governmental organizations, which are focused on improving environmental issues equals 1, otherwise 0. | Thomson Reuters |
| Code_of_Conduct | If the Company describes in the code of conduct that it strives to maintain the highest level of general business ethics equals 1, otherwise 0 | Thomson Reuters |
| Human_rights_policy | If the Company has a policy to ensure the respect of human rights in general equals 1, otherwise 0. | Thomson Reuters |
| Duality | If CEO simultaneously chairs the board or has the chairman of the board been the CEO of the company equals 0, otherwise 1 | Thomson Reuters |
| NPL_bench | If the Company has NPL ratio above the average NPL ratio of the final sample for each year of the sample equals 1, otherwise 0. | Thomson Reuters |

Notes:
The table presents the variables used in our work, along with a detailed description for each. The dependent variable is the price-to-book ratio of each bank in our sample. The explanatory variables are grouped into four categories; bank fundamentals (return on equity and price volatility); size and business mix (size, net interest income over revenue, trading assets over total assets, and the ratio of bank non-performing loans to total loans); macroeconomic and banking-sector variables (GDP growth, a sectoral concentration index, the ratio of banking total assets to GDP and the percentage of foreign controlled subsidiaries and branches as a percentage of overall banking sector assets); and ESG (E: Environmental Certificate and Environmental Partnership; S: Code of Conduct and Human Rights Policy; and G: Duality and NPL benchmark).

**Table 2: Descriptive Statistics by year of Price to Book Value, Bank Fundamentals, Size and Business Mix Variables, Median Values**

| Time | PriceBookValueRatio | ReturnonEquity | PriceVolatility | TA (€ '000) | LnTA | INT | TRAD | NonPerformingLoans |
|---|---|---|---|---|---|---|---|---|
| 2006 | 1.79 | 0.147 | 0.183 | 8,137,552 | 15.912 | 0.344 | 0.031 | 0.011 |
| 2007 | 1.73 | 0.144 | 0.182 | 8,841,791 | 15.995 | 0.296 | 0.034 | 0.011 |
| 2008 | 1.28 | 0.08 | 0.231 | 10,293,261 | 16.147 | 0.3 | 0.02 | 0.02 |
| 2009 | 0.84 | 0.075 | 0.265 | 9,781,467 | 16.096 | 0.355 | 0.01 | 0.026 |
| 2010 | 0.9 | 0.073 | 0.256 | 10,756,276 | 16.191 | 0.373 | 0.01 | 0.029 |
| 2011 | 0.79 | 0.061 | 0.256 | 11,094,943 | 16.222 | 0.367 | 0.01 | 0.027 |
| 2012 | 0.65 | 0.065 | 0.254 | 10,756,276 | 16.191 | 0.349 | 0.01 | 0.027 |
| 2013 | 0.75 | 0.061 | 0.246 | 10,810,193 | 16.196 | 0.375 | 0.013 | 0.03 |
| 2014 | 0.845 | 0.073 | 0.236 | 9,959,127 | 16.114 | 0.401 | 0.014 | 0.029 |
| 2015 | 0.9 | 0.073 | 0.225 | 10,831,835 | 16.198 | 0.446 | 0.013 | 0.03 |
| 2016 | 0.75 | 0.079 | 0.234 | 11,117,155 | 16.224 | 0.476 | 0.011 | 0.029 |
| 2017 | 0.88 | 0.081 | 0.216 | 11,722,258 | 16.277 | 0.491 | 0.01 | 0.026 |
| 2018 | 0.875 | 0.082 | 0.202 | 11,911,323 | 16.293 | 0.494 | 0.007 | 0.023 |
| 2019 | 0.77 | 0.082 | 0.19 | 12,509,514 | 16.342 | 0.472 | 0.007 | 0.026 |
| 2020 | 0.63 | 0.061 | 0.212 | 13,701,283 | 16.433 | 0.502 | 0.007 | 0.025 |

Notes: The table presents the median values of the dependent variable and bank fundamentals, size and business mix variables used in our work over the entire sample period. The dependent variable is the price-to-book ratio, which follows a downward trend over time. Regarding the explanatory variables, return on equity (ROE) and trading assets as a percentage of total assets (TRAD) follow a declining trend, whereas volatility (VOL) and non-performing loans as a percentage of gross loans (NPL) rise and then decline. There is a general upward trend in size (TA), as well as in net interest income to revenue (INT).

**Table 3: Descriptive Statistics by year of Macroeconomic, Banking Sector and ESG Variables, Median Values**

| Time | RealGDPGrowth | C5 | BTA TO GDP | FOREIGN BANKING | ESGCombinedScore |
|---|---|---|---|---|---|
| 2006 | 0.037 | 0.523 | . | . | 48.7 |
| 2007 | 0.033 | 0.518 | 1.495 | 0.098 | 49.68 |
| 2008 | 0.003 | 0.512 | 3.39 | 0.156 | 49.73 |
| 2009 | -0.038 | 0.472 | 3.23 | 0.181 | 48.16 |
| 2010 | 0.018 | 0.474 | 3.057 | 0.168 | 48.91 |
| 2011 | 0.013 | 0.483 | 3.127 | 0.123 | 48.235 |
| 2012 | 0.007 | 0.504 | 3.181 | 0.125 | 46.91 |
| 2013 | 0.009 | 0.499 | 2.945 | 0.129 | 45.75 |
| 2014 | 0.02 | 0.542 | 3.166 | 0.122 | 48.7 |
| 2015 | 0.02 | 0.574 | 3.069 | 0.125 | 47.5 |
| 2016 | 0.02 | 0.563 | 2.695 | 0.123 | 46.825 |
| 2017 | 0.023 | 0.565 | 2.644 | 0.08 | 52.81 |
| 2018 | 0.02 | 0.543 | 2.679 | 0.11 | 51.71 |
| 2019 | 0.018 | 0.548 | 2.584 | 0.129 | 52.87 |
| 2020 | -0.028 | 0.551 | 2.764 | 0.135 | 55.01 |

Notes: The table presents the median values of the macroeconomic and banking-sector explanatory variables, as well as the ESG combined score used in our work over the entire sample period. GDP growth (RealGDPGrowth) and concentration of banking assets (C5) decline until 2013 and rise thereafter. Likewise, foreign ownership of banking assets (FOREIGN BANKING) and banking assets relative to GDP (BTA TO GDP) seem to follow a declining trend until 2017 and rise thereafter. Finally, the ESG combined score (ESGCombinedScore) declines until 2015 and rises quite substantially since then, reaching its highest level by year 2020.

**Table 4A: Market-to-Book values by quartile of bank fundamentals, size and business mix variables, median value**

| | PriceBookValueRatio | ReturnonEquity | PriceVolatility | LnTA | INT | TRAD | NonPerformingLoans |
|---|---|---|---|---|---|---|---|
| **Quartiles** | | | | | | | |
| 1st (Lowest) | 0.57 | 0.0461 | 0.2367 | 16.4630 | 0.3763 | 0.0046 | 0.0311 |
| 2nd | 0.90 | 0.0663 | 0.2286 | 15.9434 | 0.4269 | 0.0173 | 0.0266 |
| 3rd | 1.43 | 0.0902 | 0.2091 | 16.3915 | 0.4121 | 0.0146 | 0.0244 |
| 4th (Highest) | 2.85 | 0.1400 | 0.2045 | 16.1644 | 0.3963 | 0.0183 | 0.0156 |

Notes: The table presents the median values of bank fundamentals, size and business mix variables, sorted by quartile of the market-to-book ratio. ROE is positively related to the market-to-book ratio, while stock price volatility and the level of non-performing loans are negatively related with it. Bank size is negatively related to the market-to-book ratio, while the proportion of trading assets relative to total assets is positively related to the market-to-book ratio. There does not seem to be any clear trend regarding the relationship of the market-to-book ratio with the proportion of net interest income relative to total operating income.

**Table 4B: Market-to-Book values by quartile of macroeconomic and banking sector and ESG variables, median value**

| | RealGDPGrowth | BTA_TO_GDP | C5 | FOREIGN_BANKING | ESGCombinedScore |
|---|---|---|---|---|---|
| | | *(In times)* | | | |
| **Quartiles** | | | | | |
| 1st (Lowest) | 0.0110 | 3.0567 | 0.4827 | 0.0747 | 51.0000 |
| 2nd | 0.0120 | 3.0551 | 0.5517 | 0.1229 | 51.1100 |
| 3rd | 0.0160 | 2.9100 | 0.5440 | 0.2437 | 51.0550 |
| 4th (Highest) | 0.0210 | 2.2897 | 0.5039 | 0.2437 | 48.5350 |

Notes: The table presents the median values of macroeconomic, banking sector and ESG variables, sorted by quartile of the market-to-book ratio. GDP growth and foreign banking is positively related to the market-to-book ratio. Banking total assets relative to GDP are negatively related to the market-to-book ratio and there does not appear to be any relationship between concentration and the ESG score and the market-to-book ratio.

## Table 5 – Results of the panel fixed effect estimation

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | PriceBookValue | PriceBookValue | PriceBookValue | PriceBookValue |
| ReturnonEquity | 1.101*** | 1.193*** | 1.162*** | 0.772* |
| | *0.222* | *0.363* | *0.364* | *0.406* |
| PriceVolatility | -0.638* | -1.062*** | -1.045*** | -0.718* |
| | *0.342* | *-0.369* | *0.373* | *0.42* |
| LnTA | | -0.049 | -0.009 | 0.057 |
| | | *0.064* | *0.07* | *0.059* |
| INT | | -0.083 | -0.095 | -0.532** |
| | | *0.201* | *0.201* | *0.245* |
| TRAD | | 0.112 | 0.036 | -0.65 |
| | | *0.466* | *0.466* | *0.561* |
| NonPerformLoans_TotalLoans | | -0.475 | -0.447 | -0.714 |
| | | *0.833* | *0.832* | *0.856* |
| SIZE_BIG | | | -0.284** | -0.277* |
| | | | *0.114* | *0.166* |
| RealGDPGrowth | | | | 3.204** |
| | | | | *1.526* |
| C5 | | | | -0.784* |
| | | | | *0.471* |
| BTA_TO_GDP | | | | 0.095*** |
| | | | | *0.032* |
| FOREIGN_BANKING | | | | 0.074 |
| | | | | *0.223* |
| _cons | 1.706*** | 2.674** | 2.105* | 1.231 |
| | *0.086* | *1.135* | *1.222* | *1.116* |
| R-sq | 0.47 | 0.479 | 0.484 | 0.398 |

Notes: ***p<0.01, **p<0.05, *p<0.1

This table reports the results of fixed effects panel data regressions. In all regressions, we cluster standard errors by bank. Regressions coefficients are reported with robust standard error in parenthesis. The dependent variable is the market-to-book ratio (M/B). We use proxies for bank fundamentals: ReturnonEquity is computed by dividing net income by average equity; PriceVolatility is a measure of the stock's average annual price movement to a high and low from a mean price for each year. The following bank-specific characteristics are also included in the regression: LnTA is the natural logarithm of total assets in thousands of euro; SIZE_BIG is a dummy that takes the value of '1' if the total assets of a bank are greater than 50 billion Euros and '0' otherwise; INT is the ratio of net interest income over revenue; TRAD is the ratio of trading securities over total assets; and NonPerformLoans_TotalLoans is the ratio of non-performing loans over total loans. The following macroeconomic and banking sector variables are also included: RealGDPGrowth is the country annual growth rate of real GDP; C5 is a concentration index computed dividing the total assets of the largest 5 banks over country total assets; BTA_TO_GDP is the ratio of country's banking sector total assets over GDP; and FOREIGN_BANKING measures the percentage of foreign banking in a national banking system calculated as the total assets of foreign controlled subsidiaries and branches as percentage of country's total banking assets. The observation period is 2006-2020. For a definition and source of the variables, see table 1.

## Table 6 – Results of the panel fixed effect estimation (ESG Variables)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | PriceBookValue | PriceBookValue | PriceBookValue | PriceBookValue |
| ReturnonEquity | 1.083*** | 0.971*** | 1.052*** | 1.061*** |
| | *0.338* | *0.337* | *0.333* | *0.389* |
| PriceVolatility | -1.235** | -1.24** | -1.091** | -1.054** |
| | *0.481* | *0.48* | *0.496* | *0.488* |
| LnTA | 0.04 | 0.023 | 0.012 | -0.07 |
| | *0.072* | *0.072* | *0.077* | *0.086* |
| SIZE_BIG | -0.21 | -0.189 | -0.195 | -0.287 |
| | *0.139* | *0.145* | *0.141* | *0.152* |
| ESGCombinedScore | -0.001 | | | |
| | *0.002* | | | |
| Envir_Certificate | | 0.033 | | |
| | | *0.055* | | |
| EnviromentPartnerships | | -0.117** | | |
| | | *0.057* | | |
| Code_of_Conduct | | | -0.052 | |
| | | | *0.056* | |
| Human_rights_policy | | | -0.045 | |
| | | | *0.048* | |
| Duality | | | | -0.215*** |
| | | | | *0.064* |
| NPL_bench | | | | -0.044 |
| | | | | *0.073* |
| _cons | 1.534 | 1.821 | 1.959 | 2.498 |
| | *1.298* | *1.30* | *1.382* | *1.586* |
| R-sq | 0.511 | 0.519 | 0.516 | 0.519 |

Notes: ***p<0.01, **p<0.05, *p<0.1

This table reports the results of fixed effects panel data regressions. In all regressions, we cluster standard errors by bank. Regressions coefficients are reported with robust standard error in parenthesis. The dependent variable is the market-to-book ratio (M/B). ReturnonEquity is computed by dividing net income by average equity; PriceVolatility is a measure of the stock's average annual price movement to a high and low from a mean price for each year; LnTA is the natural logarithm of total assets in thousands of euros; SIZE_BIG is a dummy that takes the value of '1' if the total assets of a bank are greater than 50 billion Euros and '0' otherwise. We also use proxies for ESG and its sub-pillars, as follows: ESGCombinedScore is an overall company score based on the reported information in the environmental, social, and corporate governance pillars; Envir_Certificate takes the value of '1' if the bank claims to have a certified Environmental Management System otherwise '0'; EnvironmentalPartnership takes the value of '1' if the bank reports on partnerships or initiatives with specialized NGOs, industry organizations, governmental or supra-governmental organizations, which are focused on improving environmental issues, otherwise '0'; Code_of_Conduct takes the value of '1' if the bank describes in the code of conduct that it strives to maintain the highest level of general business ethics, otherwise '0'; Human_rights_policy takes the value of '1' if the bank has a policy to ensure the respect of human rights, otherwise '0'; Duality takes the value '0' if the CEO simultaneously chairs the board or the chairman of the board has been the CEO, otherwise '1'; and NPL_bench takes the value of '1' if the bank has NPL ratio above the average NPL ratio of the full sample for each year, otherwise '0'. The observation period is 2006-2020. For a definition and source of the variables, see table 1.

**Table 7 – Owen value decomposition of R-squared for groups of determinants (Group share of the overall R-squared in %)**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | % | % | % | % | % | % |
| BF | 73.64 | 53.86 | 42.25 | 64.1 | 65.13 | 58.51 |
| SIZE | | 0.48 | 2.26 | 10.92 | 10.55 | 14.02 |
| BM | | 10.75 | 8.24 | | | |
| MACRO | | | 8.27 | | | |
| BK | | | 21.38 | | | |
| ESG Sub-pillars: | | | | | | |
| ENVIROMENTAL | | | | 3.74 | | |
| SOCIAL | | | | | 6.33 | |
| GOVERNANCE | | | | | | 7.93 |
| TIME FIXED EFFECTS | 26.36 | 34.91 | 17.6 | 21.24 | 17.99 | 19.54 |
| | | | | | | |
| R-squared | 0.29 | 0.33 | 0.31 | 0.38 | 0.38 | 0.38 |

Notes: The above table presents the results of the Owen value decomposition of the R-square of the different groups of variables. These are defined as follows:

1. Bank Fundamentals (BF); includes ReturnonEquity and PriceVolatility
2. Bank size (SIZE) and Business mix (BM); includes LnTA; SIZE_BIG; INT; TRAD; and NonPerformLoans_TotalLoans
3. Macroeconomic (MACRO) and Banking system characteristics (BK); includes RealGDPGrowth; C5; BTA_TO_GDP; and FOREIGN_BANKING.
4. ESG sub-pillars, which include the variables used to capture (E)nvironmental (Envir_Certificate, EnvironmentalPartnership); (S)ocial (Code_of_Conduct, Human_rights_policy); and (G)overnance (Duality, NPL_bench) characteristics of each bank.

## Table 8 - Results of the panel fixed effect estimation: Large, vs Smaller Banks

### Panel A: Large Banks

| **LARGE Financial Institutions** | | | | |
|---|---|---|---|---|
| **TA > EUR 50bn** | **BF, Size & Bus. Mix** | **BF, Size & Bus. Mix & Macro & Banking** | **BF, Size & ESG Comb. Score** | **BF, Size & ESG Sub-Pillars** |
| | PriceBookValue | PriceBookValue | PriceBookValue | PriceBookValue |
| ReturnonEquity | 0.397 | 0.378 | 0.52 | 0.596* |
| | *0.338* | *0.393* | *0.346* | *0.347* |
| PriceVolatility | -0.636 | -0.916 | -0.742 | -0.275 |
| | *0.517* | *0.685* | *0.77* | *0.657* |
| LnTA | -0.125 | 0.088 | -0.088 | -0.104 |
| | *0.159* | *0.204* | *0.147* | *0.145* |
| INT | -0.047 | -0.041 | | |
| | *0.33* | *0.371* | | |
| TRAD | -0.976* | -0.919 | | |
| | *0.492* | *0.741* | | |
| NonPerformLoans_TotalLoans | -0.387 | -0.385 | | |
| | *0.802* | *0.857* | | |
| RealGDPGrowth | | 2.337 | | |
| | | *1.808* | | |
| C5_w | | -1.006 | | |
| | | *0.797* | | |
| BTA_TO_GDP | | 0.055 | | |
| | | *0.037* | | |
| FOREIGN_BANKING | | -0.95 | | |
| | | *0.253* | | |
| ESGCombinedScore | | | -0.001 | |
| | | | *0.002* | |
| Envir_Certificate | | | | 0.004 |
| | | | | *0.059* |
| EnviromentPartnerships | | | | -0.101 |
| | | | | *0.071* |
| Code_of_Conduct | | | | 0.001 |
| | | | | *0.074* |
| Human_rights_policy | | | | -0.03 |
| | | | | *0.056* |
| Duality | | | | -0.227*** |
| | | | | *0.075* |
| NPL_bench | | | | -0.053 |
| | | | | *0.074* |
| _cons | 4.431 | 0.71 | 3.591 | 3.943 |
| | *3.056* | *3.919* | *2.821* | *2.79* |
| R-sq | 0.561 | 0.411 | 0.528 | 0.548 |

## Panel B: Smaller Banks

| SMALL Financial Institutions<br>TA < EUR 50bn | BF, Size & Bus. Mix | BF, Size & Bus. Mix & Macro & Banking | BF, Size & ESG Comb. Score | BF, Size & ESG Sub-Pillars |
|---|---|---|---|---|
| | PriceBookValue | PriceBookValue | PriceBookValue | PriceBookValue |
| ReturnonEquity | 1.695** | 0.7 | 1.496** | 1.355 |
| | *0.684* | *0.521* | *0.595* | *0.835* |
| PriceVolatility | -0.953* | -0.355 | -1.986*** | -2.049*** |
| | *0.523* | *0.556* | *0.631* | *0.729* |
| LnTA | 0.036 | 0.096 | 0.063 | 0.248* |
| | *0.126* | *0.116* | *0.092* | *0.127* |
| INT | 0.023 | -0.313 | | |
| | *0.261* | *-0.219* | | |
| TRAD | 1.71 | 0.262 | | |
| | *1.089* | *1.145* | | |
| NonPerformLoans_TotalLoans | -0.841 | -0.853 | | |
| | *0.698* | *0.512* | | |
| RealGDPGrowth | | 1.24 | | |
| | | *1.45* | | |
| C5_w | | -1.845*** | | |
| | | *0.573* | | |
| BTA_TO_GDP | | 0.217** | | |
| | | *0.089* | | |
| FOREIGN_BANKING | | 0.647*** | | |
| | | *0.239* | | |
| ESGCombinedScore | | | 0.001 | |
| | | | *0.002* | |
| Envir_Certificate | | | | 0.011 |
| | | | | *0.077* |
| EnviromentPartnerships | | | | -0.044 |
| | | | | *0.07* |
| Code_of_Conduct | | | | -0.078 |
| | | | | *0.073* |
| Human_rights_policy | | | | -0.209* |
| | | | | *0.112* |
| Duality | | | | -0.065 |
| | | | | *0.125* |
| NPL_bench | | | | -0.003 |
| | | | | *0.046* |
| _cons | 1.065 | 0.595 | 1.465 | 6.477*** |
| | *2.001* | *2.001* | *1.466* | *2.041* |
| R-sq | 0.478 | 0.522 | 0.53 | 0.651 |

Notes: ***p<0.01, **p<0.05, *p<0.1

This table reports the results of fixed effects panel data regressions; Panel A reports results for the larger banks (TA > 50 billion Euros) and Panel B for smaller banks (TA < 50 billion Euros). The models used are 2 and 4 from table 5 and 1 and 2 from table 6. In all regressions, we cluster standard errors by bank. Regressions coefficients are reported with robust standard error in parenthesis. The dependent variable is the market-to-book ratio (M/B) in all cases. Regarding the explanatory variables, ReturnonEquity is computed by dividing net income by average equity; PriceVolatility is a measure of the stock's average annual price movement to a high and low from a mean price for each year; LnTA is the natural logarithm of total assets in thousands of euros; INT is the ratio of net interest income over revenue; TRAD is the ratio of trading securities over total assets; and NonPerformLoans_TotalLoans is the ratio of non-performing loans over total loans; RealGDPGrowth is the country annual growth rate of real GDP; C5 is a concentration index computed dividing the total assets of the largest 5 banks over country total assets; BTA_TO_GDP is the ratio of country's banking sector total assets over GDP; and FOREIGN_BANKING measures the percentage of foreign banking in a national banking system calculated as the total assets of foreign controlled subsidiaries and branches as percentage of country's total banking assets. We also use proxies for ESG and its sub-pillars, as follows: ESGCombinedScore is an overall company score based on the reported information in the environmental, social, and corporate governance pillars; Envir_Certificate takes the value of '1' if the bank claims to have a certified Environmental Management System otherwise '0'; EnvironmentalPartnership takes the value of '1' if the bank reports on partnerships or initiatives with specialized NGOs, industry organizations, governmental or supra-governmental organizations, which are focused on improving environmental issues, otherwise '0'; Code_of_Conduct takes the value of '1' if the bank describes in the code of conduct that it strives to maintain the highest level of general business ethics, otherwise '0'; Human_rights_policy takes the value of '1' if the bank has a policy to ensure the respect of human rights, otherwise '0'; Duality takes the value '0' if the CEO simultaneously chairs the board or the chairman of the board has been the CEO, otherwise '1'; and NPL_bench takes the value of '1' if the bank has NPL ratio above the average NPL ratio of the full sample for each year, otherwise '0'. The observation period is 2006-2020. For a definition and source of the variables, see table 1.