# Macroprudential policies, corporate governance and bank risk: cross-country evidence

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## Abstract

The present study uses a sample of up to 356 banks from 50 countries over the period 2002-2017 to examine whether and how macroprudential policies and corporate governance interact in shaping bank risk. Our results show that the impact of bank corporate governance on risk-taking depends critically on the macroprudential policies in force. In more detail, bank corporate governance has a negative or insignificant impact when none or only a few macroprudential policies are in place; however, the impact becomes positive and statistically significant as the number of macroprudential policies increases. These findings seem to be attributed to financial institutions targeted macroprudential instruments rather than borrowing targeted ones. The results are robust to the use of various indicators of risk and numerous additional tests.

**Keywords:** Banks, Governance, Macroprudential, Regulations, Risk

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## 1. Introduction

In the aftermath of the financial crisis the attention of regulators and academics shifted from the microprudential to the macroprudential frameworks. In particular, macroprudential regulation attempts to fill the gap between macroeconomic policy and the microprudential regulation of financial institutions, with the main aim being to reduce the risk and the macroeconomic cost embedded by financial instability. However, despite the wide adoption of macroprudential regulatory instruments, our understanding of these policies and their efficacy remains limited (Claessens, 2015; Boar et al., 2017; Akinci and Olmstead-Rumsey, 2018). Within this context, Altunbas et al. (2018) argue that not only the evidence on the effectiveness of macroprudential policies is mixed, but also that most studies focus on the impact of macroprudential tools on bank lending (an intermediate target), rather than on bank risk (the ultimate goal). Meuleman and Vander Vennet (2019) also highlight the focus on intermediate targets, arguing that the impact of macroprudential policy tools on bank risk needs to be examined more directly. Along the same lines, Ezer (2019) argue in favor of the use of micro-level data that account for bank heterogeneity, mentioning that the use of country-level variables (e.g. total credit amount or house prices) might be misleading for evaluating the stability of the financial system.

The present study aims to fill a gap in the literature by examining whether and how corporate governance interacts with macroprudential policies in shaping bank risk. To the best of our knowledge this issue has so far been neglected in the empirical literature. [1] In theory, both the internal corporate governance mechanisms and the external macroprudential policy mechanisms aim to reduce risk-taking; however, the existing evidence suggests that this is not

[1] As we discuss in Section 2 there exists a handful number of studies that focuses on the interaction between corporate governance and microprudential regulations; however, the interaction between macroprudential regulation and corporate governance has not been examined in the literature.

necessarily the case. For example, the association between risk-taking and bank corporate governance mechanisms, like board structure, risk management systems and CEO compensation, has received a lot of attention in the aftermath of the financial crisis. Yet, as we discuss in more detail in Section 2, the results are mixed with some studies showing that corporate governance mitigates risk-taking and others concluding the opposite.

Therefore, several questions arise as for how corporate governance and macroprudential policies work together and whether they are complements or substitutes. For example, if banks have, in general, a good corporate governance framework, is there a need to introduce macroprudential regulations? Similarly, if macroprudential regulations can effectively restrict risk, is there a need to have a corporate governance framework for banking institutions? Alternatively, is it possible that the same regulations have different effects on risk-taking across banks depending on their governance mechanisms or that the impact of the governance mechanisms depends on the severity of the regulations?

Answering these questions is important from a policy making perspective. For instance, Ignazio Angeloni, a member of the Supervisory Board of the European Central Bank (ECB), mentioned in a recent speech that corporate governance, despite having no direct link to any part of the bank balance sheet, can nonetheless play a role similar to capital, arguing that "*governance is the first line of defence of a bank's soundness, whereas capital is the last one*". Angeloni (2017) makes another two interesting remarks that are relevant to our study. First, he mentions that failure to consider bank governance during the comprehensive assessment of the ECB, can partially explain while the subsequent actions taken where not enough to fully redress the situation of the banks that were identified as weak ones.[2] Second, he highlights the role of interactions mentioning

[2] The ECB jointly with the national supervisors conducts financial health checks of the banks it supervises directly. These comprehensive assessments, which are carried out either regularly or on and hoc basis, help to ensure that the

that "*the interactions between regulation and underlying governance structures (and the differential effects which these might have) call for a holistic approach towards tackling potentially excessive risk-taking by banks*".

Using a sample of up to 356 banks from 50 countries over the period 2002-2017, we find that bank risk is influenced by the interaction of macroprudential policies with corporate governance. This result is in general robust to the use of alternative measures of risk, namely Z-score, distance to default, and probability of default. It also holds when we control for various bank-specific and country-specific attributes like the macroeconomic environment, market concentration, institutional environment, microprudential regulations, and national culture. When we split our index of macroprudential policies into a component that captures financial institutions targeted instruments and one that captures borrower targeted instruments, we find that it is the former that drives our results. Additionally, it seems that this interaction exercises a statistically significant impact on risk only in the case of banks from developed countries; however, this finding should be treated with caution due to the small number of banks from developing countries in our sample.

The rest of the paper is as follows. Section 2 summarizes the literature and provides a background discussion on the interactions of macroprudential policies and bank corporate governance. Section 3 describes the data and variables. Section 4 discusses the results. Section 5 concludes the study.

banks are adequately capitalized and can withstand possible financial shocks. The assessment usually comprises two main pillars, namely an asset quality review and a stress test.

## 2. Literature review and background discussion

In this section we provide a review of related studies, that fall into the following three strands of the literature: (i) macroprudential polices and bank risk, (ij) corporate governance and bank risk, (iii) interactions of regulations and corporate governance in shaping bank risk. Within this context, we also discuss in more detail how regulatory policies could interact with corporate governance.

### *2.1. Review of related studies*

The first strand of the literature that relates to our work consists of a few recent studies that examine the association between macroprudential policies and bank-risk taking (Altunbas et al., 2018; Ezer, 2019; Meuleman and Vander Vennet, 2019). One interesting finding of these studies is that some macroprudential tools increase risk and others decrease risk.[3] Another interesting finding is that the impact of macroprudential tools on bank risk depends on bank-specific attributes, like size, capitalization, etc. (Altunbas et al., 2018; Ezer, 2019). However, these studies focus on the moderating role of financial characteristics ignoring the role of corporate governance that is the focus of the present paper.

The fact that the above studies neglect the role of corporate governance is surprising, not only in the light of arguments of policy makers like the ones mentioned in Section 1, but also based on the findings of the second group of studies that relates to our work. In general, this strand of the literature points to an association between corporate governance mechanisms and bank risk; however, the results appear to be mixed. One the one hand, some studies offer support to the conventional wisdom that good corporate governance constrains risky lending (Faleye and

[3] Using a sample from 30 European countries, Ezer (2019) finds that stricter regulation in the form of exposure limitations tends to decrease banks' risk levels whereas capital-based tools like sector-specific capital buffers tend to induce higher risk taking.

Krishnan, 2017) and overall bank risk (Switzer et al. 2018). On the other hand, there are studies concluding that stronger and more shareholder-friendly corporate governance structures may encourage rather than constrain excessive risk-taking in the financial industry (Iqbal et al., 2015; Mamatzakis et al., 2017; Anginer et al., 2018).

Finally, our work relates to a small number of studies that examine the interaction between corporate governance and microprudential regulations. Using a cross-country sample from 48 countries, Laeven and Levine (2009) show that the relationship between bank risk and capital regulations, deposit insurance policies, and restrictions on bank activities can be either positive or negative depending on the comparative power of shareholders within the corporate governance structure of each bank. Andries and Nistor (2016) provide similar evidence from ten Central Eastern European (CEE) countries, concluding that the impact of corporate governance policies on systemic risk is affected by the tightness of three types of regulations, namely supervisory power, capital requirements and activity restrictions. Finally, using data from 54 countries, De Vita and Luo (2018) conclude that with the exception of capital requirements, other tools that relate to the pillars of Basel II, namely market discipline and supervisory power are unable to mitigate the propensity to greater risk-taking by banks resulting from larger board size, higher board independence and greater gender diversity of the board. These studies provide interesting insights on the interaction of corporate governance with regulations; however, they all focus on microprudential rather than on macroprudential policies like the ones that we examine in the present study.

### 2.2. Interactions of corporate governance and regulations

A question that naturally emerges from the above discussion is: why would regulations interact with corporate governance in shaping bank risk? From a traditional point of view,

corporate governance aims to aligns the interests of the shareholders and the managers and provide some assurance that managerial risk-taking is within the bounds set by the risk appetite of the shareholders. Micro-prudential and macro-prudential policies imposed by regulators also aim to restrict both individual and systemic risk. Within this context, Mülbert (2010) and Tarullo (2014) point out that shareholders and supervisors should desire banks with good risk management, high quality corporate governance mechanisms, structures and procedures in place. Assuming that the interests of shareholders and managers are aligned with those of the supervisor in terms of risk appetite, we would expect both internal mechanisms (i.e. corporate governance) and external mechanisms (i.e. regulations) to work together and restrict bank risk-taking. In other words, if this assumption holds, our results should show that macroprudential regulations enhance the negative (positive) impact of corporate governance mechanisms on risk-taking (stability).

However, the interests of bank supervisors and bank shareholders are not necessary fully aligned (Anginer et al., 2018; Tarullo, 2014; Ciancanelli and Gonzalez, 2000; Mülbert, 2010). For instance, bank supervisors impose regulations (either macroprudential or microprudential) with an aim to enhance bank stability and protect the public interest. In contrast, shareholders introduce corporate governance procedures to: (i) comply with regulations and protect them from the consequences of violations (Tarullo, 2014) and (ii) safeguard their interests, by ensuring that the agents (bank managers) will maximize shareholder wealth and stock returns (Ciancanelli and Gonzalez, 2000; Mülbert, 2010). The latter could result in managerial policies that will lead to higher risk-taking.

Additionally, certain types of initiatives by central banks and policy makers, that are common in the banking industry can exacerbate the risk appetite of the shareholders. In more detail, the existence of a lender of last resort and the rescue of too big to fail banks that in theory aims to prevent systemic risk mean that the State is sharing the bank risk with the shareholders. In turn,

this can have an impact on the incentives and risk appetite of the shareholders and other market actors (Mülbert, 2010; Ciancanelli and Gonzalez, 2000; Anginer et al., 2018). As a result, the private assessment by shareholders and their representatives of the risk-reward tradeoffs of the bank activities will not be the same with the public assessment of the risk-reward tradeoff (Tarullo, 2014). More detailed, because of the risk sharing relationship, it is possible that the bank shareholders are willing to assume much higher level of risk than it would otherwise be the case (Ciancanelli and Gonzalez, 2000; Anginer et al., 2018). In the case that such excessive risk will generate higher returns, then the shareholders will earn excess profits. On the other hand, if the outcome is a bank failure that threatens the banking system, then the bank will be saved by the central bank or the State. This also means that banks have incentives to herd and take on correlated (or systemic) risk, since the State guarantees are more likely to be initiated in the event of many and simultaneous bank failures, and as a result, bank shareholders can benefit from taking on more stand-alone as well as systemic risk (Anginer et al., 2018). Therefore, some corporate governance practices as equity-based remuneration or a framework that aims to protect the minority shareholders may actually promote the adoption of risky strategies (John et al., 2008; Mülbert, 2010; Boubaker et al., 2012). In the words of Anginer et al. (2018), it is possible that: "*Corporate governance that aligns managerial incentives with shareholders interests can potentially result in more risk-taking, as shareholders face payoffs that are restricted on the downside by limited liability*" (p. 327).[4]

Within this context, macroprudential (and microprudential) regulations may be necessary as a response to this divergence between the private and social interests associated with the risk-taking by financial intermediaries (Tarullo, 2014). This could be achieved by the imposition of

[4] Recent empirical evidence from the banking industry discussed in Section 2.1 seems to confirm this argument.

various macroprudential requirements like loan-to-value ratio caps, countercyclical capital buffers, leverage ratios, limits on interbank exposures, limits on the fraction of assets held by a limited number of borrowers, etc. Under this scenario, we would expect to find that macroprudential regulations, constrain the positive (negative) impact of corporate governance mechanisms on bank risk-taking (stability).

## 3. Data and variables

### *3.1. Data*

We collect data from several sources. Bank-level financial data are from the S&P Global Market Intelligence database (formerly known as SNL), while the corporate governance data are from Datastream's ASSET4 template. The distance to default and probability of default risk measures are from the Credit Research Initiative (CRI) of the National University of Singapore. Information on macroprudential regulations is from the updated version of the Cerutti et al. (2017) dataset, while information on macroeconomic conditions is from World Development Indicators database of the World Bank. Data for market concentration is from the Global Financial Development Database of the World Bank and information on the institutional environment is from the Worldwide Governance Indicators project of the World Bank. We discuss these variables in Section 3.2. below, while further information for all the variables used in our study is available in Appendix I.

Our final sample includes up to 356 banks operating in 50 countries over the period 2002-2017. Our analysis begins in 2002 due to data availability for the corporate governance score in ASSET4. This score became available in 2002; however, coverage in the first years of the analysis

is limited.[5] To make use of all the available information we retain all the years in the baseline regressions. In subsequent analysis we examine the robustness of the results across different time periods.

### *3.2. Methodology and variables*

#### *3.2.1. Methodology*

To examine whether and how the macroprudential policies interact with corporate governance in shaping bank risk, we estimate a model of the following form:

$$Risk_{i,j.t} = \alpha + \beta_0 MPI_{j,t-1} + \beta_1 BCG_{i,j.t-1} + \beta_2 MPI_{j,t-1} \times BCG_{i,j.t-1} + \beta_3 BLC_{i,j,,t-1} + \beta_4 CLC_{j,t-1} + \beta_5 T + \gamma_i + \varepsilon_{i,t}$$

where $Risk_{ijt}$ is an indicator of risk for bank *i* in country *j* in year *t*, MPI is an index of country-specific macroprudential policies in country *j* in year *t-1*, BCG is a bank-level indicator of corporate governance for bank *i* in country *j* in year *t-1*, BLC is a vector of bank-level control variables, CLC is a vector of country-level control variables, and T is a set of year dummies to control for time effects.

As shown in the above equation, all the independent variables are lagged by one year to reduce endogeneity concerns. Additionally, all the estimations are performed with the use of bank fixed effects $\gamma_i$ to control for time invariant bank-level heterogeneity.[6] Furthermore, since each bank is associated with one country only, the time invariant country effect is collinear with the

[5] The sample composition of the actual dataset used in the estimations presented in Table 3, with the use of the lagged independent variables (N = 1,949), is as follows: 2003=15, 2004=16, 2005=19, 2006=61, 2007=66, 2008=70, 2009=110, 2010=129, 2011=159, 2012=169, 2013=173, 2014=181, 2015=191, 2016=256, 2017=334.

[6] The Hausman test is also in favour of the use of bank fixed effects.

bank fixed effect. Therefore, it is not possible to include country fixed effects simultaneously with the bank effects; however, the country effects are already captured by the bank fixed effects.

*3.2.2 Dependent variable*

Following Altunbas et al. (2018) and Ezer (2019) we use various indicators of individual bank risk. As discussed in Altunbas et al. (2018), given the nature of macroprudential policies, the interest could lay on how these policies influence a bank's contribution to system-wide risk. Yet, as they argue, despite the development of some measures of systemic risk in recent years (e.g. CoVaR), such indicators are still rudimentary. Therefore, Altunbas et al. (2018) suggest that a first step could be to evaluate how macroprudential tools impact specific measures of individual bank risk, like the expected default or the Z-score. In line with this argument, the present study uses three well-regarded indicators of risk, namely the Z-score, distance to default, and probability of default.

The Z-score is defined as the summation of the average return on assets (ROA) ratio and the average equity to assets ratio (EQAS), divided by the standard deviation of ROA, over a 3-years rolling time window.[7] The Z-score is widely used in the banking literature and shows the number of standard deviations below the mean by which profits must fall in order to eliminate equity. Thus, it can be seen as an accounting-based measure of bank soundness, with higher figures indicating higher bank stability or lower risk. In the analysis that follows, we use the natural logarithm of the Z-score (ZSCORE) to control for non-linear effects and outliers (e.g. Demirgüç-Kunt et al., 2008; Laeven and Levine, 2009).

The distance to default (DTD) is a popular risk measure that reveals how far away a firm is from default. The CRI's DTD that we use in the present study is a volatility adjusted leverage

[7] The use of a 3-years rolling time window is consistent with many other studies, like Schaeck et al. (2012), Beck et al. (2013), Fang et al. (2014), Doumpos et al. (2015).

measure based on Merton (1974), that accounts for differences in the capital structure of financial institutions through an adjustment method put forward by Duan (2010). The model parameters are estimated by the transformed-data maximum likelihood method, first proposed first by Duan (1994) and subsequently modified by Duan (2010) and Duan et al. (2012).

The probability of default (POD), of the credit research initiative (CRI), estimates the default risk of publicly listed firms by quantitatively analyzing numerous covariates that cover market-based and accounting-based firm-specific attributes, as well as macro-financial factors.[8] The estimations are based on the forward intensity model of Duan et al. (2012), that is governed by two independent doubly stochastic Poisson processes. The CRI POD used in the present study has a prediction horizon of 12 months.

*3.2.3. Macroprudential policy and corporate governance indices*

The macroprudential policies index (MPI), constructed by Cerutti et al. (2017), indicates how many of the following instruments are applicable in each country and in each year over the period of our analysis: (i) Loan-to-Value Ratio Caps (LTV_CAP), (ii) Debt-to-Income Ratio (DTI), (iii) General Countercyclical Capital Buffer/Requirement (CTC), (iv) Leverage Ratio (LEV), (v) Capital Surcharges on Systemically Important Financial Institutions (SIFI), (vi) Time-Varying/Dynamic Loan-Loss Provisioning (DP), (vii) Limits on Interbank Exposures (INTER), (viii) Limits the fraction of assets held by a limited number of borrowers (CONC), (ix) Limits on Foreign Currency Loans (FC), (x) Limits on Domestic Currency Loans (CG), (xi) FX and/or Countercyclical Reserve Requirements (RR_REV), (xii) Levy/Tax on Financial Institutions (TAX). Cerutti et al. (2017)

[8] The firm-specific attributes also include the distance-to-default both in level and trend. Other firm-specific indicators used are, among others, profitability, liquidity, market -to-book ratio, etc. The macro-factors include, among others, the stock index return, the short-term risk-free rate, etc. Further information is available in the Credit Research Initiative (2019) White Paper.

assign the value of one in each one of these twelve cases that a certain policy is in force, and the value of zero otherwise. Then, they take the summation, construing an overall index that theoretically ranges between 0 and 12. Higher values of MPI indicate a more stringent macroprudential framework.

BCG measures a bank's commitment and effectiveness towards following corporate governance principles. In particular, in construing this indicator, Datastream's ASSET4 framework considers around 30 indicators from three main categories, those being: (i) board functions (e.g. policy for maintaining effective board functions; board meeting attendance; succession plan for executives; independence of committees; board authority to hire external advisers or consultants, etc.), (ii) board structure (e.g. policy for well-balanced board membership; board size; board background and skills; board diversity; CEO duality, etc.), (iii) compensation policy (e.g. policy for performance-oriented compensation; compensation improvement tools; CEO Compensation Link to Total Shareholder Return, long-term objectives, CSR/H&S/Sustainability targets; Shareholders Approval of Stock Based Compensation Plan, etc.). This variable is constructed by equally weighting and z-scoring all underlying data points and comparing them against all companies in the ASSET4 universe. Consequently, the BCG score is a relative measure of corporate governance performance that takes values between 0 and 100.

*3.2.4. Control variables*

Following past studies on bank risk we control for key bank-specific financial characteristics using the natural logarithm of total assets as an indicator of size (LNAS), the liquid assets to total assets as an indicator of liquidity (LIQUID), and the cost to income ratio as an indicator of efficiency in

expenses management (COST).[9] To control for country-level macroeconomic conditions, we use the annual growth of GDP (GDPGR) and the inflation rate (INFLAT), as in among others, Boyd et al. (2006), Agoraki et al. (2011), Fang et al. (2014), Doumpos et al. (2015). Furthermore, we control for market concentration in the banking sector (MCONC), as in De Nicolo and Loukoianova (2007), Uhde and Heimeschoff (2009), Ijtsma et al (2017). [10] The literature also suggests that bank risk is influenced by the political and legal environment of a country (Fang et al., 2014; Ashraf, 2017; Bermpei et al., 2018). Therefore, following Li et al. (2006), we control for such differences at the country-level by constructing an enforcement index (ENFIND) that captures the following three dimensions of institutional environment: rule of law, regulatory quality, and absence of corruption. Each one of these dimensions takes values from -2.5 to 2.5, with higher scores corresponding to better outcomes. We calculate ENFIND as the average of the three dimensions.

## 4. Empirical results

### *4.1. Main results*

Table 1 provides summary statistics for the variables used in the analysis. The average country in the sample has around three macroprudential policies in place in a given point in time; however, we observe values across almost the entire theoretical range of the MPI index, that is from zero (e.g. Netherlands in 2002) to ten (e.g. China in 2015). Turning to the BCG, the average score is

[9]See for example, Laeven and Levine (2009), Agoraki et al. (2011), Fang et al. (2014), Doumpos et al. (2015), Berger et al. (2017).

[10] There are two opposing views on the potential impact of concentration on bank risk. The "concentration-stability view" asserts that higher market concentration will allow banks to enhance profits and build higher capital buffers, which in turn should result in higher bank stability. In contrast, the "concentration-fragility view" asserts that as a result of "too big to fail" and moral hazard issues, concentration can be damaging for bank stability.

55.13. As expected, there is heterogeneity across banks, that is evident by the standard deviation of 29.41, and the range of the value of the BCG ranging from 0.12 to 99.88.

Table 2 presents the correlation coefficients. Consistent with our expectations, DTD and ZSCORE are positively correlated (0.38), and they both have a negative correlation with POD (POD and ZSCORE: -0.29; POD and DTD: -0.54). However, the magnitude of the correlation coefficients shows that the three indicators capture different dimensions of bank risk.

[Insert Tables 1 and 2 Around Here]

We present the results in Table 3, with each column corresponding to a different risk measure. At this point it should be reminded that higher figures of ZSCORE and DTD correspond to higher stability (lower risk), whereas in the case of POD this relationship is inversed with higher figures indicating higher risk (lower stability). The interaction MPI*BCG is statistically significant in all the cases, with the sign of the coefficient being positive in the cases of ZSCORE and DTD, and negative in the case of POD.[11] Thus, the effect of bank governance on risk is being moderated by the number of macroprudential instruments that are in force in a given country.

[Insert Table 3 Around Here]

To provide a better interpretation of this finding, Table 4 shows the average marginal effect of the BCG on ZSCORE (Column 1), DTD (Column 2) and POD (Column 3), for different values of the macroprudential policy index. For example, we find that the average marginal effect of BCG

[11] We focus on the interaction term, rather than on the statistical significance of the individual terms (MPI and BCG), because as discussed in Braumoeller (2004) "*When a statistical equation includes a multiplicative term in order to capture interaction effects, the statistical significance of the lower order coefficients is largely useless for the typical purposes of hypothesis testing*" (p. 807).

on bank DTD ranges between -0.004 when the MPI is zero, to 0.027 when the MPI policy rate is at the maximum of its range in our sample (i.e. 10). Thus, the relationship between corporate governance and bank risk can change sign depending on macroprudential policies. Further inspection of the partial derivatives indicates that the average marginal effect of bank corporate governance on DTD is insignificant for MPI values in the range of 0 to 2, and positive and statistically significant thereafter. We reach quite similar conclusions in the case of the ZSCORE. Turning to the POD, the average effect of BCG on risk (stability) is positive (negative) and statistically significant for low values of MPI (equal to 0 or 1), insignificant for values of MPI between 2 and 4, and negative (positive) and significant thereafter. For a graphical illustration of the marginal effect results, Figure 1 plots the predictive margins, with the slopes illustrating the 11 estimated effect of BCG on the risk measures at 11 different constant levels of MPI, i.e. from values of MPI ranging from 0 to 10.

[Insert Table 4 and Figure 1 Around Here]

### *4.2. Further analysis*

In this section we extend our analysis towards various dimensions. In particular, we re-estimate the baseline specification while: (i) disaggregating the macroprudential policy index, (ii) splitting the sample into developed and developing countries, (iii) restricting the sample in different time periods, (iv) using additional country-level control variables, (v) disaggregating the Z-score, (vi) considering an alternative indicator of corporate governance. We discuss these results below.

*4.2.1 MPI Disaggregation*

First, we disaggregate MPI into two sub-indices from Cerrutti et al. (2017), namely the Borrower-Targeted Instruments index (BTI) and the Financial Institution-Targeted Instruments (FITI). BTI considers the first two policies of the MPI index (i.e. LTV_CAP, DTI), while FITI considers the remaining ten policies. The results in Table 5 show that our findings in section 4.1. are driven by the FITI that has the same sign and significance that MPI, rather than by BTI which is insignificant. Thus, regulations that impose a limit on household indebtedness and loan to value ratio caps do not appear to have a moderating role on the relationship between corporate governance and bank risk.

[Insert Table 5 Around Here]

To shed more light on the moderating role of FITI, we disaggregate further this sub-index into two indicators. The first indicator, concerns capital related macroprudential policies (MPCAP), and it is constructed on the basis of policies (iii) to (iv) in section 3.2.3, which reveal the existence of general countercyclical capital buffers, a minimum leverage ratio, and capital surcharges on SIFIs. The second indicator, MPOTHER, is constructed on the basis of the remaining macroprudential policies which relate to lending (e.g. dynamic loan loss provisioning, concentration limits, foreign currency loans limits, interbank exposures limits, etc.), a levy/tax on financial institutions, and foreign exchange and/or countercyclical reserve requirements. We find that both MPCAP*BCG and MPOTHER*BCG are statistically significant and with the expected sign regardless of the risk indicator that we use.[12]

[12] We do not tabulate these results to conserved space. All the estimations are available from the authors upon request.

*4.2.2 Developed vs Developing countries*

Macroprudential policies and corporate governance frameworks, and subsequently their joint impact on bank risk, may differ between developed and developing countries. For example, many studies highlight that macroprudential policy instruments – whether or not they explicitly called by this name – have been adopted more frequently and they have a longer history in emerging rather than advanced economies (Claessens et al., 2013; Cerutti et al., 2017; Galati and Moessner, 2018). Turning to corporate governance, Ararat and Dallas (2011) highlight that due to the weaker external governance mechanisms in emerging markets, the ability of the board to effectively monitor managers is crucially important for corporate governance. Additionally, referring specifically to bank corporate governance in developing countries, Arun and Turner (2004) argue that the issue becomes complicated due to the extensive political implications and activities of "distributional cartels". Therefore, we split the sample and re-estimate the specification of Table 3 separately for developed and developing countries.

[Insert Table 6 Around Here]

The results in Table 6 reveal that in the case of developed countries, the effects are comparable to the ones of Table 3. However, in the case of developing countries, the interaction term of the macroprudential indices and the corporate governance indicator is insignificant in the case of both ZSCORE and DTD. As it concerns POD, the interaction term carries a negative coefficient, which is statistically significant at the 10% level only. Nonetheless, the results for the developing countries in Table 6 should be treated with some caution as the sample in these estimations is limited to around 550 observations from up to 87 banks.

In unreported regressions we also split MPI into FITI and BTI. In the case of FITI, the interaction term is positive and statistically significant in the case of ZSCORE and DTD for developed countries, and negative and statistically significant in the case of POD. Turning to the developing countries, the interaction term (FITI*BCG) is insignificant in all three cases. As in the case of Table 5, the interaction of BTI with BCG is insignificant in most cases, the only exception being the regression of POD in the case of developing countries that is statistically significant at the 10% level. Given the similarity of these results with the ones shown in Table 6 we do not present them to conserve space.

*4.2.3. Different time periods*

As discussed earlier, data availability for the corporate governance score in the pre-2007 period is quite limited. Given that this coincides with the beginning of the financial crisis, we re-estimate our specification while: (i) excluding the years of the crisis (2007-2009, "Ex. Fin Crisis"), (ii) excluding years prior to 2007 and (iii) excluding years prior to 2009 (i.e. post-crisis analysis) from the analysis. We present these estimations in Table 7. In all the cases, the results hold. Thus, it seems that regardless of the time period that we consider, the impact of corporate governance on risk depends on the extent of macroprudential policies in force.

[Insert Table 7 Around Here]

*4.2.4. Additional country-level control variables*

Several cross-country studies show that bank-risk taking behavior can be explained by differences in microprudential regulations across countries (Agoraki et al., 2011; Danisman and Demirel, 2019; Teixeira et al., 2019). To control for such regulations, we use two indicators from Barth et al.

(2013).[13] The first relates to the initial and overall capital requirements, CAPRQ. The second reveals the restrictions imposed on bank activities, ACTRS, (i.e. real estate, insurance, securities). In both cases, higher values of these indicators correspond to higher regulatory stringency.

Additionally, some recent studies report an association between national culture and bank risk-taking (Kanagaretnam et al., 2014; Ashraf et al., 2016; Illiashenko and Laidroo, 2020).[14] To account for this, we consider the following four cultural dimensions from Hofstede's framework: uncertainty avoidance, individualism, power distance and masculinity.[15] Considering that: (i) our aim is to control for national culture rather than to explain how the individual indicators influence bank risk-taking, and (ii) the correlation between some indicators, we resort on principal component analysis.[16] This results in two components with an eigenvalue higher than one, explaining in total 78% of the variance (CULTPC1, CULTPC2).

Table 8 presents alternative specifications of the regression shown in Table 3, while including the country-level controls for microprudential regulations and national culture. All the regressions include the control variables of Table 3, which are not shown to conserve space. These results show that restrictions on bank activities have, in general, a positive impact on bank stability. Turning to the capital requirements index, this is insignificant in columns 1 to 3, no matter which dependent variable we use. When we include simultaneously the national culture indicators, we find some evidence that CAPRQ has a positive impact on risk-taking.[17] National culture also

[13] Information for the construction of these indices is available in Appendix I.
[14] Kanagaretnam et al. (2014) and Illiashenko and Laidroo (2020) focus on uncertainty avoidance and individualism. Ashraf et al. (2016) examine the four dimensions that we consider in the present study.
[15] Further information about the Hofstede framework is available in Hofstede (1980, 2001) and Hofstede et al. (2010). The data for our study were obtained from Hofstede Insights.
[16] There is a strong correlation between individualism and power distance (-0.77), and a moderate correlation between individualism and uncertainty avoidance (-0.24). Putting them in the same regression model could lead to some multicollinearity concerns. In unreported regressions we include the four indicators either one by one or simultaneously in the regressions. In all the cases, the interaction (BCG*MPI) retains its statistical significance.
[17] While contradicting the general regulatory belief, this finding is consistent with theoretical (e.g. Gennotte and Pyle, 1991; Blum, 1999) and empirical work (Sivec and Volk, 2019).

appears to have an impact on bank risk. Nonetheless, controlling for microprudential regulations and national culture does not influence our main findings.

[Insert Table 8 Around Here]

*4.2.5. Disaggregation of Z-score*

Following past studies, we also disaggregate the *Z*-score in two components (Lepetit et al., 2008; Barry et al., 2011; Doumpos et al., 2015). The first component is calculated as ZRAR = average ROA / *st.dev* (ROA), and serves as an inverse indicator of bank's portfolio risk, or in other words an indicator of risk-adjusted returns. The second component is calculated as ZRAC = average EQAS / *st.dev* (ROA), and serves as an inverse indicator of leverage risk or in other words, an indicator of risk-adjusted capitalization. We find that the interaction of MPI with BCG is positive and statistically significant in the case of both ZRAR and ZRAC.[18]

*4.2.6. Alternative corporate governance indicator*

As a final exercise we use an alternative corporate governance indicator from ASSET4. This is the so-called "Shareholder Rights" (BSR) that is associated with policies related to the equal treatment of shareholders and the use of anti-takeover devices. In more detail, it captures the following nine aspects: (i) whether the company has a policy for ensuring equal treatment of minority shareholders, facilitating shareholder engagement or limiting the use of anti-takeover devices, (ii) the percentage of maximum voting rights allowed or ownership rights, (iii) whether the company's board members are elected with a majority vote, (iv) whether the company's shareholders have the right to vote on executive compensation, (v) whether the company's articles of association, statutes or bylaws are publicly available, (vi) whether the biggest owner (by voting power) hold the veto

[18] To conserve space, we do not tabulate the results. All the estimations are available upon request.

power or own golden shares, (vii) whether the company is a State Owned Enterprise, (viii) whether all the shares of the company provide equal voting rights, (ix) the number of anti-takeover devices in place in excess of two. We present the results with the use of BSR in Table 9. The main findings remain the same.

[Insert Table 9 Around Here]

## 5. Conclusions

The global financial crisis shifted the attention of regulators from microprudential policies to macroprudential ones. Despite a large volume of academic research, many studies are either theoretical in nature or their analysis is at the country level, rather than at the bank-level. The present study fills a gap in the literature by examining the interaction of macroprudential policies with corporate governance in shaping bank risk. Our study is motivated by recent work revealing that the impact of macroprudential policies on risk depends on the financial characteristics of the banks. Our work also complements studies on bank corporate governance and risk-taking as well as a handful number of studies on the interaction of microprudential regulations and corporate governance.

Our results show that there is a statistically significant interaction of macroprudential policies and corporate governance mechanisms in shaping bank risk. More detailed, the impact of corporate governance on bank risk depends critically on the macroprudential policies. That is, corporate governance appears to have a positive (negative) effect on bank risk (stability) when there are no macroprudential policies, but it turns to negative when there are numerous macroprudential policies in place. These results suggest that macroprudential regulations may be necessary as a response to the divergences between the private and social interests associated with

the risk-taking by financial intermediaries since they constrain, to some extent, the negative impact of corporate governance mechanisms on bank stability. These results hold when we control for various bank-level and country-level factors, and they are robust to the use of different measures of bank risk. Further analysis indicates that the interaction of macroprudential policies and bank governance plays a role in developed countries but not in developing ones; however, due to the small number of banks from developing countries this finding should be treated with some caution. Additionally, the results appear to be driven by financial institutions-targeted macroprudential instruments rather than by borrower-targeted macroprudential instruments.

These findings have important implications, since they show that ignoring the interaction between corporate governance and macroprudential policies may lead to misleading results. Policy makers will have to account for this, and they might have to consider the introduction of a framework that will integrate internal forces like corporate governance with external forces like regulations, in order to balance the interests of shareholders and the general public (Ciancanelli and Gonzalez, 2000). For example, the fiduciary duties of the boards of regulated financial firms could be modified to reflect better the regulatory objectives (Tarullo, 2014). Our results also point to differences between different types of regulations, and groups of countries depending upon their overall development. Thus, it seems that there is not one "best" universal set of macroprudential regulations and corporate governance policies that interact for promoting well -functioning banks across the globe. Successful practices in developed countries, for example, may not succeed in less developing countries. Therefore, policy makers must take this into account as well, during the introduction and implementation of policies relating to macroprudential regulations and corporate governance.

Our paper is not without shortcomings. The need to consider a corporate governance index has limited our sample to around 350 large banks. While the size of our sample is comparable to

the one used in other cross-country studies on bank governance, we hope that future research will improve upon this. Data availability for the corporate governance indicator has also not allowed us to provide a comparison between the pre- and post- crisis period, that could possibly reveal differences on the role of corporate governance and macroprudential regulations during such periods.

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**Table 1 – Descriptive Statistics**

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| ZSCORE | 1949 | 4.016 | 1.236 | -3.788 | 11.681 |
| ZRAR | 1810 | 1.985 | 1.298 | -3.522 | 9.515 |
| ZRAC | 1949 | 3.904 | 1.179 | -0.594 | 11.560 |
| DTD | 1900 | 2.918 | 2.047 | -2.434 | 15.009 |
| POD | 1900 | 0.003 | 0.007 | 0.000 | 0.088 |
| FITI | 1949 | 2.714 | 1.422 | 0 | 8 |
| BTI | 1949 | 0.542 | 0.752 | 0 | 2 |
| MPI | 1949 | 3.257 | 1.735 | 0 | 10 |
| MPCAP | 1949 | 0.681 | 0.785 | 0 | 3 |
| MPOTHER | 1949 | 0.194 | 0.396 | 0 | 1 |
| BCG | 1949 | 55.134 | 29.405 | 0.120 | 99.88 |
| BSR | 1949 | 51.275 | 27.583 | 0.370 | 99.88 |
| SIZE | 1949 | 18.601 | 1.921 | 13.128 | 24.031 |
| LIQUID | 1934 | 0.509 | 0.481 | 0.027 | 6.384 |
| COST | 1940 | 55.909 | 15.566 | 2.690 | 336.5 |
| GDPGR | 1949 | 2.223 | 2.702 | -9.132 | 25.557 |
| INFLAT | 1949 | 1.981 | 3.394 | -25.958 | 23.642 |
| MCONC | 1946 | 51.810 | 17.517 | 23.319 | 100 |
| ENFIND | 1949 | 0.917 | 0.659 | -1.175 | 1.890 |
| ACTRS | 1745 | 7.468 | 1.974 | 3 | 12 |
| CAPRQ | 1752 | 6.965 | 1.840 | 2 | 10 |
| CULTPC1 | 1899 | -0.072 | 1.401 | -2.17 | 2.6 |
| CULTPC2 | 1899 | 0.087 | 1.104 | -2.937 | 2.292 |

**Table 2 – Correlation coefficients**

| | ZSCORE | ZRAR | ZRAC | DTD | POD | FITI | BTI | MPI | MPCAP | MPOTHER |
|---|---|---|---|---|---|---|---|---|---|---|
| ZSCORE | 1 | | | | | | | | | |
| ZRAR | 0.910 | 1.000 | | | | | | | | |
| ZRAC | 0.999 | 0.888 | 1.000 | | | | | | | |
| DTD | 0.378 | 0.378 | 0.375 | 1.000 | | | | | | |
| POD | -0.291 | -0.254 | -0.293 | -0.541 | 1.000 | | | | | |
| FITI | 0.204 | 0.178 | 0.207 | 0.191 | -0.192 | 1.000 | | | | |
| BTI | 0.048 | 0.106 | 0.039 | -0.043 | -0.042 | 0.204 | 1.000 | | | |
| MPI | 0.188 | 0.191 | 0.186 | 0.138 | -0.175 | 0.907 | 0.597 | 1.000 | | |
| MPCAP | 0.288 | 0.217 | 0.297 | 0.344 | -0.264 | 0.694 | -0.094 | 0.528 | 1.000 | |
| MPOTHER | -0.098 | -0.072 | -0.103 | -0.216 | 0.067 | 0.391 | 0.354 | 0.472 | -0.106 | 1.000 |
| BCG | 0.080 | 0.113 | 0.075 | 0.063 | -0.015 | -0.068 | 0.013 | -0.050 | -0.096 | -0.060 |
| BSR | -0.003 | -0.025 | 0.001 | 0.065 | 0.001 | -0.037 | -0.046 | -0.050 | -0.003 | -0.061 |
| SIZE | -0.154 | -0.049 | -0.169 | -0.244 | 0.166 | -0.184 | 0.203 | -0.064 | -0.383 | 0.218 |
| LIQUID | -0.166 | -0.169 | -0.164 | -0.367 | 0.214 | -0.183 | -0.055 | -0.174 | -0.276 | 0.165 |
| COST | -0.127 | -0.272 | -0.104 | -0.052 | 0.115 | -0.022 | -0.317 | -0.154 | 0.159 | -0.106 |
| GDPGR | 0.197 | 0.291 | 0.180 | 0.204 | -0.158 | 0.147 | 0.300 | 0.249 | -0.009 | 0.209 |
| INFLAT | -0.074 | 0.055 | -0.094 | -0.113 | 0.105 | -0.036 | 0.025 | -0.019 | -0.137 | 0.180 |
| MCONC | -0.078 | -0.078 | -0.078 | -0.217 | 0.125 | -0.239 | 0.314 | -0.061 | -0.423 | 0.110 |
| ENFIND | 0.039 | -0.070 | 0.058 | 0.165 | -0.066 | -0.055 | -0.299 | -0.173 | 0.235 | -0.308 |
| ACTRS | 0.144 | 0.161 | 0.142 | 0.168 | -0.099 | 0.251 | -0.052 | 0.184 | 0.274 | -0.110 |
| CAPRQ | 0.183 | 0.192 | 0.180 | 0.101 | -0.118 | 0.402 | 0.117 | 0.379 | 0.287 | 0.100 |
| CULTPC1 | -0.081 | 0.006 | -0.095 | -0.209 | 0.134 | -0.101 | 0.482 | 0.124 | -0.454 | 0.368 |
| CULTPC2 | -0.099 | -0.194 | -0.084 | -0.114 | 0.088 | -0.042 | -0.326 | -0.174 | -0.021 | -0.085 |

Note: Variables are defined in Appendix I

**Table 2- Correlation coefficients (cont.)**

| | BCG | BSR | SIZE | LIQUID | COST | GDPGR | INFLAT | MCONC | ENFIND | ACTRS | CAPRQ | CULTPC1 | CULTPC2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BCG | 1.000 | | | | | | | | | | | | |
| BSR | 0.030 | 1.000 | | | | | | | | | | | |
| SIZE | 0.178 | -0.033 | 1.000 | | | | | | | | | | |
| LIQUID | 0.035 | 0.022 | 0.415 | 1.000 | | | | | | | | | |
| COST | -0.066 | -0.034 | -0.215 | 0.027 | 1.000 | | | | | | | | |
| GDPGR | 0.019 | -0.009 | 0.162 | -0.120 | -0.276 | 1.000 | | | | | | | |
| INFLAT | -0.018 | -0.085 | 0.182 | 0.016 | -0.141 | 0.241 | 1.000 | | | | | | |
| MCONC | 0.115 | 0.020 | 0.369 | 0.280 | -0.198 | -0.051 | -0.052 | 1.000 | | | | | |
| ENFIND | 0.048 | 0.053 | -0.268 | 0.036 | 0.368 | -0.319 | -0.381 | 0.058 | 1.000 | | | | |
| ACTRS | -0.115 | 0.069 | -0.314 | -0.256 | 0.054 | 0.127 | 0.029 | -0.469 | -0.014 | 1.000 | | | |
| CAPRQ | 0.032 | 0.107 | -0.072 | -0.188 | -0.142 | 0.226 | 0.079 | -0.188 | -0.188 | 0.310 | 1.000 | | |
| CULTPC1 | 0.056 | -0.024 | 0.244 | 0.074 | -0.412 | 0.268 | 0.190 | 0.183 | -0.762 | -0.094 | 0.038 | 1.000 | |
| CULTPC2 | -0.127 | -0.040 | -0.388 | -0.052 | 0.327 | -0.355 | -0.175 | -0.319 | 0.181 | 0.120 | -0.181 | -0.209 | 1.000 |

**Table 3 – Macroprudential policies, bank governance and risk: baseline specification**

| VARIABLES | ZSCORE | DTD | POD |
|---|---|---|---|
| $MPI_{t-1}$ | -0.105** | -0.317*** | 0.001** |
| | (0.050) | (0.064) | (0.000) |
| $BCG_{t-1}$ | -0.001 | -0.004 | 3.00e-05** |
| | (0.002) | (0.002) | (0.000) |
| $MPI_{t-1}$ x $BCG_{t-1}$ | 0.002** | 0.003*** | -1.10e-05*** |
| | (0.001) | (0.001) | (0.000) |
| $SIZE_{t-1}$ | -0.077 | -0.582*** | 0.004*** |
| | (0.115) | (0.153) | (0.001) |
| $LIQUID_{t-1}$ | 0.109 | -0.284* | -0.001 |
| | (0.109) | (0.150) | (0.001) |
| $COST_{t-1}$ | -0.012*** | -0.011*** | 6.22e-05*** |
| | (0.002) | (0.002) | (0.000) |
| $GDPGR_{t-1}$ | 0.064*** | 0.057*** | 1.49e-06 |
| | (0.013) | (0.017) | (0.000) |
| $INFLAT_{t-1}$ | 0.009 | 0.001 | -6.80e-05 |
| | (0.008) | (0.011) | (0.000) |
| $MCONC_{t-1}$ | -0.017*** | -0.012** | -2.76e-05 |
| | (0.003) | (0.005) | (0.000) |
| $ENFIND_{t-1}$ | 2.018*** | 1.880*** | -0.014*** |
| | (0.332) | (0.436) | (0.002) |
| Constant | 5.367** | 13.790*** | -0.059*** |
| | (2.109) | (2.800) | -0.01 |
| Bank fixed effects | YES | YES | YES |
| Year dummies | YES | YES | YES |
| R-sq. within | 0.230 | 0.312 | 0.229 |
| R-sq. overall | 0.0527 | 0.146 | 0.0357 |
| Observations | 1,949 | 1,908 | 1,908 |
| Banks | 349 | 341 | 341 |
| Countries | 49 | 47 | 47 |

Notes: *** Statistically significant at the 1% level, ** Statistically significant at the 5% level, *Statistically significant at the 10% level; Standard errors in parenthesis; All the variables are defined in Appendix I.

**Table 4 – Average Marginal Effects of baseline specification**

| | ZSCORE | | DTD | | POD | |
|---|---|---|---|---|---|---|
| c | dy/dx at l.MPI = c | Delta-method Std. Err. | dy/dx at l.MPI = c | Delta-method Std. Err. | dy/dx at l.MPI = c | Delta-method Std. Err. |
| 0 | -0.001 | 0.002 | -0.004 | 0.003 | 0.00003 ** | 0.000 |
| 1 | 0.001 | 0.002 | -0.001 | 0.002 | 0.00002 * | 0.000 |
| 2 | 0.002* | 0.001 | 0.002 | 0.002 | 7.91E-06 | 0.000 |
| 3 | 0.003 *** | 0.001 | 0.005 *** | 0.002 | -3.13E-06 | 0.000 |
| 4 | 0.005 *** | 0.001 | 0.009 *** | 0.002 | -0.00001 | 0.000 |
| 5 | 0.007 *** | 0.002 | 0.012 *** | 0.003 | -0.00003 ** | 0.000 |
| 6 | 0.008 *** | 0.002 | 0.015 *** | 0.003 | -0.00004 ** | 0.000 |
| 7 | 0.011 *** | 0.003 | 0.018 *** | 0.004 | -0.00005 ** | 0.000 |
| 8 | 0.011 *** | 0.004 | 0.021 *** | 0.005 | -0.00005 *** | 0.000 |
| 9 | 0.013 *** | 0.004 | 0.024 *** | 0.006 | -0.00006 *** | 0.000 |
| 10 | 0.014*** | 0.005 | 0.027 *** | 0.006 | -0.00008 *** | 0.000 |

Notes: Average marginal effects of the baseline model (Table 3), with standard errors obtained by the Delta-method. The first column reports the 11 values of the lagged MPI covariate, in the range of 0 to 10 observed in the sample. Columns 2, 4, and 6 report the values of the marginal effects of lagged BCG on bank risk given the constant reported in the same row of the first column. ***Statistically significant at the 1% level, **Statistically significant at the 5% level, *Statistically significant at the 10% level

**Table 5- Macroprudential policies, bank governance and risk: disaggregating MPI**

| VARIABLES | ZSCORE | DTD | POD | ZSCORE | DTD | POD |
|---|---|---|---|---|---|---|
| $FITI_{t-1}$ | -0.127** | -0.436*** | 0.001* | | | |
| | (0.057) | (0.078) | (0.001) | | | |
| $BTI_{t-1}$ | | | | -0.071 | 0.028 | 0.001 |
| | | | | (0.122) | (0.163) | (0.001) |
| $BCG_{t-1}$ | -0.001 | -0.005* | 3.07e-05** | 0.004** | 0.005** | 2.33e-06 |
| | (0.002) | (0.003) | (0.000) | (0.001) | (0.002) | (0.000) |
| $FITI_{t-1}$ x $BCG_{t-1}$ | 0.002*** | 0.004*** | -1.40e-05*** | | | |
| | (0.001) | (0.001) | (0.000) | | | |
| $BTI_{t-1}$ x $BCG_{t-1}$ | | | | -0.001 | 0.0004 | -6.79e-06 |
| | | | | (0.002) | (0.002) | (0.000) |
| $SIZE_{t-1}$ | -0.079 | -0.570*** | 0.004*** | -0.102 | -0.684*** | 0.004*** |
| | (0.115) | (0.153) | (0.001) | (0.115) | (0.153) | (0.001) |
| $LIQUID_{t-1}$ | 0.113 | -0.286* | -0.001 | 0.106 | -0.263* | -0.001 |
| | (0.109) | (0.150) | (0.001) | (0.109) | (0.151) | (0.001) |
| $COST_{t-1}$ | -0.012*** | -0.012*** | 6.23e-05*** | -0.013*** | -0.012*** | 6.32e-05*** |
| | (0.002) | (0.003) | (0.000) | (0.002) | (0.003) | (0.000) |
| $GDPGR_{t-1}$ | 0.064*** | 0.056*** | 6.04e-06 | 0.066*** | 0.059*** | -1.11e-05 |
| | (0.013) | (0.017) | (0.000) | (0.013) | (0.017) | (0.000) |
| $INFLAT_{t-1}$ | 0.009 | -0.001 | -6.59e-05 | 0.005 | 0.002 | -4.72e-05 |
| | (0.009) | (0.012) | (0.000) | (0.009) | (0.012) | (0.000) |
| $MCONC_{t-1}$ | -0.017*** | -0.013** | -3.13e-05 | -0.017*** | -0.012** | -2.88e-05 |
| | (0.004) | (0.005) | (0.000) | (0.004) | (0.005) | (0.000) |
| $ENFIND_{t-1}$ | 2.006*** | 1.876*** | -0.014*** | 2.058*** | 1.868*** | -0.014*** |
| | (0.332) | (0.434) | (0.002) | (0.332) | (0.438) | (0.002) |
| Constant | 5.424** | 13.760*** | -0.059*** | 5.490*** | 14.72*** | -0.059*** |
| | (2.105) | (2.789) | (0.013) | (2.109) | (2.819) | (0.013) |
| Bank fixed effects | YES | YES | YES | YES | YES | YES |
| Year dummies | YES | YES | YES | YES | YES | YES |
| R-sq. within | 0.231 | 0.317 | 0.229 | 0.227 | 0.302 | 0.226 |
| R-sq. overall | 0.0541 | 0.148 | 0.0361 | 0.0514 | 0.148 | 0.0336 |
| Observations | 1,949 | 1,908 | 1,908 | 1,949 | 1,908 | 1,908 |
| Banks | 349 | 341 | 341 | 349 | 341 | 341 |
| Countries | 49 | 47 | 47 | 49 | 47 | 47 |

Notes: *** Statistically significant at the 1% level, ** Statistically significant at the 5% level, *Statistically significant at the 10% level; Standard errors in parenthesis; All the variables are defined in Appendix I.

**Table 6 – Macroprudential policies, bank governance and risk: Developed vs Developing countries**

| | ZSCORE | | DTD | | POD | |
|---|---|---|---|---|---|---|
| VARIABLES | Developed | Developing | Developed | Developing | Developed | Developing |
| $MPI_{t-1}$ | -0.355*** | 0.054 | -0.272*** | -0.240*** | 0.002** | 0.0004*** |
| | (0.073) | (0.069) | (0.099) | (0.086) | (0.001) | (0.000) |
| $BCG_{t-1}$ | -0.004 | 1.57e-05 | -0.005 | 0.001 | 4.39e-05** | 1.20e-05 |
| | (0.003) | (0.004) | (0.004) | (0.005) | (0.000) | (0.000) |
| $MPI_{t-1}$ x $BCG_{t-1}$ | 0.003*** | 0.0003 | 0.004*** | 0.0009 | -1.75e-05** | -4.16e-06* |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) |
| $SIZE_{t-1}$ | 0.253* | 0.255 | -0.124 | -1.581*** | 0.004*** | 0.003*** |
| | (0.138) | (0.314) | (0.190) | (0.394) | (0.001) | (0.001) |
| $LIQUID_{t-1}$ | 0.035 | -0.752 | -0.245 | -1.122* | -9.57e-05 | 0.001 |
| | (0.111) | (0.465) | (0.158) | (0.588) | (0.001) | (0.001) |
| $COST_{t-1}$ | -0.011*** | -0.011 | -0.011*** | -0.002 | 6.51e-05*** | -2.00e-05 |
| | (0.002) | (0.009) | (0.003) | (0.012) | (0.000) | (0.000) |
| $GDPGR_{t-1}$ | 0.088*** | 0.023 | 0.112*** | -0.018 | -8.07e-06 | 6.11e-05 |
| | (0.018) | (0.019) | (0.024) | (0.024) | (0.000) | (0.000) |
| $INFLAT_{t-1}$ | 0.039 | -0.019* | -0.091*** | 0.001 | -0.0001 | 1.53e-05 |
| | (0.024) | (0.011) | (0.033) | (0.013) | (0.000) | (0.000) |
| $MCONC_{t-1}$ | -0.034*** | -0.011* | -0.022*** | -0.009 | -1.57e-05 | -2.93e-05* |
| | (0.005) | (0.006) | (0.007) | (0.007) | (0.000) | (0.000) |
| $ENFIND_{t-1}$ | 3.271*** | 0.180 | 2.484*** | 1.572** | -0.020*** | -0.006*** |
| | (0.470) | (0.483) | (0.636) | (0.609) | (0.003) | (0.001) |
| Constant | -1.504 | 0.905 | 4.601 | 36.67*** | -0.046** | -0.058*** |
| | (2.478) | (5.873) | (3.403) | (7.364) | (0.018) | (0.016) |
| Bank fixed effects | YES | YES | YES | YES | YES | YES |
| Year dummies | YES | YES | YES | YES | YES | YES |
| R-sq. within | 0.347 | 0.074 | 0.370 | 0.284 | 0.249 | 0.209 |
| R-sq. overall | 0.164 | 0.0103 | 0.410 | 0.0435 | 0.100 | 0.0651 |
| Observations | 1,395 | 554 | 1,364 | 544 | 1,364 | 544 |
| Banks | 262 | 87 | 256 | 85 | 256 | 85 |
| Countries | 24 | 25 | 22 | 25 | 22 | 25 |

Notes: *** Statistically significant at the 1% level, ** Statistically significant at the 5% level, *Statistically significant at the 10% level; Standard errors in parenthesis; All the variables are defined in Appendix I.

**Table 7 – Macroprudential policies, bank governance and risk: estimations over different time periods**

| | ZSCORE | | | DTD | | | POD | | |
|---|---|---|---|---|---|---|---|---|---|
| Variables | Ex. Fin Crisis | 2007-2017 | 2010-2017 | Ex. Fin Crisis | 2007-2017 | 2010-2017 | Ex. Fin Crisis | 2007-2017 | 2010-2017 |
| $MPI_{t-1}$ | -0.096* | -0.095* | -0.080 | -0.262*** | -0.359*** | -0.324*** | 0.001** | 0.001** | 0.001** |
| | (0.054) | (0.049) | (0.054) | (0.068) | (0.065) | (0.068) | (0.000) | (0.000) | (0.000) |
| $BCG_{t-1}$ | -0.002 | -0.0002 | -0.001 | -0.005 | -0.004 | -0.004 | 3.46e-05*** | 3.11e-05** | 3.65e-05*** |
| | (0.003) | (0.002) | (0.003) | (0.003) | (0.003) | (0.003) | (0.000) | (0.000) | (0.000) |
| $MPI_{t-1}$ x $BCG_{t-1}$ | 0.002** | 0.001** | 0.001* | 0.003*** | 0.003*** | 0.003*** | -1.14e-05*** | -1.11e-05*** | -1.11e-05*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) |
| $SIZE_{t-1}$ | -0.128 | -0.207* | -0.405*** | -0.877*** | -0.641*** | -1.078*** | 0.003*** | 0.005*** | 0.003*** |
| | (0.136) | (0.121) | (0.153) | (0.171) | (0.163) | (0.192) | (0.001) | (0.001) | (0.001) |
| $LIQUID_{t-1}$ | 0.117 | 0.105 | 0.040 | -0.645*** | -0.190 | -0.660*** | 0.0004 | -0.001 | 0.001 |
| | (0.146) | (0.111) | (0.162) | (0.191) | (0.154) | (0.213) | (0.001) | (0.008) | (0.001) |
| $COST_{t-1}$ | -0.012*** | -0.011*** | -0.011*** | -0.010*** | -0.012*** | -0.010*** | 3.11e-05*** | 5.94e-05*** | 3.27e-05*** |
| | (0.003) | (0.002) | (0.003) | (0.003) | (0.003) | (0.003) | (0.000) | (0.000) | (0.000) |
| $GDPGR_{t-1}$ | 0.055*** | 0.066*** | 0.053*** | 0.019 | 0.053*** | 0.010 | 0.0002*** | 1.01e-05 | 0.0002*** |
| | (0.014) | (0.013) | (0.014) | (0.018) | (0.017) | (0.017) | (0.000) | (0.000) | (0.000) |
| $INFLAT_{t-1}$ | 0.003 | 0.008 | 0.002 | 0.003 | 3.07e-07 | 0.002 | -7.24e-05 | -5.76e-05 | -7.32e-05 |
| | (0.001) | (0.009) | (0.009) | (0.012) | (0.012) | (0.012) | (0.000) | (0.000) | (0.000) |
| $MCONC_{t-1}$ | -0.015*** | -0.015*** | -0.008 | -0.004 | -0.012** | 0.002 | -4.62e-05** | -3.34e-05 | -7.00e-05*** |
| | (0.005) | (0.004) | (0.005) | (0.006) | (0.008) | (0.007) | (0.000) | (0.000) | (0.000) |
| $ENFIND_{t-1}$ | 1.694*** | 1.815*** | 1.063*** | 1.366*** | 1.929*** | 0.893* | -0.007*** | -0.015*** | -0.005** |
| | (0.382) | (0.338) | (0.399) | (0.476) | (0.448) | (0.502) | (0.002) | (0.002) | (0.002) |
| Constant | 6.479** | 7.362*** | 11.410*** | 18.950*** | 13.750*** | 23.070*** | -0.043*** | -0.069*** | -0.053*** |
| | (2.513) | (2.241) | (2.846) | (3.146) | (3.004) | (3.590) | (0.012) | (0.015) | (0.014) |
| Bank fixed effects | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Year dummies | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| R-sq. within | 0.153 | 0.204 | 0.115 | 0.205 | 0.316 | 0.223 | 0.124 | 0.228 | 0.123 |
| R-sq. overall | 0.0585 | 0.0625 | 0.0685 | 0.0886 | 0.129 | 0.0690 | 0.0415 | 0.0316 | 0.0354 |
| Observations | 1,703 | 1,838 | 1,592 | 1,670 | 1,799 | 1,561 | 1,670 | 1,799 | 1,561 |
| Banks | 349 | 349 | 349 | 341 | 341 | 341 | 341 | 341 | 341 |
| Countries | 49 | 49 | 49 | 47 | 47 | 47 | 47 | 47 | 47 |

Notes: *** Statistically significant at the 1% level, ** Statistically significant at the 5% level, *Statistically significant at the 10% level; Standard errors in parenthesis; All the variables are defined in Appendix I.

**Table 8 – Macroprudential policies, bank governance and risk: controlling for microprudential regulations and national culture**

| VARIABLES | ZSCORE | DTD | POD | ZSCORE | DTD | POD | ZSCORE | DTD | POD |
|---|---|---|---|---|---|---|---|---|---|
| $MPI_{t-1}$ | -0.054 | -0.248*** | 0.001 | -0.085** | -0.267*** | 0.001*** | -0.080* | -0.259*** | 0.001*** |
| | (0.054) | (0.071) | (0.000) | (0.040) | (0.052) | (0.000) | (0.042) | (0.055) | (0.000) |
| $BCG_{t-1}$ | -0.0003 | -0.004 | 2.51e-05* | -0.002 | -0.007*** | 4.53e-05*** | -0.001 | -0.008*** | 3.27e-05*** |
| | (0.002) | (0.003) | (0.000) | (0.002) | (0.003) | (0.000) | (0.002) | (0.003) | (0.000) |
| $MPI_{t-1}$ x $BCG_{t-1}$ | 0.001** | 0.002** | -9.33e-06** | 0.002*** | 0.004*** | -1.46e-05*** | 0.002** | 0.004*** | -1.20e-05*** |
| | (0.001) | (0.001) | (0.000) | (0.001) | (0.001) | (0.000) | (0.001) | (0.001) | (0.000) |
| $ACTRS_{t-1}$ | 0.215*** | 0.166*** | -0.0004* | | | | 0.113*** | 0.105*** | -0.0001 |
| | (0.035) | (0.046) | (0.000) | | | | (0.024) | (0.032) | (0.000) |
| $CAPRQ_{t-1}$ | 0.020 | -0.015 | 0.0003 | | | | -0.011 | -0.058** | 0.0002* |
| | (0.027) | (0.037) | (0.000) | | | | (0.022) | (0.029) | (0.000) |
| CULT_PC1 | | | | 0.059 | -0.068 | 0.001*** | -0.007 | -0.010 | 0.001*** |
| | | | | (0.052) | (0.063) | (0.000) | (0.056) | (0.069) | (0.000) |
| CULT_PC2 | | | | -0.132** | -0.474*** | 0.001*** | -0.157** | -0.315*** | 0.001*** |
| | | | | (0.058) | (0.070) | (0.000) | (0.062) | (0.077) | (0.000) |
| Constant | 1.393 | 7.589** | -0.046*** | 7.307*** | 8.012*** | -0.012*** | 6.064*** | 6.483*** | -0.010*** |
| | (2.328) | (3.044) | (0.014) | (0.568) | (0.724) | (0.002) | (0.672) | (0.869) | (0.003) |
| Bank fixed effects | YES | YES | YES | NO | NO | NO | NO | NO | NO |
| Year dummies | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Control variables | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| R-sq. within | 0.222 | 0.344 | 0.192 | | | | | | |
| R-sq. overall | 0.0912 | 0.198 | 0.0432 | 0.258 | 0.419 | 0.251 | 0.260 | 0.435 | 0.256 |
| Observations | 1,745 | 1,704 | 1,704 | 1,841 | 1,858 | 1,858 | 1,695 | 1,654 | 1,654 |
| Banks | 342 | 334 | 334 | 328 | 332 | 332 | 333 | 325 | 325 |
| Countries | 48 | 46 | 46 | 43 | 44 | 44 | 45 | 43 | 43 |

Notes: *** Statistically significant at the 1% level, ** Statistically significant at the 5% level, *Statistically significant at the 10% level; Standard errors in parenthesis; All the regressions also include the following variables, which are not shown to conserve space: SIZE, LIQUID, COST, GDPGR, INFLAT, MCONC, ENFIND; All the variables are defined in Appendix I.

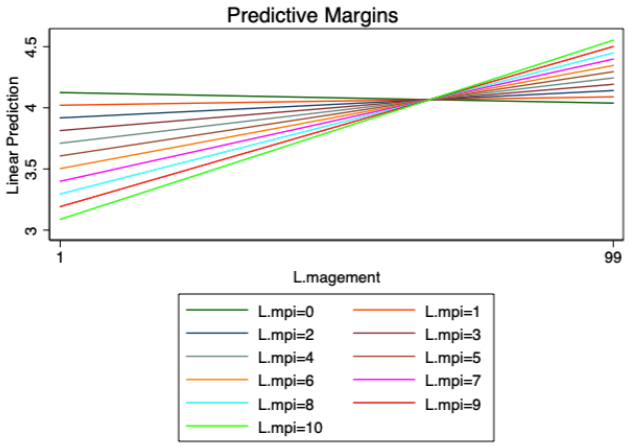
**Table 9 – Macroprudential policies, bank governance and risk: Shareholder rights index**

| VARIABLES | ZSCORE | DTD | POD |
|---|---|---|---|
| $MPI_{t-1}$ | -0.117** | -0.280*** | 0.001* |
| | (0.050) | (0.066) | (0.000) |
| $BSHR_{t-1}$ | -0.003* | -0.004 | 2.83e-05** |
| | (0.002) | (0.003) | (0.000) |
| $MPI_{t-1}$ x $BSHR_{t-1}$ | 0.002** | 0.002** | -8.39e-06** |
| | (0.001) | (0.001) | (0.000) |
| $SIZE_{t-1}$ | -0.084 | -0.609*** | 0.004*** |
| | (0.116) | (0.154) | (0.001) |
| $LIQUID_{t-1}$ | 0.107 | -0.297** | -0.0003 |
| | (0.109) | (0.151) | (0.001) |
| $COST_{t-1}$ | -0.013*** | -0.012*** | 6.37e-05*** |
| | (0.002) | (0.003) | (0.000) |
| $GDPGR_{t-1}$ | 0.067*** | 0.060*** | -1.19e-05 |
| | (0.013) | (0.017) | (0.000) |
| $INFLAT_{t-1}$ | 0.005 | -0.007 | -5.29e-05 |
| | (0.009) | (0.012) | (0.000) |
| $MCONC_{t-1}$ | -0.017*** | -0.012** | -2.77e-05 |
| | (0.004) | (0.005) | (0.000) |
| $ENFIND_{t-1}$ | 1.976*** | 1.827*** | -0.014*** |
| | (0.332) | (0.437) | (0.002) |
| Constant | 5.627*** | 14.290*** | -0.058*** |
| | (2.110) | (2.806) | (0.013) |
| Bank fixed effects | YES | YES | YES |
| Year dummies | YES | YES | YES |
| R-sq. within | 0.226 | 0.306 | 0.228 |
| R-sq. overall | 0.0546 | 0.136 | 0.0350 |
| Observations | 1,949 | 1,908 | 1,908 |
| Banks | 349 | 341 | 341 |
| Countries | 49 | 47 | 47 |

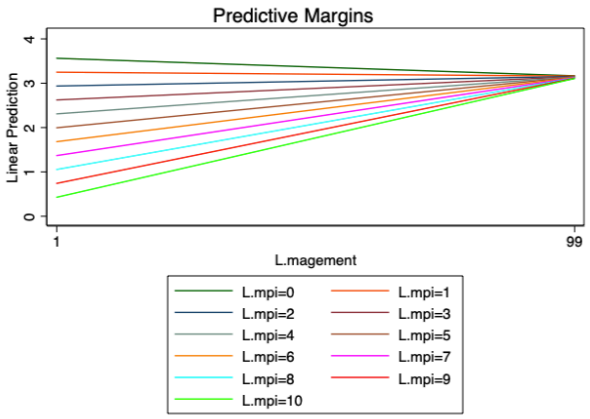
Notes: *** Statistically significant at the 1% level, ** Statistically significant at the 5% level, *Statistically significant at the 10% level; Standard errors in parenthesis; All the variables are defined in Appendix I.

**Figure 1 - Average margins showing the moderating effect of BCG on bank risk measures for different values of MPI**

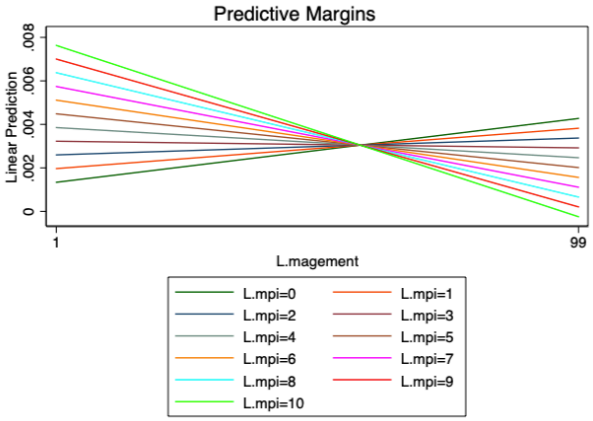
(a) - ZSCORE




(b) - DTD




(c) - POD



## Appendix I – Definitions and construction of variables

| Acronym | Definition and Source |
|---|---|
| **ZSCORE** | Natural logarithm of Z-score, calculated as the summation of the average return on assets (ROA) ratio and the average equity to assets ratio, divided by the standard deviation of ROA, over a 3-years rolling time window. Higher figures denote higher bank stability or else lower risk (Source: Authors' calculations using data from S&P Global Market Intelligence database-formerly known as SNL) |
| **ZRAR** | Average return on assets (ROA) divided by the standard deviation of ROA, over a 3-years rolling time window. Higher figures denote higher risk-adjusted returns (Source: Authors' calculations using data from S&P Global Market Intelligence database-formerly known as SNL) |
| **ZRAC** | Average equity to assets ratio divided by the standard deviation of ROA, over a 3-years rolling time window. Higher figures denote higher risk adjusted capitalization (Source: Authors' calculations using data from S&P Global Market Intelligence database-formerly known as SNL) |
| **DTD** | Distance to default (DTD) indicator that reveals how far away a firm is from default. A volatility adjusted leverage measure based on Merton (1974), that accounts for differences in the capital structure of financial institutions through an adjustment method put forward by Duan (2010). The model parameters are estimated by the transformed-data maximum likelihood method, first proposed first by Duan (1994) and subsequently modified by Duan (2010) and Duan et al. (2012). (Source: Credit Research Initiative -CRI, National University of Singapore) |
| **POD** | Indicator of probability of default that reflects the default risk of publicly listed firms by quantitatively analyzing numerous covariates that cover market-based and accounting-based firm-specific attributes, as well as macro-financial factors. The estimations are based on the forward intensity model of Duan et al. (2012), that is governed by two independent doubly stochastic Poisson processes. The CRI POD used in the present study has a prediction horizon of 12 months. (Source: Credit Research Initiative -CRI, National University of Singapore) |
| **BTI** | Borrower-Targeted Macroprudential Instruments Index. The index takes values between 0 and 1, adding 1 for each one of the following macroprudential policies that are in force in a given country: (i) Loan-to-Value Ratio Caps (LTV_CAP), (ii) Debt-to-Income Ratio (DTI). In theory, BTI may take values between 0 and 2. (Source: Updated version of Cerutti et al., 2017) |
| **FITI** | Financial Institution-Targeted Macroprudential Instruments Index. The index takes values between 0 and 1, adding 1 for each one of the following macroprudential policies that are in force in a given country: (i) General Countercyclical Capital Buffer/Requirement (CTC), (ii) Leverage Ratio (LEV), (iii) Capital Surcharges on Systemically Important Financial Institutions (SIFI), (iv) Time-Varying/Dynamic Loan-Loss Provisioning (DP), (v) Limits on Interbank Exposures (INTER), (vi) Limits the fraction of assets held by a limited number of borrowers (CONC), (vii) Limits on Foreign Currency Loans (FC), (viii) Limits on Domestic Currency Loans (CG), (ix) FX and/or Countercyclical Reserve Requirements (RR_REV), (x) Levy/Tax on Financial Institutions (TAX). In theory, FITI may take values between 0 and 10. (Source: Updated version of Cerutti et al., 2017) |
| **MPI** | Macroprudential policies index. Summation of BTI and FITI. MPI may take values between 0 and 12. (Source: Updated version of Cerutti et al., 2017) |

**MPCAP** Index of Capital related financial institution-targeted macroprudential policies, constructed on the basis of (i), (ii), (iii) from FITI. In theory, MPCAP may take values between 0 and 3. (Source: Updated version of Cerutti et al., 2017)

**MPOTHER** Index of Non-capital related financial institution targeted macroprudential policies, constructed on the basis of (iv) to (x) from FITI. In theory, MPOTHER may take values between 0 and 7. (Source: Updated version of Cerutti et al., 2017)

**BCG** Bank corporate governance indicator, that reflects a bank's commitment and effectiveness towards following corporate governance principles. BCG is constructed on the basis of the following information along three dimensions.

(I) Board Functions: (1) Does the company have a policy for maintaining effective board functions? (2) Average overall attendance percentage of board meetings as reported by the company? (3) Does the company have a succession plan for executive management in the event of unforeseen circumstances? (4) Does the board or board committees have the authority to hire external advisers or consultants without management's approval? (5) Percentage of independent board members on the audit committee as stipulated by the company, (6) Does the company report that all audit committee members are non-executives? (7) Percentage of independent board members on the compensation committee as stipulated by the company (8) Does the company report that all compensation committee members are non-executives? (10) Percentage of non-executive board members on the nomination committee (11) Percentage of nomination committee members who are significant shareholders (more than 5%) (12) Does the company publish information about the attendance of the individual board members at board meetings?

(II) Board Structure: (1) Does the company have a policy for maintaining a well-balanced membership of the board? (2) Total number of board members which are in excess of ten or below eight, (3) Does the company describe the professional experience or skills of every board member? OR Does the company provide information about the age of individual board members? (4) Percentage of female on the board, (5) Percentage of board members who have either an industry specific background or a strong financial background, (6) Average number of years each board member has been on the board, (7) Percentage of non-executive board members, (8) Percentage of independent board members as reported by the company, (9) Does the CEO simultaneously chair the board or has the chairman of the board been the CEO of the company? (10) Average number of other corporate affiliations for the board member, (11) Are all board member individually subject to re-election (no classified or staggered board structure)?

(III) Compensation Policy: (1) Does the company have a policy for performance-oriented compensation that attracts and retain the senior executives and board members? (2) Does the company have the necessary internal improvement and information tools for the board members to develop appropriate compensation/remuneration to attract and retain key executives? (3) Is the CEO's compensation linked to total shareholder return (TSR)? (4) The total compensation paid to all senior executives (if total aggregate is reported by the company, (5) Does the company require that shareholder approval is obtained prior to the adoption of any stock based compensation plans? (6) Does the company provide information about the total individual compensation of all executives and board members? (7) Highest remuneration package within the company in US dollars, (8) Is the management and board members remuneration partly linked to objectives or targets which are more than two years forward looking? (9) Is the senior executive's compensation linked to CSR/H&S/Sustainability targets?

This variable is constructed by equally weighting and z-scoring all underlying data points and comparing them against all companies in the ASSET4 universe. Consequently, the score

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| | used is a relative measure of corporate governance performance that takes values between 0 and 100. (Source: ASSET4, Datastream) |
| **BSR** | Bank shareholder rights indicator that is associated with policies related to the equal treatment of shareholders and the use of anti-takeover devices. BSR is constructed on the basis of the following information: (i) Does the company have a policy for ensuring equal treatment of minority shareholders, facilitating shareholder engagement or limiting the use of anti-takeover devices? (ii) The percentage of maximum voting rights allowed or ownership rights, (iii) Are the company's board members elected with a majority vote? (iv) Do the company's shareholders have the right to vote on executive compensation? (v) Are the company's articles of association, statutes or bylaws publicly available? (vi) Does the biggest owner (by voting power) hold the veto power or own golden shares? (vii) Is the company a State Owned Enterprise (SOE)? (viii) Are all shares of the company providing equal voting rights? (ix) The number of anti-takeover devices in place in excess of two. (Source: ASSET4, Datastream) |
| **SIZE** | Natural logarithm of total assets (Source: S&P Global Market Intelligence database-formerly known as SNL) |
| **LIQUID** | Ratio of Total deposits from customers to total assets (Source: S&P Global Market Intelligence database-formerly known as SNL) |
| **COST** | Ratio of Operating expenses to operating income (Source: S&P Global Market Intelligence database-formerly known as SNL) |
| **GDPGR** | Annual GDP Growth (Source: World Development Indicators, World Bank) |
| **INFLAT** | Annual inflation rate (Source: World Development Indicators, World Bank) |
| **MCONC** | Assets of three largest commercial banks as a share of total commercial banking assets (Source: Global Financial Development Database, World Bank) |
| **ENFIND** | Enforcement index that reflects the institutional environment in terms of rule of law, regulatory quality, and control of corruption. Calculated as the average of these three dimensions. Higher values denote a better institutional environment. Source: Authors' calculations based on data from the Worldwide Governance Indicators (WGI) project – World Bank. |
| **ACTRS** | Index of restrictions on banking activities, along the following three dimensions: (i) Securities activities, (ii) Insurance activities, (iii) Real estate activities. In each case, the sub-indicator may take the values of 1 (unrestricted), 2 (permitted), 3 (restricted) or 4 (prohibited). ACTRS is being constructed by taking the summation along the three dimensions. Thus, in theory it takes values between 3 and 12, with higher figures reflecting more restrictive regulatory environment (Source: Barth et al., 2013) |
| **CAPRQ** | Capital requirements index. The index reflects the following two dimensions:<br>(I) Initial requirements, based on the following three questions: (1) Are the sources of funds to be used as capital verified by the regulatory/supervisory authorities? (2) Can the initial disbursement or subsequent injections of capital be done with assets other than case or government securities, (3) Can initial disbursement of capital be done with borrowed funds?<br>(II) Overall capital stringency, based on the following questions: (1) Is the capital ratio risk-weighted in line the Basel guidelines? (2) Does the minimum ratio vary as a function of an individual bank's credit risk? (3) Does the minim ratio vary as a function of market risk? (4-6) Before minimum capital adequacy is determined, which of the following are deducted from the book value capital? (i) market value of loan losses not realized in accounting books? (ii) Unrealized losses in securities portfolios? (iii) Unrealized foreign exchange losses? (7) What fraction of revaluation gains is allowed as part of capital?<br>CAPRQ takes values between 0 and 1, with higher values indicating greater stringency (Source: Barth et al., 2013) |

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| **CULTPC** | Scores from a principal component analysis of the following national culture indicators from Hofstede's framework: uncertainty avoidance, individualism, power distance and masculinity. (Source: Authors' calculations using data from Hofstede Insights) |