Macro-prudential Regulations and Systemic Risk: The Role of Country-level Governance Indicators

Abstract:

This paper empirically examines the moderating role of country-level governance indicators (CGIs) in the relationship between macro-prudential policy instruments (MPI) and systemic risk. Results from 68 countries, involving the period 2000-2017, show that CGIs in terms of corruption controls, government effectiveness, regulatory quality, and rule of law play a negative moderating role in the MPI-systemic risk nexus. Countries scoring high (low) on these CGIs experience stability benefits (instability costs) from MPIs. These findings suggest that the mere implementation of macro-prudential regulations may not perform the intended function of systemic stability. Overall, institutional development in a country's governance ecosystem is necessary, hence, a coordinated effort is required from all the stakeholders of the country.

Keywords: Systemic risk, Macro-prudential regulations, Country-level governance indicators, Structural stability.

1. Introduction

The Global Financial Crisis (GFC) of 2007-09 exposed, among others, two major challenges for Financial Institutions (FIs) in playing their role in the current financial systems. First, FIs are prone to contagion risk arising from correlated payoffs. FIs strive for the diversification of risk like many other businesses by including different asset classes in their investment portfolios. However, in line with the efficient frontier framework, most FIs may end up investing in similar efficient assets, which may generate highly correlated rewards, often quoted as the overlapping portfolio problem (Poledna et al., 2021). This results in highly interdependent and interconnected FIs (Goldin & Vogel, 2010). Regulations for managing the idiosyncratic risk, which covers only individual bank-level shocks (Benoit et al. 2017; Hartmann et al., 2009), may not work effectively to control the systematic shocks that lead to contagion risk of the financial system (Suh, 2019). Furthermore, FIs over(under) estimate risks during the low(high) economic growth cycles which are commonly known as pro-cyclicality (Kouretas et al., 2020; Neef & Schandlbauer, 2020; Ibrahim, 2016; Athanasoglou et al., 2014). Any economic shock, such as the GFC, results in deteriorating financial consequences for FIs. In the events of such systemic shocks, both these issues group together and rapidly chock the whole financial system.

Micro-prudential regulations focus on the stability of individual FI. However, the two problems discussed above are not idiosyncratic. The fragility of FIs to the interconnectedness demands a system-level regulatory framework. During the episode of the GFC, regulators around the world learned this lesson the hard way, and such macro-prudential regulations were introduced to deal with system-level systemic risk (Hanson et al., 2011; Williams, 2015; Hancock, 2019).

The paradigm shifts in the regulatory frameworks motivated researchers to study the objectives, implementation, and effectiveness of macro-prudential policy instruments (MPIs) and their relationship with monetary policy (Tayler & Zilberman, 2016; Karmakar, 2016; Rubio & Carrasco-Gallego, 2016; Agénor & Silva, 2014; Galati & Moessner, 2013). The growing literature in this domain stresses that the development and implementation of macro-prudential regulations have been done in response to the GFC debacle based on limited research and analytical tools (Galati & Moessner, 2013) and more work is needed in these areas for the prevention of any future crisis (Davis & Karim, 2020). Vodenska, et al., (2020) recommend that the emphasis should be on devising and implementing suitable MPIs.

The existing literature studies the association of macro-prudential regulations with financial, credit, and housing cycle (Lambertini et al., 2013), credit cycles and capital flows (Fendoğlu, 2018), bank risks (Altunbas et al., 2018), foreign exchange regulations (Ahnert et al., 2021), and real exchange rate risk (Ouyang & Guo, 2019). Our paper, however, contributes to the literature on macro-prudential regulations and systemic risk. In this domain, Meuleman and Vander Vennet (2020) conclude that on average, banks have benefited from the enforcement of macro-prudential policies in Europe. Ailian et al., (2020) find that systemic risk is controlled by monetary policy in the short term while it is controlled by macro-prudential regulations in the long term in China. However, Rizwan (2021) studies the macro-prudential regulations and systemic risk nexus in a cross-country setting. The findings of the study reveal that there exists cross-country heterogeneity, i.e., jurisdictions at higher (lower) levels of economic development experience systemic stability benefits (costs) of macro-prudential regulations. Such heterogeneity is important to explore for

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policymakers to choose among different macroprudential instruments which are most suited to their socio-economic system. Therefore, investigating the factors behind such a variation is essential because it may have valuable policy implications for both global (i.e., Basel Committee on Banking Supervision (BCBS)) and local regulators.

Rizwan (2021), after observing the cross-country heterogeneity, argued that the institutional quality of a country may be the missing link. As described by North, (1990, p. 3) "Institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction. In consequence, they structure incentives in human exchange, whether political, social, or economic". As suggested by Uddin et al., (2020), the culture and behaviour of a society have a significant influence on the institutions, and the behaviour of the stakeholders of the financial sector is no exception. As "a seed needs a fertile soil to grow"[1], arguably, the efficacy of macro-prudential regulations depends upon the institutional ecosystem (Omori, 2023; Dutra et al., 2023). We argue that institutional quality can play a "complimentary" or "substitutional" role in the MPI-systemic risk relationship. Under the complementarity hypothesis, institutional quality may positively influence the behaviour of the financial stakeholders, such that the regulations may be implemented and monitored in true spirit and may have intended positive outcomes. Under such a situation, we may observe that as institutional quality increases in a country, macro-prudential regulations may have higher efficacy in controlling systemic risk and vice versa. Under the substitutional hypothesis, higher levels of institutional quality may make financial stakeholders more responsible and consequently, MPIs may become irrelevant. If this is the case then it can be observed that as a country goes up on the ladder of institutional quality, it may not need extra strict macro-prudential regulations as these may have lower efficacy or relevance in controlling systemic risk and vice versa. We used six aspects of country-level governance indicators to measure institutional quality, i.e., Corruption Control (CC), Government Effectiveness (GE), Political Stability, and Absence of Violence/Terrorism (PS), Regulatory Quality (RQ), Rule of Law (RL), and Voice and Accountability (VA), and studied if the efficacy of macro-prudential regulations is shaped by these institutional development aspects.

Full sample results show support for the complementarity hypothesis where among six institutional indicators, CC, GE, RQ, and RL have a significantly negative moderating effect on the overall MPI-systemic risk relationship. This suggests that jurisdictions scoring high (low) on these indicators have higher (lesser) efficacy of MPIs in terms of systemic stability. However, interesting results emerge from subsample analysis. We find evidence of the complementarity hypothesis in low and lower-middle-income countries while the substitutional hypothesis is in upper-middle-income countries. For high-income countries, we find mixed results as corruption control and government effectiveness show significantly negative while voice and accountability show positive moderating effects. Subsample analysis based upon institutional indicators shows that in jurisdictions where institutional quality is low, MPIs show instability costs while in jurisdictions with moderate and high levels of institutional quality, MPIs have stability benefits.

These findings have important policy implications. For global regulators, such as Basel, it is important to understand that the efficacy of regulations depends upon the institutional development of the country. Developing macro-

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prudential regulations and applying those on global levels may not serve the intended purpose rather local institutional factors must also be considered. For local regulators, it is important to understand that to get the intended results of the regulatory framework, a holistic approach is required where all the stakeholders should work together. Institutional development is very important for a resilient banking system.

The rest of the paper is organized as follows: the next section (Section 2) provides relevant literature, followed by the discussion of the data, variables, and econometric methodology in Section 3, results and discussion in Section 4 and the conclusion of the study in Section 5.

2. Literature Review

In this section, we briefly discuss the role of FIs in the current business and economic environment, which is followed by a discussion on the requirement of macro-prudential regulations in the current financial ecosystem. In the end, the importance of country-level governance indicators for the effective use of macro-prudential regulations is discussed.

2.1 Role of Financial Institutions

FIs are intermediaries that play an unequivocal role in the economy. As outlined by the theory of financial intermediation (Allen, & Santomero, 1997; Campbell & Kracaw, 1980), the primary function of FIs is intermediation through which information asymmetry is cut off between funds' 'long' and 'short' position holders (Sharpe, 1990). This helps in efficient capital formulation, which ultimately leads to an acceleration in economic growth (Sevena & Yetkinerb, 2016; Galbis, 2007; HAO, 2006; Bencivenga & Smith, 1991). FIs also perform agency and utility functions that are essential for business enterprises (Chuluun, 2015; Fernando et al., 2015; Jääskeläinen & Maula, 2014; Henderson & Tookes, 2012; Huanga et al., 2008). These functions have a significant contribution to a country's economic growth. However, an equally important consideration is that FIs are business entities that strive for profit maximization. For FIs, profits mainly come from interest margins, a reward for taking risks (Shahidul Islam & Nishiyama, 2016; Entrop et al., 2015; Lin et al., 2012; López-Espinosa et al., 2011; LazarusAngbazo, 1997; Shahin, 1996).

As per the theory on bank risk-taking (Akerlof et al., 1993; Calomiris & Kahn, 1991; Diamond & Dybvig, 1983), in the presence of implicit and/or explicit depositors' protection, FIs tend to take higher risks to earn higher rewards, commonly known as the moral hazard problem (Antzoulatos & Tsoumas, 2014). Another issue relates to the procyclicality of financial institutions whereby, FIs over(under) estimate the risks during periods of low(high) economic growth (Kouretas et al., 2020; Neef & Schandlbauer, 2020; Ibrahim, 2016; Athanasoglou et al., 2014). Theoretical explanation of this behaviour can be linked to the disaster myopia hypothesis, which sheds light on the times when investors become too optimistic, and this kind of optimism pushes them to disregard relevant information and the mounting degree of risk (Cornand & Gimet, 2012). These issues in the business models of FIs lead to excessive and imprudent risk-taking behaviour that makes the whole financial system vulnerable to systemic instability due to the interconnectedness, interdependency, and complexity of FIs (Goldin & Vogel, 2010). The GFC is a textbook example of these problems in the financial systems.

2.2 Macro-prudential Regulations

The need for financial regulations in the banking system can be justified by the public interest theory (Hantke-Domas, 2003) which postulates that government action is necessary for some businesses, such as banking, to safeguard the public interest and therefore, rules are necessary for the regulatory framework to protect the integrity and stability of the financial system by constraining actions that can be detrimental to the general welfare. In the pre-GFC era, primarily regulations were focused on monitoring FIs' risk-taking at a micro-level. However, it appeared that managing micro-level risks was not enough as small risks built up to become system-wide stress points (Evant, 2010). As a response to the GFC, regulatory frameworks went under strict scrutiny to make regulators more vigilant and financial systems more resilient. In addition to managing micro-risks through micro-prudential regulations, regulators focused on managing macro-risks of financial systems through a macro-prudential regulatory framework. This development opened space for a variety of questions regarding the effect of these regulations on economic systems.

One strand of literature studies the broader macroeconomic outcomes of macro-prudential regulations. Tayler and Zilberman (2016) compared the role played by macro-prudential policies with monetary policy and the results of their study concluded that monetary policy is less effective in terms of improving financial welfare as compared to macro-prudential policies. Similarly, Karmakar (2016) developed a dynamic stochastic general equilibrium model (DSGE) and found that countercyclical, as well as higher capital requirements, result in the reduction of volatility and, generate prosperity. By utilizing the same DSGE model, Rubio and Carrasco-Gallego (2016) report that to increase the stability of the economic and financial system, aggressive monetary policy should be employed which must be supported with rigorous capital regulations. Meeks (2017) observes that the contractionary consequences of micro-prudential regulations can be compensated by employing a relatively simpler monetary policy along with macro-prudential regulations. Other studies on macro-prudential regulations, monetary policy, and the subsequent financial, as well as economic outcomes, include but are not limited to, (Ely et al., 2021; Nakatani, 2020; Kinghan et al., 2019; Ozge & Jane, 2018; Bassett & Marsh, 2017; Agénor & Silva, 2014; English & Shahin, 1994).

Another strand of literature sheds light on the effect of macro-prudential regulations on the banking sector. Yener et al., (2018) examined the nexus between macro-prudential tools and banks' risk-taking and reported a negative association between macro-prudential policy and banks' risk. In a large sample of 133 countries, Gaganis et al., (2021) found a negative relationship between macro-prudential policies and the profit efficiency of banks. However, the authors argue that the truly appropriate conclusion of macro-prudential policies from a regulatory perspective is systemic stability and not profit efficiency.

The strand of literature that relates macro-prudential regulations with systemic stability is quite scarce. Bluhm and Krahnen, (2014) highlight the existence of disagreement between optimal macro-prudential capitalization and reasonable systemic risk charge from the regulator's perspective. Meuleman and Vander Vennet (2020) empirically examined the macro-prudential policies-bank systemic risk nexus in European countries between 2007 and 2017. They found that on average banks have received stability benefits from macro-prudential regulations because of the credit growth instruments and limits on the exposure risk as these two factors were instrumental in the sliding effect on the

systemic risk. Ailian et al., (2020) investigated the association between financial system-level risk and macro-prudential regulations in China and reported a negative association.

Contributing to this strand of literature, Rizwan (2021) found a negative association between macro-prudential regulations and the systemic risk covering a relatively large sample of 68 countries during a period from 2000 to 2017. However, the results of the study reveal that this association is not consistent for countries at varying levels of economic development. Countries with higher (lower) economic development have systemic (in)stability benefits(costs). The author argues that these contrasting findings may be due to the institutional factors of countries. Building on the findings of heterogeneous systemic outcomes, this study fills this vital gap and investigates the role of institutional factors in the efficacy of macro-prudential regulations.

2.3 Institutional Quality and Financial Systems

Institutional theory (Amenta & Ramsey, 2010) comprehends how institutions influence a nation's social and economic environment by means of institutional quality. Institutions are a set of rules and norms that societal stakeholders follow when interacting with one another and they shape incentives in human exchange, whether political, social, or economic (North, 1990). They also have a significant impact on the culture and behaviour of a society, and the financial sector is not an exception (Uddin et al., 2020). Arguably, the efficacy of macro-prudential regulations depends upon the institutional ecosystem. There will always be certain loopholes to exploit in prudential regulations, and especially, less developed, and low-income sovereigns suffer the most from such loopholes (Wang & Sun, 2019). Certain flaws exist in administration and organization (Mertzanis, 2020), monitoring leniency (Ahamed & Mallick, 2017), political and diplomatic meddling and obstruction (Charnock, 2009), relatively compromised accounting and auditing environment (Benkraiem et al., 2021), legal structure issues (Genta-Fons, 2007), and corruption and exploitation (Sami et al., 2017). We argue that the inefficacy of macro-prudential regulations in less developed countries may be explained by these institutional factors.

Omori (2023) found that institutions are very important to improving a country's banking supervision by examining the relationship between the independence of the central bank and the rule of law on banking supervision for 100 economies from 1973 to 2013. Their findings suggest that higher levels of banking supervision are found in countries with more independent central banks and robust legal systems. Dutra et al. (2023) also report that political institutions play a significant role in channeling the influence of banking regulation on banks' risks. Based upon this strand of literature, we argue that institutional quality can play a "complimentary" or "substitutional" role in the MPI-systemic risk relationship. Under the complementarity hypothesis, institutional quality may positively influence the behaviour of the financial stakeholders, and regulations may be implemented and monitored in true spirit and may have intended positive outcomes. Under the substitutional hypothesis, higher levels of institutional quality may make financial stakeholders more responsible. As a result, MPIs may become irrelevant. All else being equal, under the complementarity (substitutional) hypothesis, as a country's institutional environment develops more, the efficacy and relevance of macro-prudential regulations increase (decrease).

Existing literature reports a significant effect of institutional quality on the functioning of financial institutions. Bahoo (2020) provides a bibliometric review of corruption in banks by highlighting that corruption has negative consequences for banks' lending quality and causes constraints to bank borrowers (firms). Whereas strong institutional and governance mechanisms have a controlling effect on corruption in banks. Ali et al., (2020) examined the role played by corruption in the occurrence of banking crises in 38 countries. Their results show that corruption increases the probability of a banking crisis. They also report that corruption negatively affects banks' lending through excessive risk. Furthermore, corruption matters more in low-income countries than in high-income countries.

Asteriou et al., (2021) investigate the impact of corruption, economic freedom, bank regulation, and transparency on the profitability and stability of banks in 19 Eurozone countries during the period 2005 – 2018. Their findings suggest that corruption and transparency have a negative association with the profitability and stability of Eurozone banks. Ozili (2019) addressed the effect of corruption on income smoothing by African banks. The results show that banks in highly corrupt environments smooth their positive (non-negative) earnings as opposed to smoothing the entire profit distribution. Tao (2020) analyzed the causal effect of the anti-corruption campaign on bank loan loss provisions in China by reporting that loan loss provisions have been significantly reduced in response to the anti-corruption campaign. They conclude that the main motivation for such behaviour during the anti-corruption campaign is risk prevention.

Hasanov & Bhattacharya (2019) look at the role of political factors in the occurrence of the financial crisis. Their findings suggest that household credit growth has a greater impact on the banking crisis as compared to enterprise credit growth. They argue that the government's involvement in the domestic approval rates may increase the credit boom, which may result in a banking crisis. Hou et al., (2018) studied the relationship between shadow banking and cost efficiency while considering the moderating role of political intervention in the Chinese banking sector. Their findings suggest that although shadow banking offers cost efficiency, political intervention weakens this relationship and plays a detrimental role in the cost efficiency of banks.

Papadimitri et al., (2021) examine the effect of political influence on regulatory decision-making in the US banking sector by using data from commercial banks during the period 2000 – 2015. The results highlight that political influence does influence regulatory decision-making as it reduces the probability of receiving regulatory enforcement action. Gazdar & Cherif (2015) discuss financial development and economic growth nexus in MENA countries. The findings reveal that countries with a high score in law and order, bureaucracy, and investment profile have a positive association between banking sector development and economic growth. They conclude that institutional development facilitates the implementation of adequate financial regulatory and supervisory frameworks.

The above discussion highlights that institutional factors influence banks' behaviour and outcomes, providing a base for our argument that the efficacy of macro-prudential regulation may depend upon a country's institutional quality. For empirical investigation in this line of inquiry, we have used six institutional quality aspects i.e., Corruption Control (CC), Government Effectiveness (GE), Political Stability, and Absence of Violence/Terrorism (PS), Regulatory Quality (RQ), Rule of Law (RL), and Voice and Accountability (VA) to assess whether the efficacy of the macro-

prudential regulations depends upon the institutional environment. In the next section, we define these six institutional quality indicators along with other variables, data, and methodology.

3. Data, variables, and methodology

For the empirical investigation of the moderating role that institutional quality aspects play on the systemic risk and macro-prudential policies nexus, freely accessible data on MPIs is utilized, which is compiled by the IMF. This dataset is also used by Cerutti et al., (2017) for the use and effectiveness of macro-prudential policies in 119 countries. The dataset covers 160 countries from 2000 – 2017.[2] However, the selection of the final sample is influenced by the availability of the equity price data of banks on Clarivate's DataStream for the measurement of systemic risk. Furthermore, those countries are dropped from the final sample where the data of the available banks was less than three. The final sample consists of 68 countries that are listed in the table shown in Annex I.

3.1 Variable definitions
3.1.1 Macro-prudential policy instruments (MPIs)

We use the IMF's dataset for this purpose where twelve macroeconomic tools are available, starting from 1) DIT (debt-to-income ratio) which is used for putting restrictions on the liability of the households, 2) DP (time-varying dynamic loan-loss provision) is used by banks as a loan-loss provision to proportionate the business cycle, 3) CTC (general countercyclical capital buffer) is a requirement for banks to keep additional capital during growth periods, 4) LV (leverage ratio) is used for putting restrictions on the leverage ratios of the banks, 5) $SIFI$ is capital surcharges on systemically significant financial institutions, 6) $INTER$ (restrictions on interbank exposures) is a measure that reduces the risk exposure arising from interbank transactions, 7) $CONC$ (concentration restrictions) is used to keep an eye on the overall assets of the bank and restrict its concentration by reducing the portion of assets with a handful of debtors, 8) FC (restrictions on foreign currency loans) is a measure that reduces the banking sector's exposure to foreign currency risk by putting restrictions on the amount of foreign currency loans, 9) CG (restrictions on domestic currency loans) is used to put direct restrictions on the credit growth, 10) TAX (levy/tax on financial institutions) is a measure used for imposing taxes on the revenues of financial institutions, 11) LTV_CAP (caps on loan-to-value ratio) is used to put an additional compulsory cap on the new loans as a measure of loan to value, 12) RR_REV (reserve requirements) is used for the restriction of reserve requirements that are either altered countercyclically or forced as a chunk on foreign currency deposits. All these instruments are dichotomous variables, which means if any sovereign is utilizing them in a year, they take the value of 1, otherwise 0.

Cerutti et al., (2017) analyze the connection between macro-prudential policy instruments and credit growth by aggregating the above-discussed policy instruments in the following groups. 1) borrower (Borrower-Targeted), that are borrower-focused MPIs, and include (LTV_CAP), and (DTI). These MPIs have given a value of 0 if none of the countries uses any of these two in any given year. Similarly, they have given a value of 1, if one of these two MPIs is used by a country in any given year. Finally, if both MPIs are used by any country in any given year, then a value of

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[2] The data is available until 2017 deciding the cut-off point of our sample period.

2 is used. 2) financial (FI-Targeted), that focuses on financial institutions directly. In this case, the sum of all other ten measures is used by developing a range from 0 (a situation where none of the sovereigns uses none of the ten measures in a given year) up to 10 (where all ten measures are used by a sovereign in any given year). Lastly, Cerutti et al., (2017) have utilized the sum of all twelve measures to create an MPI index. Following their index formation technique, we have also utilized the MPI index with twelve individual indicators and two subcategories.

Following existing literature, such as Altunbas et al., (2018), investigate the effects of macro-prudential regulations on the risks of the banks in 61 advanced and emerging countries. They discussed that the classification of MPIs can be further extended into two sub-groups, 1) CYC (cyclical MPIs), which is the collection of those measures that stifle the cyclicality of credit expansion by FIs. For example, (DTI, LTV_CAP), (CG, RR_REV), and (FC), and 2) $NCYC$ (Non-cyclical MPIs) which are there for the enhancement of the financial system's strength. For example, (DP), (CTC), (LEV), $(SIFI)$, $(INTER)$, $(CONC)$, and (TAX). Rizwan (2021) also used these classifications. Following this strand of literature, we use these sub-categories of MPIs in our analysis.

3.1.2 Systemic Risk

Allen et al. (2012) introduced CATFIN as an early warning indicator using both value-at-risk (VaR) and expected shortfall (ES) methodologies. Formally, Allen et al., (2012) introduced three variants of value-at-risk. The non-parametric estimation (VaR_{NP}), the skewed generalized error distribution (VaR_{SGED}), and the generalized Pareto Distribution (VaR_{GPD}). Using forecasting evaluation of macroeconomic shocks, Giglio, et al. (2016) showed superior performance of $CATFIN$ in forecasting macroeconomic shocks. Following Giglio et al., (2016), we employ the non-parametric constituent of $CATFIN$ (VaR_{NP}). As CATFIN is projected on the equity returns data using daily observations of FIs, in line with Rizwan (2021), we convert daily CATFIN into yearly systemic risk indicator using the median value.

3.1.3 Country-level governance indicators

Worldwide governance indicators provided by the World Bank are used as a proxy to gauge the institutional quality aspects of a country. These indicators include 1) Corruption Control (CC) for capturing the use of public power for private gain; 2) Government Effectiveness (GE) which captures the quality of public and civil services; 3) Political Stability and Absence of Violence/Terrorism (PS) that captures the probability of political turbulence and politically driven viciousness including terrorism; 4) Regulatory Quality (RQ) for showing the ability of governments to develop and implement good policies and regulations; 5) Rule of Law (RL) which highlights the quality of contract implementation, property rights, policing and judicial efficacy; and 6) Voice and Accountability (VA) that captures the quality of the democratic process and freedom of speech. Annex III shows how the World Bank describes these aspects.

3.1.4 Other control variables

Several country-specific variables are employed for control purposes in the multivariate analysis. Bank Crisis Dummy ($BNKCD$), sourced from IMF, is utilized for capturing the impact of the banking crisis on systemic risk (Bullard et

al., 2009). If a country experiences a banking crisis, it takes a value of 1 and 0 otherwise. Following Rizwan (2021), six variables are used for controlling the financial development of a country. These variables measure financial institutions and financial market development based on access, depth, and efficiency. These include $FIAI$ (FIs Access Index), $FIDI$ (FIs Depth Index), $FIEI$ (FIs Efficiency Index), $FMAI$ (FIs Market Access Index), $FMDI$ (Financial Market Depth Index), $FMEI$ (Financial Market Efficiency Index). Data on these indices are collected from the IMF's publicly available database. To control for the cyclicality of macroeconomic conditions (Kanas, et al., 2021), the Real GDP Per Capita Growth ($GDPGPC$) is utilized which is collected from the economic indicators reported by the World Bank. Finally, country and time-fixed effects are utilized throughout the estimations for controlling any unobserved effects related to specific countries or periods.

3.2 Econometric Methodology

To discover the role of institutional factors in the efficacy of macro-prudential regulations in mitigating the systemic risk the regression model is given as;

$$CATFIN_{it} = \alpha_0 + \beta_1 MPI_{it} + \beta_2 IF_{it} + \beta_3 IF_{it} \times MPI_{it} + X_{it}\lambda_0 + Country_i\delta + Year_t\gamma + \epsilon_{it}$$

$$(1)$$

In equation (1), $CATFIN_{it}$ is a systemic risk measure, an index of MPI_{it} is macro-prudential policy indicator, IF_{it} is used for institutional factors, $IF_{it} \times MPI_{it}$ is an interactive variable between institutional factors and macro-prudential policy indicators, X_{it} represents country-specific factors, $Country_i$ are dummy variables for the countries, $Year_t$ are used to control for time effects as dummy variables, and ϵ_{it} is the disturbance term. The subscripts i and t are country and time representatives, respectively. Equation (1)'s coefficients α_0, β_1 and β_2 are intercept, the impact of MPI on systemic risk, and the impact of institutional factors on systemic risk, respectively. β_3 is the coefficient that captures the moderating role of institutional factors in the MPI_{it} and systemic risk nexus, λ_0 is a coefficient vector depicting the country-specific control variables, while country and time-fixed effects are represented by coefficient vectors δ and γ, respectively.

In line with Rizwan (2021), we tested the distributional properties of CATFIN and found that it is highly skewed towards 0 and has a numerical range between 0 and 1. Therefore, we estimate equation (1) using the beta regression model and used the Bayesian information criterion (BIC) for the selection of the appropriate link function among logit, clog-log, and probit link functions and scale variables.[3]

4. Results and Discussion

In this section, we provide a discussion of descriptive statistics and regression results.

4.1 Descriptive Statistics

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[3] For further discussion, please refer Rizwan (2021).

Table 1 reports the descriptive statistics of systemic risk ($CATFIN$) and macro-prudential regulations based on low, medium, and high levels of different aspects of institutional development.[4] The last three columns of the table provide K-Wallis's test statistics for assessing the significance of differences among the variables. Overall, countries with high levels of institutional development have the lowest mean values of systemic risk which are significantly different from low and medium-level countries. Similarly, countries with high levels of institutional development employ lower macro-prudential regulations and, generally, these differences are also statistically significant.

Table 2 provides correlation coefficients of macro-prudential indicators with systemic risk based on the low, medium, and high levels of institutional development. There exists positive correlation between MPI and systemic risk in countries with low levels of all the aspects of institutional development except voice and accountability (VA), albeit the correlation is statistically insignificant. Whereas in sovereigns having medium and high levels of institutional development, the MPI index shows a negative correlation, except for the government effectiveness (GE), and voice and accountability (VA) aspects. Borrowers-focused MPI index shows a significant negative correlation with systemic risk in countries with low levels of regulatory quality (RQ). Financial-focused MPI index has a significantly negative correlation in countries with medium levels of corruption control (CC), government effectiveness (GE), regulatory quality (RQ), and rule of law (RL). However, a positive correlation exists in countries with high levels of government effectiveness (GE), and low levels of regulatory quality (RQ). In terms of the cyclical MPI index, countries with medium levels of government effectiveness (GE), and rule of law (RL), while lower levels of voice and accountability (VA) show a negative correlation whereas positive correlation in countries with low levels of rule of law (RL). Finally, for the non-cyclical MPI index, a significant correlation exists in countries with medium levels of government effectiveness (GE) and voice and accountability (VA) while a positive correlation in sovereigns having high levels of government effectiveness (GE).

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[4] These levels are decided based upon yearly quartiles of these indicators with quartile 1 being low level, quartiles 2 and 3 as medium, and quartile 4 as high level.

		Low		Middle		High		K-Wallis Test	
	Variable	Mean	SD	Mean	SD	Mean	SD	1vs2	2vs3	1vs3
Control of Corruption	CATFIN	0.028	0.017	0.029	0.019	0.026	0.023	1.300	18.7***	7.7***
	MPI	2.495	2.143	2.703	1.865	2.117	1.699	5.1**	16.8***	2.5
	BORROWER	0.387	0.653	0.637	0.782	0.540	0.766	21.2***	3.5**	5.3**
	FI	2.108	1.815	2.065	1.466	1.577	1.363	0.300	19.9***	9.1***
	CYC	1.070	1.271	1.000	1.141	0.573	0.787	0.200	21.6***	25.3***
	NCYC	1.425	1.183	1.703	1.167	1.544	1.323	10.1***	3.9**	0.800
Government Effectiveness	CATFIN	0.029	0.017	0.029	0.022	0.025	0.017	0.194	14.7***	13.8***
	MPI	2.599	2.285	2.612	1.835	2.193	1.600	2.1	6.8***	1.1
	BORROWER	0.436	0.706	0.609	0.768	0.547	0.760	11.5***	1.5	3.4*
	FI	2.164	1.877	2.004	1.462	1.646	1.299	0	8.2***	6.6**
	CYC	1.151	1.320	0.950	1.108	0.591	0.794	2.8*	17.9***	25.4***
	NCYC	1.449	1.228	1.662	1.184	1.602	1.257	6.5**	0.2	2.6
Political Stability	CATFIN	0.030	0.017	0.028	0.021	0.026	0.018	7.1***	20.2***	5.4**
	MPI	2.659	2.319	2.667	1.746	2.018	1.693	3.3*	28.5***	7.4***
	BORROWER	0.554	0.750	0.526	0.740	0.595	0.785	0.3	1.2	0.2
	FI	2.105	1.804	2.142	1.470	1.423	1.299	1.9	49.3***	18***
	CYC	1.060	1.348	0.961	1.094	0.664	0.832	0	11.4***	7.6***
	NCYC	1.599	1.225	1.706	1.195	1.354	1.217	1.5	19.6***	6.9***
Regulatory Quality	CATFIN	0.028	0.017	0.029	0.020	0.026	0.022	0.400	5.2**	12.6***
	MPI	2.505	2.278	2.591	1.712	2.336	1.894	5.6**	4**	0
	BORROWER	0.418	0.684	0.570	0.749	0.646	0.813	9***	1.1	11.5***
	FI	2.087	1.880	2.021	1.377	1.690	1.491	1.3	11.1***	4.1**
	CYC	1.175	1.380	0.885	1.058	0.701	0.855	5**	3.8*	13***
	NCYC	1.331	1.143	1.706	1.110	1.635	1.439	21.2***	1.9	4.9**
Rule of Law	CATFIN	0.026	0.017	0.030	0.020	0.026	0.022	9.7***	23***	2.1
	MPI	3.014	2.371	2.462	1.705	2.069	1.659	6.7***	7.7***	20.3***
	BORROWER	0.477	0.752	0.618	0.760	0.485	0.732	9.2***	7***	0.1
	FI	2.537	1.955	1.844	1.314	1.584	1.360	20.4***	6.6***	32.6***
	CYC	1.323	1.359	0.894	1.057	0.529	0.771	18.2***	22.8***	56.9***
	NCYC	1.693	1.316	1.568	1.105	1.540	1.318	1.5	0.4	1.4
Voice and Accountability	CATFIN	0.023	0.015	0.031	0.019	0.027	0.023	49.6***	26.8***	2.8*
	MPI	2.700	2.355	2.639	1.759	2.033	1.618	0.9	19.7***	7.2***
	BORROWER	0.676	0.804	0.579	0.765	0.358	0.632	2.8*	16.4***	24.9***
	FI	2.024	1.833	2.060	1.462	1.675	1.378	2.4	10.3***	2
	CYC	1.317	1.369	0.948	1.055	0.420	0.687	11.9***	50.7***	82***
	NCYC	1.383	1.249	1.690	1.134	1.613	1.316	15.4***	0.6	5.2**

Table 1: This table shows the descriptive statistics of systemic risk (CATFIN) and macroprudential regulations at different levels of institutional development. The last three columns show K-Wallis test statistics to test if there is any difference in the systemic risk and MPI indexes. *,**, and *** shows significance at 10%, 5%, and 1% level of significance.

Governance Indicators		MPI	BORROWER	FINANCIAL	CYC	NCYC
	Low	0.02	-0.09	0.06	0.09	-0.05
Control of Corruption	Medium	-0.08*	-0.02	-0.10*	-0.08	-0.06
	High	-0.01	-0.03	0	-0.04	0.01
	Low	0.04	0.05	0.03	0.11	-0.03
Government Effectiveness	Medium	-0.13*	-0.07	-0.13*	-0.10*	-0.11*
	High	0.11	0	0.13*	-0.01	0.14*
	Low	0.01	0.04	0.00	0.07	-0.05
Political Stability	Medium	-0.08	-0.06	-0.07	-0.07	-0.05
	High	-0.01	-0.01	-0.01	-0.03	0.00
	Low	0.06	-0.15*	0.12*	0.07	0.04
Regulatory Quality	Medium	-0.08	0.03	-0.12*	-0.05	-0.08
	High	-0.04	-0.04	-0.03	-0.06	-0.02
	Low	0.04	-0.06	0.07	0.15*	-0.07
Rule of Law	Medium	-0.08*	-0.04	-0.08*	-0.10*	-0.03
	High	-0.01	-0.02	0	-0.03	0
	Low	-0.10	-0.11	-0.09	-0.12*	-0.07
Voice and Accountability	Medium	-0.02	-0.01	-0.02	0.06	-0.09*
	High	0.01	0.02	0.01	-0.01	0.02

Table 2: This table shows the correlation coefficients of macroprudential indexes and systemic risk measured by CATFIN at different levels of institutional development. * Shows significance at a 5% level of significance.

Overall, descriptive statistics provide an early indication that macro-prudential policies may have a higher association with systemic risk in countries with medium levels of institutional development while there might be no positive association in countries with high levels of institutional development. However, inferences can only be drawn after multivariate regression analysis which is presented as follows.

4.2 Regression Results

4.2.1 Overall Results

The estimates using beta regression are reported in Table 3. $Cloglog$ link function with GDP per capita growth is used as a link function by following Rizwan (2021), and FDI (financial development index) is utilized as variance scale variables. In addition, the clustering of the standard error is conducted on the year level. In Model (1), corruption control (CC) is used as the institutional development indicator along with its interaction term with the MPI index. The MPI index is statistically insignificant, CC shows a negative but statistically insignificant coefficient, while the interaction term of CC and MPI turns out to be negative and highly significant. This suggests that as institutional development in terms of corruption controls improves, systemic stability benefits of macro-prudential regulations increase. This is in line with the existing literature indicating that banks' decision-making is influenced by corruption-prone institutional settings (Tao, 2020; Asteriou et al., 2021; Ozili, 2019).

Similar results have been found for government effectiveness (GE), regulatory quality (RQ), and rule of law (RL), as shown by the models (2), (4), and (5), respectively. These results are in line with the complementarity hypothesis which maintains that institutional development helps improve the efficacy of macro-prudential regulations. In comparison, the MPI index keeps its statistical significance when political stability (PS) and voice and accountability (VA), in models (3) and (6), are used as institutional development indicators, where both PS and VA show insignificant coefficients of level and interactive terms.

In the next step, we categorized MPIs into borrower-targeted or FI-targeted MPI indexes, and the results are reported in Table 4. Results show that when we account for CC (model (1)), borrower-targeted MPIs remained significant while their interaction term with CC was insignificant. This suggests that the efficacy of borrower-targeted MPIs does not depend upon the control of corruption. However, results show a significantly negative coefficient of FI-targeted MPIs and CC. Similar results are shown by VA (model (6)). These results suggest that as countries perform better in terms of corruption controls and voice and accountability, FI-targeted macro-prudential regulations play their intended role. Rule of law (RL), model (5), shows the moderating effect on both borrower-targeted and FI-targeted MPIs suggesting that the rule of law is very much necessary for MPIs to work at both borrowers' level as well as financial institutions' level. Results of PS (model (3)) and RQ (model (4)), show insignificant moderating effects.

Governance Indicator Dependent Variable	(1) CC CATFIN	(2) GE CATFIN	(3) PS CATFIN	(4) RQ CATFIN	(5) RL CATFIN	(6) VA CATFIN
Panel A:						
MPI (0-12)	-0.0094	-0.0032	-0.0261*	0.0036	-0.0047	-0.0256*
	(0.0157)	(0.0153)	(0.0158)	(0.0153)	(0.0147)	(0.0145)
Governance Indicator	-0.0647	-0.1234	0.0360	-0.1500	-0.0894	0.0061
	(0.0890)	(0.0961)	(0.0521)	(0.1066)	(0.1133)	(0.0929)
Governance Indicator × MPI	-0.0267***	-0.0279***	-0.0071	-0.0314**	-0.0362***	-0.0081
	(0.0072)	(0.0088)	(0.0069)	(0.0125)	(0.0090)	(0.0102)
BNKCD	0.2628***	0.2540***	0.2677***	0.2695***	0.2716***	0.2619***
	(0.0759)	(0.0745)	(0.0773)	(0.0717)	(0.0712)	(0.0757)
FIAI	-0.8030***	-0.6950***	-0.6594***	-0.7360***	-0.8448***	-0.6470***
	(0.1912)	(0.2004)	(0.1914)	(0.1680)	(0.1789)	(0.1878)
FIDI	-0.6309**	-0.5874**	-0.7009**	-0.5758**	-0.5772**	-0.6992**
	(0.2670)	(0.2690)	(0.2768)	(0.2599)	(0.2615)	(0.2810)
FIEI	0.0428	0.0219	0.0273	0.0550	0.0318	0.0409
	(0.1704)	(0.1768)	(0.1833)	(0.1679)	(0.1733)	(0.1806)
FMAI	-0.1361	-0.1559	-0.1113	-0.1258	-0.1319	-0.1237
	(0.1606)	(0.1653)	(0.1662)	(0.1633)	(0.1637)	(0.1698)
FMDI	0.2955	0.3297	0.2862	0.3176	0.2913	0.2830
	(0.2292)	(0.2400)	(0.2447)	(0.2281)	(0.2266)	(0.2298)
MFEI	0.0535	0.0727	0.0728	0.0709	0.0673	0.0688
	(0.0897)	(0.0893)	(0.0925)	(0.0883)	(0.0885)	(0.0945)
GDGPC (%)	-0.0160***	-0.0161***	-0.0175***	-0.0151***	-0.0158***	-0.0171***
	(0.0040)	(0.0041)	(0.0043)	(0.0039)	(0.0040)	(0.0041)
Constant	-2.9689***	-2.9553***	-2.8501***	-3.1995***	-3.0824***	-2.8412***
	(0.1585)	(0.1708)	(0.1617)	(0.1291)	(0.1632)	(0.1761)
Panel B:						
GDGPC (%)	0.0491***	0.0484***	0.0510***	0.0491***	0.0477***	0.0518***
	(0.0159)	(0.0152)	(0.0153)	(0.0164)	(0.0164)	(0.0160)
FDI	1.1164***	1.0821***	1.1123***	1.1743***	1.1410***	1.1095***
	(0.3314)	(0.3324)	(0.3379)	(0.3365)	(0.3198)	(0.3424)
Constant	5.1005***	5.1199***	5.0882***	5.0802***	5.0971***	5.0875***
	(0.2091)	(0.2113)	(0.2089)	(0.2150)	(0.2060)	(0.2115)
Observations	1,126	1,126	1,126	1,126	1,126	1,126
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Log-Likelihood	3797	3797	3791	3802	3800	3791
Chi-Squared	3447	2179	860.4	288.1	1546	882
Model test p-value	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***

Table 3: In this table, results are reported using the beta regression technique for the overall sample. Panel A provides results of the mean equation while Panel B shows results of the variance scale equation. Models (1) to (6) show results of Corruption Control (CC), Government Effectiveness (GE), Political Stability and Political Stability and Absence of Violence/Terrorism (PS), Regulatory Quality (RQ), Rule of Law (RL), and Voice and Accountability (VA) as explanatory and interactive variables, respectively. The period covered in the analysis is 2000-2017. Standard errors are robust and clustered by year. *** p<0.01, ** p<0.05, * p<0.1.

Governance Indicator	(1) CC	(2) GE	(3) PS	(4) RQ	(5) RL	(6) VA
Dependent Variable	CATFIN	CATFIN	CATFIN	CATFIN	CATFIN	CATFIN
Panel A:						
Borrower-Targeted Instruments (0-2)	-0.0658*	-0.0138	-0.0878***	-0.0319	-0.0336	-0.1009***
	(0.0378)	(0.0409)	(0.0314)	(0.0401)	(0.0381)	(0.0341)
FI-Targeted Instruments (0-10)	0.0169	0.0035	0.0037	0.0206	0.0111	0.0086
	(0.0254)	(0.0259)	(0.0224)	(0.0238)	(0.0241)	(0.0185)
Governance Indicator	-0.0484	-0.1139	0.0414	-0.1370	-0.0700	0.0022
	(0.0890)	(0.0996)	(0.0528)	(0.1060)	(0.1136)	(0.0946)
Governance Indicator × Borrower MPI	-0.0229	-0.0707**	-0.0009	-0.0468	-0.0625**	0.0218
	(0.0248)	(0.0282)	(0.0219)	(0.0293)	(0.0290)	(0.0291)
Governance Indicator × FI MPI	-0.0278**	-0.0086	-0.0110	-0.0249	-0.0250**	-0.0221*
	(0.0137)	(0.0147)	(0.0101)	(0.0153)	(0.0127)	(0.0127)
BNKCD	0.2714***	0.2590***	0.2772***	0.2751***	0.2768***	0.2691***
	(0.0739)	(0.0715)	(0.0745)	(0.0703)	(0.0695)	(0.0737)
FIAI	-0.8048***	-0.7018***	-0.6653***	-0.7390***	-0.8426***	-0.6616***
	(0.1934)	(0.1976)	(0.1926)	(0.1683)	(0.1799)	(0.1908)
FIDI	-0.6977***	-0.6513**	-0.7706***	-0.6415**	-0.6489**	-0.7681***
	(0.2609)	(0.2642)	(0.2692)	(0.2552)	(0.2542)	(0.2758)
FIEI	0.0770	0.0652	0.0640	0.0918	0.0727	0.0679
	(0.1732)	(0.1744)	(0.1877)	(0.1704)	(0.1749)	(0.1874)
FMAI	-0.0948	-0.0920	-0.0651	-0.0824	-0.0758	-0.1008
	(0.1495)	(0.1500)	(0.1538)	(0.1520)	(0.1515)	(0.1662)
FMDI	0.3115	0.3792	0.3028	0.3436	0.3338	0.2807
	(0.2366)	(0.2510)	(0.2452)	(0.2344)	(0.2308)	(0.2294)
MFEI	0.0660	0.0602	0.0857	0.0744	0.0654	0.0947
	(0.0898)	(0.0883)	(0.0916)	(0.0872)	(0.0876)	(0.0896)
GDGPC (%)	-0.0163***	-0.0164***	-0.0177***	-0.0154***	-0.0161***	-0.0171***
	(0.0040)	(0.0041)	(0.0042)	(0.0038)	(0.0040)	(0.0040)
Constant	-3.1271***	-3.0274***	-3.0325***	-3.2882***	-3.1620***	-3.0010***
	(0.1834)	(0.1885)	(0.1772)	(0.1594)	(0.1897)	(0.1890)
Panel B:						
GDGPC (%)	0.0501***	0.0502***	0.0517***	0.0503***	0.0497***	0.0519***
	(0.0157)	(0.0153)	(0.0154)	(0.0162)	(0.0163)	(0.0163)
FDI	1.1658***	1.1057***	1.1667***	1.2057***	1.1706***	1.1684***
	(0.3184)	(0.3183)	(0.3184)	(0.3221)	(0.3068)	(0.3284)
Constant	5.0780***	5.1109***	5.0651***	5.0660***	5.0834***	5.0647***
	(0.2068)	(0.2077)	(0.2047)	(0.2107)	(0.2027)	(0.2095)
Observations	1,126	1,126	1,126	1,126	1,126	1,126
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Log-Likelihood	3799	3801	3795	3805	3803	3795
Chi-Squared	1025	1360	1760	647.8	535.3	726.6
Model test p-value	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***

Table 4: In this table, results are reported using the beta regression technique for the overall sample with borrower-targeted and FI-targeted MPI indexes. Panel A provides the results of the mean equation while Panel B shows the results of the variance scale equation. Model (1) reports results without governance indicators. Models (1) to (6) show results of Corruption Control (CC), Government Effectiveness (GE), Political Stability and Political Stability and Absence of Violence/Terrorism (PS), Regulatory Quality (RQ), Rule of Law (RL), and Voice and Accountability (VA) as explanatory and interactive variables, respectively. The period covered in the analysis is 2000-2017. Standard errors are robust and clustered by year. *** p<0.01, ** p<0.05, * p<0.1.

We further categorized MPIs into cyclical and non-cyclical indexes and present the results in Table 5. Model (1) reports the moderating role of CC on the efficacy of two types of MPIs. Results show that CC significantly moderates the effect of cyclical MPIs and increases their efficacy. Similar results are found in terms of GE (model (2)), RQ (model (4)), and RL (model (5)). For PS (model (3)), results show the insignificant coefficient of the interactive term while for VA (model (6)), there is a significant moderating effect, albeit at a 10% level of significance. Overall, the results of Table 5 show that institutional factors play a complementary role in the efficacy of cyclical macro-prudential policies to control systemic risk.

Governance Indicator	(1) CC	(2) GE	(3) PS	(4) RQ	(5) RL	(6) VA
Dependent Variable	CATFIN	CATFIN	CATFIN	CATFIN	CATFIN	CATFIN
Panel A:						
Cyclical MPIs	-0.0208	0.0079	-0.0465**	0.0129	-0.0043	-0.0332*
	(0.0192)	(0.0209)	(0.0224)	(0.0216)	(0.0192)	(0.0201)
Non-Cyclical MPIs	0.0009	-0.0152	-0.0081	-0.0034	-0.0075	-0.0227
	(0.0318)	(0.0308)	(0.0295)	(0.0299)	(0.0299)	(0.0234)
Governance Indicator	-0.0577	-0.1268	0.0558	-0.1386	-0.0707	0.0201
	(0.0895)	(0.1021)	(0.0525)	(0.1075)	(0.1142)	(0.0951)
Governance Indicator × CYC	-0.0570***	-0.0808***	-0.0171	-0.0891***	-0.0950***	-0.0464*
	(0.0200)	(0.0210)	(0.0169)	(0.0257)	(0.0236)	(0.0244)
Governance Indicator × NCYC	-0.0119	0.0068	-0.0035	0.0040	-0.0007	0.0180
	(0.0148)	(0.0162)	(0.0149)	(0.0152)	(0.0135)	(0.0126)
BNKCD	0.2651***	0.2562***	0.2701***	0.2738***	0.2750***	0.2668***
	(0.0754)	(0.0742)	(0.0763)	(0.0717)	(0.0705)	(0.0756)
FIAI	-0.7923***	-0.6634***	-0.6721***	-0.7108***	-0.8133***	-0.6206***
	(0.2165)	(0.2195)	(0.2067)	(0.1816)	(0.2009)	(0.1943)
FIDI	-0.6362**	-0.6004**	-0.7024***	-0.5926**	-0.5973**	-0.6980**
	(0.2612)	(0.2659)	(0.2704)	(0.2591)	(0.2535)	(0.2748)
FIEI	0.0783	0.0582	0.0414	0.0920	0.0787	0.0848
	(0.1706)	(0.1734)	(0.1875)	(0.1670)	(0.1732)	(0.1776)
FMAI	-0.1062	-0.1246	-0.0935	-0.0953	-0.0893	-0.0822
	(0.1564)	(0.1572)	(0.1633)	(0.1555)	(0.1559)	(0.1667)
FMDI	0.3402	0.4081	0.2966	0.3953	0.3810	0.3236
	(0.2460)	(0.2613)	(0.2472)	(0.2431)	(0.2420)	(0.2339)
MFEI	0.0463	0.0634	0.0758	0.0645	0.0575	0.0513
	(0.0930)	(0.0932)	(0.0938)	(0.0911)	(0.0913)	(0.0930)
GDGPC (%)	-0.0149***	-0.0152***	-0.0167***	-0.0144***	-0.0152***	-0.0165***
	(0.0038)	(0.0038)	(0.0041)	(0.0037)	(0.0038)	(0.0038)
Constant	-3.0208***	-3.0222***	-2.8534***	-3.3160***	-3.1872***	-2.8653***
	(0.1632)	(0.1682)	(0.1616)	(0.1296)	(0.1644)	(0.1792)
Panel B:						
GDGPC (%)	0.0466***	0.0458***	0.0479***	0.0485***	0.0474***	0.0526***
	(0.0162)	(0.0155)	(0.0151)	(0.0166)	(0.0170)	(0.0159)
FDI	1.0552***	0.9980***	1.0781***	1.1010***	1.0603***	1.0951***
	(0.3591)	(0.3523)	(0.3487)	(0.3438)	(0.3349)	(0.3416)
Constant	5.1479***	5.1831***	5.1202***	5.1330***	5.1555***	5.1035***
	(0.2219)	(0.2197)	(0.2098)	(0.2165)	(0.2133)	(0.2081)
Observations	1,124	1,124	1,124	1,124	1,124	1,124
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Log-Likelihood	3797	3800	3790	3804	3804	3792
Chi-Squared	2041	787.8	4856	1026	1535	1345
Model test p-value	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***

Table 5: In this table, results are reported using the beta regression technique for the overall sample with cyclical and non-cyclical MPI indexes. Panel A provides the results of the mean equation while Panel B shows the results of the variance scale equation. Model (1) reports results without governance indicators. Models (2) to (7) show results of Corruption Control (CC), Government Effectiveness (GE), Political Stability and Political Stability and Absence of Violence/Terrorism (PS), Regulatory Quality (RQ), Rule of Law (RL), and Voice and Accountability (VA) as explanatory and interactive variables, respectively. The period covered in the analysis is 2000-2017. Standard errors are robust and clustered by year. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

To see if the relationship of MPIs with the systemic risk differs depending upon the degree of institutional development of a country, we divided our sample into three groups, i.e., low, medium, and high institutional development. Table 6 reports the results. Although all control variables are used in the regression, for the sake of precision, results of overall MPI and its sub-indexes are reported only.

Governance Indicators Score Dependent Variable	(1) Low CATFIN	(2) Middle CATFIN	(3) High CATFIN	(4) Low CATFIN	(5) Middle CATFIN	(6) High CATFIN
	Corruption Controls			Regulatory Quality		
Macroprudential Index (0-12)	0.0278	-0.0445***	-0.0182	0.0624**	-0.0587***	-0.0553**
	(0.0480)	(0.0161)	(0.0287)	(0.0277)	(0.0216)	(0.0244)
Borrower-Targeted Instruments (0-2)	0.0207	-0.1188***	-0.0679*	0.0448	-0.1056***	-0.0965**
	(0.0467)	(0.0370)	(0.0393)	(0.0599)	(0.0404)	(0.0441)
FI-Targeted Instruments (0-10)	0.0307	-0.0109	0.0092	0.0672**	-0.0349	-0.0352
	(0.0643)	(0.0237)	(0.0420)	(0.0282)	(0.0305)	(0.0332)
Cyclical MPIs	0.1560***	-0.0853***	-0.0301	0.1463***	-0.1004***	-0.0652
	(0.0486)	(0.0243)	(0.0401)	(0.0325)	(0.0254)	(0.0411)
Non-Cyclical MPIs	-0.0861	0.0060	-0.0111	-0.0283	0.0017	-0.0500
	(0.0538)	(0.0268)	(0.0442)	(0.0559)	(0.0373)	(0.0367)
	Government Effectiveness			Rule of Law		
Macroprudential Index (0-12)	0.0051	-0.0488**	-0.0271	0.0602*	-0.0609***	-0.0434**
	(0.0356)	(0.0190)	(0.0235)	(0.0308)	(0.0217)	(0.0208)
Borrower-Targeted Instruments (0-2)	0.0615	-0.1177***	-0.0811**	0.1281**	-0.1229***	-0.0958***
	(0.0585)	(0.0362)	(0.0369)	(0.0625)	(0.0384)	(0.0346)
FI-Targeted Instruments (0-10)	-0.0264	-0.0172	0.0015	0.0383	-0.0277	-0.0172
	(0.0563)	(0.0227)	(0.0338)	(0.0374)	(0.0262)	(0.0268)
Cyclical MPIs	0.1357***	-0.0912***	-0.0370	0.1872***	-0.1061***	-0.0728*
	(0.0393)	(0.0229)	(0.0359)	(0.0389)	(0.0247)	(0.0372)
Non-Cyclical MPIs	-0.1330***	0.0078	-0.0210	-0.0688	0.0048	-0.0267
	(0.0461)	(0.0241)	(0.0368)	(0.0495)	(0.0323)	(0.0307)
	Political Stability and Absence of Violence			Voice and Accountability		
Macroprudential Index (0-12)	-0.0630**	0.0385	-0.0861***	0.0339	-0.0715***	-0.0209
	(0.0274)	(0.0238)	(0.0226)	(0.0367)	(0.0268)	(0.0183)
Borrower-Targeted Instruments (0-2)	-0.1614**	-0.0408	-0.1064***	-0.0943	-0.1018***	-0.0714*
	(0.0668)	(0.0611)	(0.0408)	(0.1022)	(0.0394)	(0.0384)
FI-Targeted Instruments (0-10)	-0.0123	0.0664***	-0.0754***	0.0759**	-0.0543	0.0004
	(0.0365)	(0.0223)	(0.0250)	(0.0310)	(0.0395)	(0.0202)
Cyclical MPIs	-0.0701**	0.0042	-0.0853**	0.0550	-0.0792***	-0.0761***
	(0.0342)	(0.0509)	(0.0364)	(0.0716)	(0.0236)	(0.0293)
Non-Cyclical MPIs	-0.0543	0.0670*	-0.0866***	0.0157	-0.0583	0.0125
	(0.0433)	(0.0350)	(0.0284)	(0.0361)	(0.0513)	(0.0237)

Table 6: This table shows the regression results of the sub-sample based upon Low, moderate, and High levels of governance indicators using the beta regression technique with cyclical and non-cyclical MPI indexes. The period

covered in the analysis is 2000-2017. Standard errors are robust and clustered by year. *** p<0.01, ** p<0.05, * p<0.1..

With respect to CC, results show that in countries with lower corruption controls, overall MPI index, borrower- as well as FI-focused MPI indexes show positive, albeit statistically insignificant, while cyclical MPI index shows positive relationship with systemic risk which is statistically significant as well. Non-cyclical MPI index shows a statistically insignificant negative relationship with systemic risk. Comparatively, in sovereigns that are in the middle range of corruption controls, results show that the MPI index, borrower-targeted MPI index, and cyclical MPI index have a negative relationship with systemic risk which is statistically significant as well. In the high CC, levels subsample, only the borrower-focused MPI index results in a substantially negative relationship with systemic risk.

In terms of GE, countries with low scores on GE also have no significant systemic stability benefits from overall MPI, borrower-targeted, and FI-targeted MPIs. Whereas, cyclical MPI has a positive association with systemic risk. Only non-cyclical MPIs provide systemic stability benefits in countries with low government effectiveness. In comparison, countries in the middle level of government effectiveness, overall MPI, borrower-targeted MPIs, and cyclical MPIs have a statistically significant negative relationship with systemic risk. In sovereigns with a high degree of government effectiveness, only borrower-targeted MPIs provide systemic stability.

Political stability and absence of violence show quite different results where low- and high-level countries have systemic stability-enhancing benefits of MPIs while average-scoring countries have systemic instability costs from FI-targeted and non-cyclical MPIs.

In terms of the regulatory quality aspect, countries with a low regulatory quality show a positive association between overall MPI, FI-targeted MPI, and cyclical MPI indexes. Whereas, in countries with a middle level of regulatory quality, overall MPI, borrower- and cyclical MPI have a statistically significant negative relationship with systemic risk. Similar results are shown by the countries with high levels of regulatory quality except that cyclical MPIs are not significant. Similar results have been found with the rule of law and voice and accountability aspects with minor differences in terms of significance.

Overall, the results of Table 6 show that countries that are scoring low on institutional development experience systemic instability costs of MPIs. While countries with a medium level of institutional development have strong intended systemic stability benefits from MPIs. While in countries having high institutional development, MPIs provide mixed results.

4.2.2 Cross Country Analysis

In the next step, we divided our sample into three groups based on the income level of the sovereigns. Table 7 reports the results. To be precise, results of MPI, institutional indicators, and their interactive terms are reported for low and lower-middle-income (panel A), upper-middle-income (panel B), and high-income (panel C) sovereigns.[5]

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[5] We used time-variant income classification of countries provided by The World Bank.

Model (1) reports the results of CC and shows that a significant (Interactive term is not significant, only non-cyclical MPI is negative and significant) negative coefficient of an interactive term is found for low and lower-middle-income (panel A) and high-income (panel C) sovereigns which are in line with overall results. However, for upper-middle-income sovereigns, directionally results are like low & lower-middle-income, and high-income sovereigns but statistically, these are insignificant. Model (2) reports the results of GE and shows a negative moderating role of GE for low and lower-middle-income sovereigns (panel A). However, in upper-middle-income sovereigns, once governance effectiveness is accounted for, MPI becomes statistically significant. GE also shows a statistically significant and negative coefficient suggesting that among upper-middle-income countries, government effectiveness has a negative influence on systemic risk. Interestingly, the interactive terms of GE and MPI show statistically significant and positive coefficients. This provides support for the substitutional hypothesis suggesting that as government effectiveness increases in middle-income countries, the efficacy of macro-prudential regulations reduces. Results of GE in high-income countries (model (2), panel C) show support for the complementarity hypothesis where countries scoring high in terms of GE have higher efficacy of macro-prudential regulations.

	(1) CC	(2) GE	(3) PS	(4) RQ	(5) RL	(6) VA
Governance Indicator Dependent Variable	CATFIN	CATFIN	CATFIN	CATFIN	CATFIN	CATFIN
Panel A: Low & Lower-Middle Income						
Macroprudential Index (0-12)	0.0014	0.0430	0.0425	0.0348	0.0343	0.0534
	(0.0485)	(0.0347)	(0.0408)	(0.0389)	(0.0334)	(0.0356)
Governance Indicator	0.3431	0.1496	0.0898	0.5551***	0.3408**	0.4858***
	(0.2201)	(0.1943)	(0.0574)	(0.1474)	(0.1345)	(0.1527)
Governance Indicator $\times$ MPI	-0.1291***	-0.1011***	-0.0407**	-0.1833***	-0.0994***	-0.0913***
	(0.0408)	(0.0282)	(0.0163)	(0.0484)	(0.0210)	(0.0277)
Panel B: Upper-Middle Income						
Macroprudential Index (0-12)	-0.0402	-0.0667**	-0.0237	-0.0462**	-0.0687**	-0.0443
	(0.0300)	(0.0273)	(0.0531)	(0.0210)	(0.0325)	(0.0439)
Governance Indicator	-0.2843	-0.9452***	-0.1497	-0.3738*	-0.3790	-0.0223
	(0.2258)	(0.2662)	(0.1916)	(0.2181)	(0.2311)	(0.2150)
Governance Indicator $\times$ MPI	-0.0081	0.1455***	0.0255	-0.0313	-0.0550	0.0003
	(0.0568)	(0.0356)	(0.0295)	(0.0443)	(0.0460)	(0.0447)
Panel C: High Income						
Macroprudential Index (0-12)	-0.0223	-0.0134	-0.0716***	-0.0478*	-0.0657**	-0.1043***
	(0.0188)	(0.0231)	(0.0179)	(0.0260)	(0.0260)	(0.0299)
Governance Indicator	-0.0797	-0.1264	-0.1146	-0.3790**	-0.5329***	-0.5565**
	(0.1189)	(0.1327)	(0.1183)	(0.1911)	(0.1838)	(0.2453)
Governance Indicator $\times$ MPI	-0.0358***	-0.0415***	-0.0011	-0.0096	-0.0089	0.0428**
	(0.0102)	(0.0150)	(0.0124)	(0.0216)	(0.0157)	(0.0209)

Table 7: This table shows the regression results of the sub-sample of low and lower-middle-income countries (Panel A), Upper-middle-income countries (Panel B), and High-Income countries (Panel C) using the beta regression technique. Model (1) reports results without governance indicators. Models (2) to (7) show results of Corruption Control (CC), Government Effectiveness (GE), Political Stability and Political Stability and Absence of Violence/Terrorism (PS), Regulatory Quality (RQ), Rule of Law (RL), and Voice and Accountability (VA) as explanatory and interactive variables, respectively. For precision, results of only MPI, governance indicator and the interaction terms are reported. Control variables are the same as given in Table 1. The period covered in the analysis is 2000-2017. Standard errors are robust and clustered by year. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Results of political stability (PS), given in model (3), show that for low and lower-middle-income sovereigns PS significantly increases the efficacy of macro-prudential policies. However, it has no role for upper-middle (panel B) and high-income (panel C) (Results are significant in panel C) sovereigns. Regulatory quality (RQ), rule of law (RL), and voice and accountability (VA) show quite interesting results, specifically for low and lower-middle-income countries. These institutional aspects significantly increase the overall systemic risk in low and lower-middle-income sovereigns. From a regulatory perspective, these findings suggest that low and lower-middle-income sovereigns should back their macro-prudential regulatory framework with a strong progression toward institutional development. In that way, they can limit the systemic risk that may arise due to higher trust of financial actors in the progressing institutional environment. In upper-middle income and high-income sovereigns, RQ and RL have a negative relationship with systemic risk, albeit statistically insignificant for RL in upper-middle income, while these aspects have no moderating role in the MPI-systemic risk nexus.

4.2.3 Robustness Test: Alternate measure of systemic risk

As a robustness test, we used an alternative systemic risk measure, the aggregate 1% VaR of the entire financial sector estimated using the cross-section of excess returns on financial firms through estimation of the parameters of the Skewed Generalized Error Distribution (SGED) density as introduced by Allen et al. (2012). In contrast to the CATFIN based upon a non-parametric approach, 1% VaR using SGED is a parametric approach and provides an alternative methodological application to estimate systemic risk.

For robustness purposes, we only re-estimated the results of Table 3 with SGED 1% VaR as the dependent variable. Overall, results remained consistent and show a significant moderating effect of corruption controls (CC), government effectiveness (GE), regulatory quality (RQ), and rule of law (RL). Political stability (PS) and voice & accountability (VA) play no significant role in the MPI-systemic risk relationship. The results of all other control variables are also generally in line with the results of Table 3.

	(1)	(2)	(3)	(4)	(5)	(6)
Governance Indicator	CC	GE	PS	RQ	RL	VA
Dependent Variable	SGED VaR	SGED VaR	SGED VaR	SGED VaR	SGED VaR	SGED VaR
Macroprudential Index (0-12)	-0.0125	-0.0079	-0.0304**	-0.0047	-0.0126	-0.0325***
	(0.0131)	(0.0129)	(0.0128)	(0.0128)	(0.0131)	(0.0123)
Governance Indicator	-0.0730	-0.1928**	0.0454	-0.2719**	-0.2265	-0.0419
	(0.0951)	(0.0873)	(0.0506)	(0.1116)	(0.1399)	(0.0913)
Governance Indicator × MPI	-0.0261***	-0.0244***	-0.0086	-0.0228*	-0.0323***	0.0014
	(0.0080)	(0.0092)	(0.0070)	(0.0126)	(0.0098)	(0.0099)
BNKCD	0.2652***	0.2514***	0.2729***	0.2703***	0.2751***	0.2663***
	(0.0788)	(0.0739)	(0.0792)	(0.0737)	(0.0734)	(0.0775)
FIAI	-0.8643***	-0.7123***	-0.7389***	-0.7478***	-0.8778***	-0.6720***
	(0.1821)	(0.1900)	(0.1883)	(0.1685)	(0.1579)	(0.1831)
FIDI	-0.5398**	-0.4802*	-0.6050**	-0.4426*	-0.4172	-0.6001**
	(0.2721)	(0.2713)	(0.2762)	(0.2554)	(0.2702)	(0.2893)
FIEI	-0.2466	-0.2578	-0.2662	-0.1897	-0.2253	-0.2372
	(0.2018)	(0.1991)	(0.1975)	(0.1919)	(0.1995)	(0.1996)
FMAI	0.0500	0.0071	0.0751	0.0489	0.0210	0.0519
	(0.1437)	(0.1459)	(0.1554)	(0.1378)	(0.1505)	(0.1501)
FMDI	0.2950	0.3439*	0.2873	0.3506*	0.3051	0.2895
	(0.1865)	(0.1930)	(0.1956)	(0.1951)	(0.1926)	(0.1879)
MFEI	0.0018	0.0219	0.0228	0.0162	0.0118	0.0134
	(0.0880)	(0.0864)	(0.0891)	(0.0876)	(0.0884)	(0.0921)
GDGPC (%)	-0.0185***	-0.0187***	-0.0203***	-0.0178***	-0.0188***	-0.0201***
	(0.0057)	(0.0057)	(0.0058)	(0.0061)	(0.0064)	(0.0056)
Constant	-2.8577***	-2.8362***	-2.7312***	-3.1426***	-3.0262***	-2.7117***
	(0.1936)	(0.2026)	(0.2054)	(0.1560)	(0.1768)	(0.2240)
Panel B:						
GDGPC (%)	0.0530**	0.0519**	0.0524***	0.0483**	0.0447*	0.0527**
	(0.0213)	(0.0204)	(0.0203)	(0.0239)	(0.0252)	(0.0210)
FDI	1.7048***	1.6433***	1.6938***	1.7206***	1.7224***	1.6951***
	(0.3664)	(0.3744)	(0.3688)	(0.3932)	(0.3731)	(0.3700)
Constant	4.7324***	4.7694***	4.7285***	4.7530***	4.7567***	4.7258***
	(0.2321)	(0.2357)	(0.2300)	(0.2527)	(0.2465)	(0.2304)
Observations	1,126	1,126	1,126	1,126	1,126	1,126
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Log-Likelihood	3693	3695	3687	3703	3701	3687
Chi-Squared	1370	3676	2699	712.1	1186	3549
Model test p-value	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***

Table 8: In this table, results are reported using the beta regression technique for the overall sample. The dependent variable is 1% VaR of the whole financial system estimated using the Skewed Generalized Error Distribution (SGED) density approach of Allen et al. (2012). Panel A provides results of the mean equation while Panel B shows results of the variance scale equation. Models (1) to (6) show results of Corruption Control (CC), Government Effectiveness (GE), Political Stability and Political Stability and Absence of Violence/Terrorism (PS), Regulatory Quality (RQ), Rule of Law (RL), and Voice and Accountability (VA) as explanatory and interactive variables, respectively. The period covered in the analysis is 2000-2017. Standard errors are robust and clustered by year. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

5. Conclusion

In the post-global financial crisis 2007-09 era, regulatory authorities, both at the local as well as global levels, conducted regulatory reforms. An important development along this path was the development and implementation of macroprudential regulations. In contrast to the micro-prudential regulations which were the focus of the pre-GFC regulatory framework and were focusing on the risk profile of individual financial institutions, macroprudential regulations place more emphasis on the comprehensive assessment of systemic risk in the overall financial system. Following the enactment of these regulations, academic research emerged with a focus primarily on disentangling their complex effects, which ranged from economic outcomes to the complex fields of monetary policy implications. However, relatively few studies focus specifically on the primary goal of these regulations, which is systemic stability. Among existing literature that investigates the implications of macroprudential policies for systemic risk, Rizwan (2021) shows a subtle aspect by demonstrating that the advantages of systemic stability resulting from these regulations exhibit a marked heterogeneity. It is observed that high- and upper-middle-income countries benefit directly from the application of macroprudential regulations, while low- and lower-middle-income countries face unexpected consequences in the form of structural instability.

In this study, we contribute to this emerging field of research by delving further into the factors that may explain this heterogeneity. For this purpose, we used data from 68 countries from 2000 to 2017. For systemic risk, we used CATFIN as a systemic risk measure which was introduced by Allen et al. (2012). By considering the distributional properties of the dependent variable, we used beta regression as an appropriate econometric methodology. After controlling multiple market and economic variables, our results show the crucial role that institutional development plays in moderating the effectiveness of macroprudential regulations. Our findings suggest that macro-prudential regulations are beneficial to systemic stability in countries with strong institutional foundations, but they are not beneficial to countries with weaker institutional development. These results have significant policy implications. Financial regulatory systems should take a comprehensive and all-encompassing approach considering these empirical findings to develop and implement financial regulations. Our results highlight that the efficacy of macro-prudential regulations is dependent upon the overall institutional framework of a country. Therefore, for sustained systemic stability, a sophisticated grasp of the complex interactions between institutional development and regulatory frameworks is instrumental. This means that to accomplish the objective of a robust, resilient, and stable financial system, a paradigm changes from isolated regulatory interventions to a more comprehensive approach that examines and strengthens the entirety of the institutional fabric strengthens institutional capacities within countries and ensures equal distribution at the society level.

These findings also have very important societal implications. For instance, the current regulatory framework, such as BASEL III, is global and all countries have to comply with these regulatory constraints to maintain trust in international financial transactions. However, as shown by the results of the study, upper-middle and high-income countries receive disproportionately systemic stability benefits from macroprudential policies, leaving their lower-income counterparts susceptible to unforeseen effects. This emphasizes how important it is for regulators to focus on institutional development in addition to regulatory actions to guarantee a more robust and inclusive financial system.

Furthermore, our study's practical implications are evident in the field of policy creation. Regulatory agencies and policymakers ought to take a sophisticated and situation-specific approach to financial regulation, understanding that the success of these initiatives depends on the larger institutional framework. Our research supports a comprehensive regulatory framework that incorporates institutional development as a fundamental component and breaks down traditional regulatory silos. By doing this, countries can aim to promote a stronger, more inclusive, and stable financial environment in addition to reducing systemic risks, which is in line with the larger social objective of sustainable economic development.

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Annexe I: This table provides the list of countries included in the sample.

Sr. No.	County Name	Sr. No.	County Name	Sr. No.	County Name
1	Argentina	24	Indonesia	47	Qatar
2	Australia	25	Ireland	48	Romania
3	Austria	26	Israel	49	Russian Federation
4	Bahrain	27	Italy	50	Saudi Arabia
5	Bangladesh	28	Jamaica	51	Singapore
6	Belgium	29	Japan	52	Slovakia
7	Botswana	30	Jordan	53	South Africa
8	Brazil	31	Kazakhstan	54	South Korea
9	Bulgaria	32	Kenya	55	Spain
10	Canada	33	Kuwait	56	Sri Lanka
11	Chile	34	Malaysia	57	Sweden
12	China	35	Malta	58	Switzerland
13	Colombia	36	Mauritius	59	Thailand
14	Croatia	37	Mexico	60	Tunisia
15	Denmark	38	Morocco	61	Turkey
16	Egypt	39	Netherlands	62	Ukraine
17	Finland	40	Nigeria	63	United Arab Emirates
18	France	41	Norway	64	United Kingdom
19	Germany	42	Oman	65	United States
20	Ghana	43	Pakistan	66	Venezuela
21	Greece	44	Peru	67	Vietnam
22	Hong Kong	45	Philippines	68	Zambia
23	India	46	Poland		

Annexe II: Variable abbreviations with explanation.

Variable	Label	Data source
CATFIN	Systemic Risk (CATFIN)	Author's estimation
MPI	Macroprudential Index (0-12)	(Cerutti, Claessens, & Laeven, 2017)
BORROWER	Borrower-Targeted Instruments (0-2)	(Cerutti, Claessens, & Laeven, 2017)
FINANCIAL	Financial Institution-Targeted Instruments (0-10)	(Cerutti, Claessens, & Laeven, 2017)
CYC	Cyclical MPIs	(Cerutti, Claessens, & Laeven, 2017)
NCYC	Non-Cyclical MPIs	(Cerutti, Claessens, & Laeven, 2017)
CG	Limits on Domestic Currency Loans	(Cerutti, Claessens, & Laeven, 2017)
CONC	Concentration Limits	(Cerutti, Claessens, & Laeven, 2017)
CTC	General Countercyclical Capital Buffer/Requirement	(Cerutti, Claessens, & Laeven, 2017)
FC	Limits on Foreign Currency Loans	(Cerutti, Claessens, & Laeven, 2017)
DP	Time-Varying/Dynamic Loan-Loss Provisioning	(Cerutti, Claessens, & Laeven, 2017)
DTI	Debt-to-Income Ratio	(Cerutti, Claessens, & Laeven, 2017)
INTER	Limits on Interbank Exposures	(Cerutti, Claessens, & Laeven, 2017)
LEV	Leverage Ratio	(Cerutti, Claessens, & Laeven, 2017)
LTV_CAP	Loan-to-Value Ratio Caps	(Cerutti, Claessens, & Laeven, 2017)
RR_REV	FX and/or Countercyclical Reserve Requirements	(Cerutti, Claessens, & Laeven, 2017)
SIFI	Capital Surcharges on SIFIs	(Cerutti, Claessens, & Laeven, 2017)
TAX	Levy/Tax on Financial Institutions	(Cerutti, Claessens, & Laeven, 2017)
BNKCD	Bank Crisis Dummy	IMF
GDPGPC	Real GDP Per Capita Growth (%)	World Bank
FIAI	Financial Institutions Access Index	IMF
FIDI	Financial Institution Depth Index	IMF
FIEI	Financial Institution Efficiency Index	IMF
FMAI	Financial Market Access Index	IMF
FMDI	Financial Market Depth Index	IMF
FMEI	Financial Market Efficiency Index	IMF
FDI	Financial Development Index	IMF

Annex III: World Bank Worldwide Governance Indicators

Institutional Quality Aspect	Explanation
Voice and Accountability (VA)	Perceptions of the extent to which a country's citizens can participate in selecting their government, as well as freedom of expression, freedom of association, and free media.
Political Stability and Absence of Violence/Terrorism (PS)	Perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism.
Government Effectiveness (GE)	Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
Regulatory Quality (RQ)	Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
Rule of Law (RL)	Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
Control of Corruption (CC)	Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Source: World Bank Worldwide Governance Indicators:
https://info.worldbank.org/governance/wgi/Home/Documents#doc-intro