# EUROPEAN DEPOSIT INSURANCE SCHEME AND BANK BOARD COMPOSITION

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**How to cite this paper:** Arnaboldi, F., & Capizzi, V. (2020). European deposit insurance scheme and bank board composition [Special issue]. *Corporate Ownership & Control, 17*(4), 246-256. http://doi.org/10.22495/cocv17i4siart3

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**ISSN Online:** 1810-3057
**ISSN Print:** 1727-9232

**Received:** 19.05.2020
**Accepted:** 15.07.2020

**JEL Classification:** G21, G38
**DOI:** 10.22495/cocv17i4siart3

## Abstract

This paper investigates whether bank corporate governance can play a role in the aggregate risk score assigned to individual banks by regulators. We exploit regulatory changes at the European level and a fixed-effects model to reduce endogeneity issues. We contribute to the existing literature on bank corporate governance by showing that board age significantly increases bank risk. This may indicate that boards formed by older members are more entrenched and can also be less dynamic. Board size and gender composition of the board are risk-neutral.

**Keywords:** European Deposit Insurance Scheme, Bank Boards, Bank Risk, Financial Stability

**Authors' individual contribution:** Conceptualization – F.A. and V.C.; Methodology – F.A.; Formal Analysis – F.A.; Resources – V.C.; Validation – F.A. and V.C.; Writing – Original Draft – F.A. and V.C.; Writing – Review and Editing – F.A. and V.C.

**Declaration of conflicting interests**: The Authors declare that there is no conflict of interest.

## 1. INTRODUCTION

In recent years, corporate governance issues have received increased attention from various international bodies. As highlighted by the Group of Thirty (2012), weaknesses in bank corporate governance mechanisms are thought to have played a vital role during the global financial crisis (GFC) in promoting bank risk-taking. The finding that corporate governance has implications for bank stability was already established long before the global financial crisis (Saunders, Strock, & Travlos, 1990; Gorton & Rosen, 1995; Anderson & Fraser, 2000).

Nevertheless, the global financial crisis brought attention, both in academic and policy circles, back the role of bank corporate governance structures for financial stability. Recent literature investigates the impact of corporate governance on bank risk-taking (Caprio, Laeven, & Levine, 2007; Laeven & Levine, 2009; Pathan, 2009; DeYoung, Peng, & Yan, 2013). Kirkpatrick (2009) establishes that weak corporate governance in banks leads to inadequate risk management, especially insufficient risk monitoring through the board, a factor that contributed significantly to the bank instabilities during the crisis. Berger, Imbierowicz, and Rauch (2016) show that corporate governance arrangements lead to actual bank failure. Recent academic work aims at identifying the most efficient bank governance structures (Adams & Mehran, 2012; Beltratti & Stulz, 2012; Mehran, Morrison, & Shapiro, 2011).

Policymakers have tried to address the perceived flaws of the existing bank governance structures with a series of initiatives to control bank risk-taking (Basel Committee on Banking Supervision, 2014; Federal Reserve System et al., 2010; Liikanen, 2012). They have mainly focused on specific governance shortcomings (Srivastav & Hagendorff, 2016). In the UK, the Walker Review (Walker, 2009) revises board arrangements and the qualifications of board members as well as the compensation arrangements. Similarly, since 2010 the Dutch Banking Code addresses the selection process of bank boards, including the skill and training of board members and their remuneration. Guidance for compensation has been released, introducing restrictions on salary and perks, and disclosure of compensation (Federal Reserve System et al., 2010).

In the European Union (EU), CRD IV (Directive 2013/36/EU) reinforces the governance requirements for banks, highlighting the

responsibility of the management body for sound governance arrangements, the importance of a robust board that challenges and monitors management decision-making, and the need to establish and implement a sound risk strategy and risk management framework.

Against this background, in this paper we try to answer to the following research question: do board features, namely the size of the board, the average age of its members, and the presence of women board members, impact bank risk? As the board of directors is the primary governing body of a company, it has ultimate responsibility for the banks' business strategy and financial soundness, key personnel decisions, internal organisation and governance structure and practices, and risk management and compliance obligations. Sound corporate governance is fundamental to the banks to operate well. We thus expect to find an impact of board features on the system of risk indicators as proposed by the European Banking Authority guidelines on the methods for calculating contributions to deposit insurance schemes (DIS), pursuant to Article 13(3) of the Directive 2014/49/EU of the European Parliament and of the Council of 16 April 2014 (EBA, 2015). Before the guidelines' approval, many member states did not have pre-financed DIS. Hence the guidelines set out principles for technically sound methods for calculating contributions to ensure that costs of deposit insurance are borne primarily by the banking sector and that the available financial means reach the target level within the time horizon envisaged in Directive 2014/49/EU. The EBA (2015) aim is to provide incentives to banks to operate under a less risky business model. To that end, the guidelines set out principles on the risk component of the calculation method. In addition, they capture various aspects of the banks' risk profile by specifying the number of core risk indicators pertaining to capital, liquidity and funding, asset quality, business model and management, and potential losses for the DIS.

A causal relationship between board features and bank risk is, however, difficult to establish. The literature has documented that board features are not exogenous random variables but are endogenously chosen by firms (Hermalin & Weisbach, 2003; Sila, Gonzalez, & Hagendorff, 2016). Our estimates may be impacted by omitted variable bias and reverse causality. To address endogeneity caused by omitted variable bias we use a fixed-effects model with lagged independent variables. Country fixed effects account for unobserved country-specific characteristics that are time-invariant and may be correlated with the level of bank risk. In line with previous literature we find evidence that board features affect bank risk; specifically, we find that board age has a positive impact (Arnaboldi, Casu, Kalothychou, & Sarkisyan, 2018). We find no evidence that board size and board gender composition impact bank risk.

Our results contribute to the existing literature by shedding some light on the impact of board features on the contribution of banks to financial stability through the risk banks' add to the deposit insurance scheme at the European level. At our knowledge, this is the first study to investigate corporate governance issues as related to deposit insurance provisions at European level.

Section 2 reviews the literature. Section 3 discusses the main variables and presents the research methodology. Section 4 presents the results, providing for discussion. Section 5 concludes.

## 2. LITERATURE REVIEW

Sound governance is relevant in any organisation, and it is even more critical in a complex and challenging environment as the one banks are facing nowadays. Sound governance provides the necessary checks and balances; it counters excessive risk-taking; it ensures that decisions are taken sustainably.

Since the beginning of the Single Supervisory Mechanism (SSM), ECB Banking Supervision has developed a comprehensive approach, based on a range of tools, to assess the design and implementation of sound governance in the European banking system (ECB, 2018). A first tool is a fit and proper assessment which is employed to check whether banks' board members are suited to their position. The Supervisory Authority assesses their experience, reputation, independence, their time commitment, and their potential conflicts of interest to ensure that they are fit and proper for the job. Secondly, governance is one of the four central elements that constitute the Supervisory Review and Evaluation Process (SREP). SREP allows the ECB, and the national supervisory authorities for the less significant banks, to analyse whether the risks that a bank takes are consistent with its risk capacity and strategic objectives by assessing banks' risk appetite framework (RAF). In particular, banks should mull the policies, processes, controls, systems, and procedures defined in their RAF over their decision-making processes and risk management. The RAF should also be aligned with banks' business plans, strategies, capital planning, and remuneration schemes. A third tool is the "deep-dive" one, which is an on-site mission, which allows the ECB to better understand specific processes or approaches related to governance and risk assessment, for instance by attending board meetings. On-site inspections are a fourth tool that is used to discuss governance and risk management with banks.

According to ECB (2018) despite significant achievements, banks still need to make improvements on: 1) the fit and proper assessments, 2) boards' independence, 3) risk appetite frameworks, and 4) risk reporting and data aggregation. As for the first aspect, the collective knowledge of the board can be improved strengthening some areas of expertise, such as IT and accounting. In this respect, induction arrangements and ongoing training are not always sufficient to ensure risk awareness and thus foster the necessary quality of debate (ECB, 2016). The quality of debate on the board, especially its capacity to independently challenge the executives, is a key element to enhance board independence. The quality of debate can be improved working on the quality of documentation, on interactions among board members and the organisations of board meetings. The ECB (2016) highlights various shortcomings, for example, that the documentation is often not sent sufficiently far in advance, information asymmetries among board members can

reduce the quality of the debate and the time of debate is often too limited. On the design of the RAF, several banks, in particular the smaller ones, have only recently formalised and integrated the framework. Thus areas of improvement are related to the full coverage of material risk areas, in particular non-financial risks or profitability and business risk, and to the proper adjustment of the risk appetite metrics to the bank's business model and risk profile. Finally, it is essential that banks have effective management information systems to be able to report any limit breach adequately and promptly. Data aggregation issues impact the quality of the risk reports and hamper an effective reporting of limit breaches.

In this paper, we investigate three features of the board of directors, as suggested by EBA (2017), which relate to the four areas of improvement listed above. Board age, board size, and the gender composition of the board may both positively or negatively contribute to ensuring risk awareness, foster the quality of debate, and to board independence, which ultimately affects the quality of board monitoring and advising functions.

A second challenge European banks face refers to the governance rules applicable in Europe. Although various policy initiatives at the EU level aimed at improving standards of corporate governance, further harmonisation, and supervisory convergence are needed to ensuring a level playing field. Rules are different among member states; as a consequence, banks have to apply national law in this area facing higher compliance costs, and greater complexity. Besides, the grip of nationalism on corporate law shows how governance structures matter in ways that surpass the agency cost considerations investigated in the literature (Pargendler, 2019). Pressures influencing governance policies reflect differing views of capital markets and corporate purposes between shareholder- and stakeholder-oriented systems. For instance, in the Netherlands comply-or-explain code works reasonably well, assisted by the existence of a monitoring capability in this jurisdiction (Dallas & Pitt-Watson, 2016).

Nevertheless, in situations involving controlling shareholders, the lack of an enforcement mechanism may be a weakness of comply-or-explain. Minimum corporate governance standards or stricter enforcement laws at the European level might help overcome such deficiencies. However, the potential risk of attempts for further harmonisation is to lower base standards to establish an acceptable common denominator across a very diverse group of countries with differing governance traditions. In this paper, we focus on corporate governance arrangements in the Eurozone as affected by the ECB regulatory changes.

## 3. RESEARCH METHODOLOGY

### 3.1. Variables

We initially considered all Eurozone listed commercial banks for which accounting and board data are available on Orbis Bank Focus, from 2011 to 2018. The sample spans eight years around the year of implementation of the guidelines, that is 2015. Due to data availability, the final sample is formed by 51 commercial banks in 14 Eurozone countries. Appendix 1 reports the list of countries under scrutiny. Appendix 2 lists the definition of variables.

The EBA (2015) guidelines on methods for calculating contributions to a DIS are applied to the banks under scrutiny. Core and additional indicators are computed as proxies of bank risk, which are our dependent variables. Indicators belong to one of the following risk categories: capital; liquidity and funding; asset quality; business model and management; potential losses for the DIS.

*Core indicators*

For the first risk category (capital), the EBA proposes two core indicators: leverage ratio, defined as tier 1 capital to total asset ratio, and capital coverage ratio (actual to required CET1 ratio) or common equity tier 1 ratio (common equity tier 1 capital to risk-weighted assets). Capital indicators reflect the level of the loss-absorbing capacity of the bank. Higher amounts of capital show that the bank has a better ability to absorb losses internally, thus decreasing its likelihood of failure. Therefore, banks with higher values of capital indicators should contribute less to the DIS (EBA, 2015).

For the liquidity and funding category, the two core indicators suggested by the authority (liquidity coverage ratio, LCR, and net stable funding ratio, NSFR) cannot be applied because, even if their definition as determined in Regulation (EU) No.575/2013 is fully operational, few data are available on Orbis Bank. As a transitional indicator, the liquidity ratio (LR) defined as liquid assets to total assets is computed. It measures the bank's ability to meet its short-term debt obligations as they become due. The higher the ratio, the larger the safety margin to meet obligations and unforeseen liquidity shortfalls. Indeed, low liquidity levels indicate the risk that the institution may be unable to meet its current and future, expected or unexpected, cash-flow obligations and collateral needs.

The asset quality category shows the extent to which the bank is likely to experience credit losses. Large credit losses may cause financial problems that increase the likelihood of failure, therefore justifying higher contributions to the DIS. This category includes the non-performing loan (NPL) ratio, given by NPLs to total assets. It provides an indication of the type of lending the bank engages in. A high degree of credit losses in the loan portfolio indicates lending to high-risk customers.

Business model and management takes into account the risk related to the bank's current business model and strategic plans and reflects the quality of internal governance and controls. Business model indicators can, for instance, include indicators related to profitability, balance sheet development, and exposure concentration. The first core indicator proposed by the EBA is risk-weighted assets to total assets ratio, which indicates the kind of risky activities a bank engages in. A higher value indicates a higher risk. A second core indicator is return on asset (ROA). A business model that is able to generate high and stable returns indicates lower risk. However, unsustainably high levels of *ROA* also indicate higher risk (EBA, 2015).

The last risk category is potential losses for the DIS. The EBA (2015) suggests one core indicator

(unencumbered assets to covered deposits), which measures the degree of expected recoveries from the bankruptcy estate of the bank, which was resolved or put into normal insolvency proceedings. A bank with a low ratio exposes the DIS to the higher expected loss. However, the proposed definition of the unencumbered asset does not allow the ratio to be computed with data currently available.[1]

*Additional indicators*

In addition to the core risk indicators, DISs may include additional risk indicators that are relevant for determining the risk profile of member banks. The additional risk indicators should be classified into the above-listed risk categories. The EBA proposes indicators for the asset quality, business model, and management and potential losses for the DIS categories. In this empirical investigation, three additional indicators belonging to the business model and management category are applied: 1) excessive balance sheet growth ratio (total asset growth – TAG), which measures the growth rate of the bank's balance sheet. Unsustainably high growth might indicate higher risk; 2) return on equity (ROE), which measures the ability to generate profits to shareholders from the capital these have invested in the bank. A business model that is able to generate high and stable returns indicates a reduced likelihood of failure. However, unsustainably high levels of ROE indicate higher risk; 3) cost to income ratio (CI) which measures cost efficiency. An unusually high ratio may indicate that the institution's costs are out of control, especially if represented by the fixed costs (that is, higher risk). A very low ratio may indicate that operating costs are too low for the institution to have the required risk and control functions in place, also indicating higher risk (EBA, 2015).

Overall this paper considers seven out of nine core indicators and three out of 13 additional indicators.

*Individual risk score*

As is normal practice, the EBA proposes thresholds, classes, and weights to compute individual bank risk scores (IRS). The EBA allows two methods to assign banks to risk classes: the bucket method and the sliding method. The first one uses a fixed number of buckets defined for each risk indicator by setting upper and lower boundaries for each bucket. The number of buckets for each risk indicator should be at least two. The buckets should reflect different levels of risk posed by the member banks (for example, high, medium, low risk) assessed on the basis of particular indicators (EBA, 2015). Where the calculation method follows the sliding scale approach instead of a fixed number of risk classes, the upper and lower limits are set by the DIS on the basis of regulatory requirements or historical data on the particular indicator. Since the sliding method is based on information available only to the national DIS, this empirical investigation employs the bucket method.

*Bucket method*

In the bucket method, an IRS is assigned to each bucket. The buckets' boundaries should be determined either on a relative or absolute basis. When using a relative basis, the IRS of banks depends on their relative risk position vis-à-vis other institutions; in this case, institutions are distributed evenly between risk buckets, meaning that institutions with similar risk profiles may end up in different buckets. In the absolute basis, the buckets' boundaries are determined to reflect the riskiness of a specific indicator; in this case, all banks may end up in the same bucket if they all have a similar level of riskiness.

For each risk indicator, the IRS assigned to buckets should range from zero to 100, where zero indicates the lowest risk and 100 the highest risk. To compute the IRS of the sample banks, buckets, and boundaries provided by the EBA have been used for the NPL ratio, ROA, ROE, and TAG. The EBA does not provide specific examples for the leverage ratio, CET1, LR, RWA to total assets (TA), and cost-to-income ratio, thus relative boundaries, which correspond to the 20, 40 and 60th percentile of the sample banks distribution year-to-year, have been used for those indicators. The percentiles and corresponding IRS have been fixed according to EBA guidelines. Relative boundaries imply an even distribution of banks among risk buckets.

*Aggregate risk score*

The EBA (2015) multiplies each IRS by an indicator weight (IW), which should be the same for all banks and calibrated by using supervisory assessment and/or historical data on failures of institutions (EBA, 2015).

The sum of weights assigned to all risk indicators is equal to 100 percent. When assigning weights to particular risk indicators, the minimum weights for the risk categories and core risk indicators, which sum up to 75 per cent, should be preserved. EBA (2015) shows the weights assigned to risk indicators when only core indicators are computed and NSFR is not yet available and states that the minimum IW assigned to NSFR is assigned to LR, which belongs to the same risk category.

The aggregate risk score (ARS) is the weighted average of the IRS, according to the following formula:

$$ARS_i = \sum_{j=1}^{n} IW_j * IRS_j \qquad (1)$$

where, $\sum_{j=1}^{n} IW_j = 100\%$ and $IRS_j = IRS_{x_j}$ when $X$ in $\{A, B, \dots, M\}$, i.e. the bucket corresponding to indicator $A_j$.

In this paper, the IWs applied to core indicators are the ones presented EBA (2015).[2] Consequently, when only core indicators are investigated, the ARS is computed according to:

[1] EBA defines unencumbered and encumbered assets as the following: "an asset should be treated as encumbered if it has been pledged or it is subject to any form of arrangement to secure, collaterise or credit-enhance any on-balance sheet or off-balance sheet transaction from which it cannot be freely withdrawn (for instance, to be pledged for funding purposes)" (EBA, 2015, p. 22).

[2] As previously mentioned, the ratio of unencumbered assets to covered deposits has not been computed because data on unencumbered assets for the sample banks are not available. Thus, the weight (17 per cent) originally assigned by the EBA to this ratio is equally allocated among all other computed indicators.

$$ARS_{core} = 0.15 * leverage\ ratio + 0.15 * CET1 + 0.25 * LR + 0.21 * NPL\ ratio + \\ +0.12 * RWA/TA + 0.12 * ROA \quad (2)$$

When core and additional indicators are considered, equation (3) applies:

$$ARS_{core+additional} = 0.115 * leverage\ ratio + 0.115 * CET1 + 0.18 * LR + 0.18 * NPL\ ratio + 0.085 * \\ RWA/TA + 0.085 * ROA + 0.08 * ROE + 0.08 * TAG + 0.08 * CI \quad (3)$$

$ARS_{core}$ is the proxy for bank risk used as the main dependent variable. $ARS_{core+additional}$ is used as an alternative measure for bank risk.

*Independent variables*

Many of the post-crisis governance reforms explicitly emphasise that diversity on board would positively affect the governance of companies. Directive 2013/36/EU recommends that diversity is one of the criteria for the composition of boards and should also be addressed in banks' recruitment policy more generally. EBA (2017) considers age a key aspect of diversity, as the period in which a person has grown up influences his or her values, skills, experiences, social networks, and risk culture. By increasing the age diversity of the board of directors, the board's aggregated human and social capital can be maximised with a positive impact on performance (Carter, D'Souza, Simkins, & Simpson, 2010). On the other hand, Westphal and Zajac (1995) argue that CEOs prefer to work with demographically similar board directors. Thus, CEOs who can influence the directors' nomination process will try to hire directors who are demographically similar to themselves. Furthermore, member states show different demographical structures, which may affect the age of board members. To this extent, the supervisory authority encourages selecting board members of different ages to enhance board effectiveness. We, therefore, test the average board members' age as an independent variable, taking its natural logarithm (*AGE*).

Board size is a second feature that may impact board independence and the quality of the debate. Larger boards may strive at reaching consensus as several different opinions have to be reconciled. However, smaller boards can more easily follow the CEO's lead and be more entrenched. In the financial services industry, the results on the relationship between board size and performance are mixed; possible explanations refer to regulatory issues, informational asymmetries, and organisational structure (Eisenberg, Sundgren, & Wells, 1998; Adams & Mehran, 2003, 2012; Boone, Casares Field, Karpoff, & Raheja, 2007; De Andrés & Vallelado, 2008; Cheng, 2008; Harris & Raviv, 2008; Linck, Netter, & Yang, 2008).To test whether larger boards impact bank risk-taking, we consider the natural logarithm of the size of the board of directors (*SIZE*).

We finally study the presence of women on board. One argument is that gender balance is of particular importance to ensure adequate representation of population and directors should be selected among a greater pool of talents. Despite a general call for greater diversity, EBA (2017) shows that in most member states, a relatively low number of banks have adopted a diversity policy. Most frequently, banks do not indicate a timeline within which they intend to achieve diversity targets. Evidence suggests that soft law regulation aimed at improving the participation of women and minorities in high profile roles have had little impact. Therefore, several European regulators recommend gender quotas for publicly listed companies' boards. We consider the presence of women (*WOM*) on bank boards as our third explanatory variable.

To mitigate the effect of correlated omitted variable bias, we control for a set of bank-level characteristics that are typically related to bank performance (Kanagaretnam, Lim, & Lobo, 2014; Garcia-Meca, Garcia-Sanchez, & Martinez-Ferrero, 2015; Arnaboldi, Casu, Kalothychou, & Sarkisyan, 2018). Specifically, we include bank size measured by the natural logarithm of total assets. We also control for the possible effect of bank growth on performance by including total asset growth. Next, we control for asset composition using the loan to total assets ratio and for the quality of the loan portfolio using the loan loss provision ratio. We control for funding sources by including the deposit and short-term funding to total assets ratio. We account for the impact of capital on bank performance by including the capital to total assets ratio. Finally, we control for the bank operating efficiency proxied by the cost to income ratio.

## 3.2. Model

To test whether bank board features impact bank risk, proxied by aggregate risk scores, we use the following fixed effects model:

$$ARS_{it} = \alpha + \beta\, X_{i,t-1} + \gamma\, Z_{i,t-1} + u_{it} \qquad i = 1, 2, \dots, N \quad t = 1, 2, \dots, T \quad (4)$$

where $ARS_{it}$ refers to the aggregate risk score (core and core+additional) of bank $i$ in year $t$, $X_{i,t-1}$ is a matrix containing the $k$ board features, $Z_{i,t-1}$ is a matrix containing the $m$ bank control variables. We estimate the $(1 + k + m)$ coefficient vector $\alpha + \beta + \gamma$. The error term $u_{it} = \eta_i + \varepsilon_{it}$ is assumed to be independent from the $k$ board-specific regressors and the $m$ bank-specific controls. The noise $\varepsilon_{it}$ is assumed to be identically and independently distributed, whereas the time-invariant component $\eta_i$ represents unobserved firm-specific heterogeneity. The model employs time and country fixed effects which help to mitigate to some extent biases caused by omitted variables correlated with the independent variables. The use of lagged independent variables also alleviates some of the endogeneity concerns.

## 4. RESEARCH RESULTS

### 4.1. Univariate analysis

Table 1 reports descriptive statistics for the sample banks. Bank boards are formed by 17 members on average, of which 22 per cent are women. The average age is 59 years. Banks under scrutiny are commercial banks, which finance 70 per cent of total assets through deposits and invest 59 per cent in loans. As for bank risk, the total asset growth is one per cent, well below the pre-global financial crisis level. Equity to total assets equals seven per cent and the ratio of provisions to loans is one per cent. The average cost to income ratio is 64 per cent.

**Table 1.** Descriptive statistics

| *Variables* | *Obs* | *Mean* | *Std. dev.* | *Min* | *Max* |
|---|---|---|---|---|---|
| *ARSc* | 290 | 56.88 | 16.13 | 4.95 | 100.00 |
| *ARSca* | 290 | 58.09 | 13.75 | 19.80 | 93.28 |
| *Board variables* | | | | | |
| *Size* | 290 | 16.80 | 6.18 | 7.00 | 41.00 |
| *Age* | 290 | 59.21 | 4.73 | 35.80 | 70.38 |
| *Wom* | 290 | 0.22 | 0.12 | 0.00 | 0.53 |
| *Bank-specific variables* | | | | | |
| *Bank size* | 258 | 25.23 | 1.80 | 21.16 | 28.36 |
| *Total asset growth* | 255 | 0.01 | 0.12 | -0.28 | 0.66 |
| *Loans to total assets* | 258 | 0.59 | 0.19 | 0.10 | 0.87 |
| *Total deposits to total assets* | 257 | 0.70 | 0.13 | 0.35 | 0.92 |
| *Equity to total assets* | 258 | 0.07 | 0.03 | 0.01 | 0.15 |
| *Loan loss provisions to loans* | 257 | 0.01 | 0.01 | 0.00 | 0.06 |
| *Cost to income* | 254 | 0.64 | 0.15 | 0.32 | 1.24 |

*Note: Bank specific variables are winsorized at 99 per cent. Definitions of the variables are provided in Appendix 2.*

The aggregate risk score may depend on past bank features. In this respect, differences may exist among Southern and Northern Eurozone countries (Southern European countries in our sample are Cyprus, Spain, France, Greece, Italy, Malta and Portugal). We, therefore, test the difference in means of the core and core-plus additional aggregate risk scores among Southern and Northern European countries. Table 2 reports the results.

**Table 2.** Difference in means

| | *Souther Eurozone countries* | | *Norther Eurozone countries* | | |
|---|---|---|---|---|---|
| | *No. of obs.* | *Mean* | *No. of obs.* | *Mean* | *Difference in means* |
| *ARSc* | 192 | 61.26 | 99 | 48.15 | 13.10627*** |
| *ARSca* | 192 | 61.81 | 98 | 50.82 | 10.98008*** |

*Note: The table reports the summary statistics (number of observations, mean, and difference in means) for the aggregate risk scores used in the analysis for Southern and Northern Euro. The t-statistics for the mean differential are reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively. Definitions of the variables are provided in Appendix 2.*

Banks incorporated in Southern Eurozone countries report higher bank risk measured both by core and core-plus additional aggregate risk scores than banks in Northern Eurozone countries (61 versus 48 and 62 versus 51, respectively). The result confirms that differences are still relevant among Eurozone countries in terms of bank risk, and these differences may be partly due to differences in board structures.

Appendix 3 reports the correlation matrix.

### 4.2. Multivariate analysis

The regression results of the models in equation (4) that investigate the impact of board features on bank aggregate risk scores as defined by EBA (2015) are shown in Table 3. In column (1), we examine the effect of board features on core aggregate risk score ($ARS_{core}$), in columns (2) we add the gender composition, and in column (3) and (4) we replace the core aggregate risk score with the core and additional aggregate risk score ($ARS_{core+additional}$). All specifications use bank-specific control variables and account for time- and country-specific fixed effects.

We find that among board features, board age (*AGE*) is positively related to both core and core-plus additional aggregate risk scores, suggesting that more senior boards increase bank risk. Although the relationship between board age and firm performance is unclear, our result is in line with the strand of literature that posits that older boards show more entrenched views and can also signal lower board dynamism (Schleifer & Vishny, 1997). Board age had an increasing effect on bank risk during the Eurozone crisis (Arnaboldi, Casu, Kalothychou, & Sarkisyan, 2018). Boards with similar demographics can be prone to group thinking and therefore be less efficient in their monitoring function, for instance aligning their compensation to (higher) CEO compensation (Westphal & Zajac, 1995). With a larger age diversity, the board's aggregated human and social capital can be maximised (Carter, D'Souza, Simkins, & Simpson, 2010), if the assumption that demographically different directors will hold differing perspectives is verified (Li & Wahid, 2017).

**Table 3.** Fixed effects model with lagged independent variables

| | *ARSc* | *ARSc* | *ARSca* | *ARSca* |
|---|---|---|---|---|
| | *(1)* | *(2)* | *(3)* | *(4)* |
| *Size* | -2.7479 | -2.7386 | -2.0303 | -2.2185 |
| | (-0.82) | (-0.81) | (-0.67) | (-0.71) |
| *Age* | 33.0848*** | 33.0920*** | 18.7138* | 18.5680* |
| | (2.86) | (2.84) | (1.83) | (1.81) |
| *Wom* | | 0.2862 | | -5.7966 |
| | | (0.03) | | (-0.63) |
| *Bank size* | 1.7708 | 1.7662 | 1.3978 | 1.4892 |
| | (1.51) | (1.45) | (1.43) | (1.49) |
| *Total asset growth* | -0.2229 | -0.2379 | -5.4254 | -5.1216 |
| | (-0.04) | (-0.04) | (-1.14) | (-1.07) |
| *Loans to total assets* | 37.8552*** | 37.8104*** | 26.1701*** | 27.0781*** |
| | (6.63) | (6.26) | (5.17) | (5.16) |
| *Total deposits to total assets* | -12.0821 | -12.0342 | -11.8059 | -12.7746 |
| | (-1.06) | (-1.06) | (-1.17) | (-1.26) |
| *Equity to total assets* | -95.9388** | -95.8742** | -88.1016** | -89.4096** |
| | (-2.31) | (-2.31) | (-2.45) | (-2.48) |
| *Loan loss provisions to loans* | -48.4393 | -48.8142 | -54.2278 | -46.6343 |
| | (-0.45) | (-0.44) | (-0.65) | (-0.54) |
| *Cost to income* | 16.4910** | 16.5043** | 23.4362*** | 23.1676*** |
| | (2.44) | (2.44) | (3.84) | (3.79) |
| Country fixed effects | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |
| Clustered SE (bank) | Yes | Yes | Yes | Yes |
| No. of obs. | 269 | 269 | 269 | 269 |
| Adjusted R-squared | 0.624 | 0.622 | 0.568 | 0.568 |

*Note: The table reports the main regression results of the effects of board features on bank aggregate risk scores (core and core+additional). Model 1 presents the results for the effects of bank board features on its core aggregate risk score; Model 2 adds the board gender composition; Model 3 presents the results for the effects of bank board features on its core and additional aggregate risk score; Model 4 adds the board gender composition. The models control for bank-specific characteristics, country fixed effects and time fixed effects. Bank-specific characteristics are winsorised at 99% of the bank-year distribution. All independent variables are lagged by one period. The t-statistics calculated using standard errors clustered at the bank level are reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively. Definitions of the variables are provided in Appendix 2.*

Board size and the presence of women on the other hand are not related to aggregate risk scores. As for board size, our result is in line with the previous literature which has uncovered a U-shaped relationship between board size and performance. De Andrés and Vallelado (2008) show that larger boards create more value; however, this relationship is non-monotonic and when the board reaches a certain size, the firm value decreases. Arnaboldi Casu, Kalothychou, and Sarkisyan (2018) show that board size does not impact bank risk, measured as performance variability, but larger boards bring a performance benefit that is non-linear and only documented when the board size is bigger than average.

The presence of women on boards has been strongly encouraged on the view that boards should not exclude female talents and that women are less entrenched and more independent than men. However, the effect of gender diversity on performance is mixed (Adams & Ferreira, 2009; Dezso & Ross, 2011; Garcia-Meca, Garcia-Sanchez, & Martinez-Ferrero, 2015). Arnaboldi, Casu, Kalothychou, and Sarkisyan (2018) find no impact of gender diversity on bank performance. Ahern and Dittmar (2012) use the mandatory introduction of gender quotas in Norwegian listed firms as a natural experiment to analyse the impact of quota on firm valuation. The authors find a large negative impact of the mandated board changes on firm value, because younger and less experienced members enter the board, thus reducing the effectiveness of the board. In the same case, Garcia-Lara, Penalva-Zuasti, and Scapin (2017) find that the changes in monitoring are not primarily driven by the introduction of a gender quota, but by changes in the professional characteristics of board members, such as experience and age.

The estimated coefficients on the bank control variables exhibit the expected signs. The share of total assets invested in loans is positively related to bank risk (*Loans to total assets*). A larger loan portfolio is linked to a higher risk, ceteris paribus. Similar results are found for the cost to income ratio: lower efficiency is related to higher risk. On the other hand, the equity to total assets ratio shows a negative and statistically significant association with bank risk as expected, since equity works as a cushion protecting stakeholders if the bank experiences heavy losses.

## 5. CONCLUSION

In the last few years, the Eurozone banking sector has continued to reduce its level of risk, benefitting from the positive macroeconomic developments in most euro area countries and from the implementation of several reforms both at the EU and national levels. We empirically investigate the level of risk of a sample of listed commercial Eurozone banks by employing the monitoring system of bank riskiness proposed by the EBA (2015) and by applying risk indicators, scores, and weights and we relate it to banks board features. The average age of board members, board size, and the fraction of women on board are considered. Whereas board age has a positive impact on bank risk, board size and the presence of women do not seem to impact EBA scores. Although our results are in line with the previous literature, as more data become available, the sample size could be enlarged. In addition, alternative models should be tested to better control for endogeneity.

Our evidence supports recent policy initiatives aiming to foster board diversity, encouraging the appointment of members from different backgrounds. It implies the relevance of the average

age of the board of directors on its decision process, on board independence, and the quality of the debate. As older boards appear to be risk enhancing, the regulator should take the average age of the board, and not only its variability, in careful consideration.

Our results also shed a light on the relevance of the methods for calculating risk-based contributions to national DIS, which should properly address the characteristics of the national banking sectors and business models of banks with the goal to reduce the potential losses stemming from a DIS intervention by adequately reflecting the likelihood of the bank's failure. A wider set of indicators may help to calibrate contributions to each country's banking system specificity.

The EBA (2015) guidelines were incorporated in the domestic supervisory processes and procedures by the end of 2015, with the exception of Latvia, Poland, and Finland. From that date on, and in any case no later than by 31 May 2016, contributions to be raised by national DISs comply with these guidelines, de facto creating national deposit insurance schemes working under the same European rules.

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## APPENDIX 1. SAMPLE GEOGRAPHICAL DISTRIBUTION

| *Country* | *Number of banks* |
|---|---|
| Austria | 5 |
| Belgium | 2 |
| Cyprus | 2 |
| Germany | 3 |
| Spain | 6 |
| Finland | 2 |
| France | 8 |
| Greece | 4 |
| Ireland | 2 |
| Italy | 12 |
| Lithuania | 1 |
| Malta | 1 |
| Netherlands | 1 |
| Portugal | 2 |

## APPENDIX 2. VARIABLE DEFINITIONS

| *Variable* | *Definition* | *Source* |
|---|---|---|
| ***Risk variables*** | | |
| *ARSc* | Core aggregate risk score | Authors' calculation using EBA (2015) and Orbis Bank Focus data |
| *ARSca* | Core and additional risk score | Authors' calculation using EBA (2015) and Orbis Bank Focus data |
| ***Board variables*** | | |
| *SIZE* | Board size = Number of board members | Authors' calculation using Orbis Bank Focus data |
| *AGE* | Board age = Average age of board members (years) | Authors' calculation using Orbis Bank Focus data |
| *WOM* | Fraction of women on the board | Authors' calculation using Orbis Bank Focus data |
| ***Bank-specific variables*** | | |
| *TA* | Total assets (Euro billions) | Authors' calculation using Orbis Bank Focus data |
| *TAGA* | Total asset growth | Authors' calculation using Orbis Bank Focus data |
| *LOANTA* | Loan ratio = Gross loans to total assets | Authors' calculation using Orbis Bank Focus data |
| *TDTA* | Deposit ratio = Deposit and short-term funding to total assets | Authors' calculation using Orbis Bank Focus data |
| *ETA* | Equity to total assets | Authors' calculation using Orbis Bank Focus data |
| *LLPLOAN* | Quality of loan portfolio = Loan loss provisions to gross loans | Authors' calculation using Orbis Bank Focus data |
| *CI* | Cost to income ratio (%) | Authors' calculation using Orbis Bank Focus data |

*Note: The table defines the variables used in the study and the source of the data.*

## APPENDIX 3. CORRELATION MATRIX

| | *ARSc* | *ARSca* | *Size* | *Age* | *Wom* | *Bank size* | *Total asset growth* | *Loans to total assets* | *Total deposits to total assets* | *Equity to total assets* | *Loan loss provisions to loans* | *Cost to income* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *ARSc* | 1 | | | | | | | | | | | |
| *ARSca* | 0.9637* | 1 | | | | | | | | | | |
| *Size* | 0.1834* | 0.1848* | 1 | | | | | | | | | |
| *Age* | 0.2631* | 0.2148* | 0.1342* | 1 | | | | | | | | |
| *Wom* | -0.0695 | -0.0678 | 0.1750* | 0.1685* | 1 | | | | | | | |
| *Bank size* | 0.1069 | 0.1420* | 0.3573* | 0.1922* | 0.3184* | 1 | | | | | | |
| *Total asset growth* | -0.067 | -0.045 | -0.0805 | 0.015 | 0.0789 | -0.1890* | 1 | | | | | |
| *Loans to total assets* | 0.5606* | 0.4724* | 0.0526 | 0.2583* | -0.1124 | -0.2641* | -0.0716 | 1 | | | | |
| *Total deposits to total assets* | 0.0705 | 0.0134 | -0.2878* | -0.0461 | -0.2860* | -0.6623* | 0.1703* | 0.3726* | 1 | | | |
| *Equity to total assets* | -0.1837* | -0.2241* | -0.0613 | 0.0989 | -0.0833 | -0.4888* | 0.044 | 0.2809* | 0.4672* | 1 | | |
| *Loan loss provisions to loans* | 0.6204* | 0.6279* | -0.0438 | 0.0378 | -0.2306* | -0.0956 | -0.114 | 0.4167* | 0.2220* | 0.0407 | 1 | |
| *Cost to income* | -0.0311 | 0.1094 | 0.1247* | -0.0559 | 0.1561* | 0.2075* | -0.1856* | -0.1773* | -0.2699* | -0.1887* | 0.0304 | 1 |

*Note: Board size, board age and bank size are taken in natural logarithm. Bank specific variables are winsorized at 99 per cent. Definitions of the variables are provided in Appendix 2.*