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Explicit Deposit Insurance and Bank Risk-Taking: Does Banking Supervision Matter?

Raheel Mumtaz (Corresponding author)
College of Commerce, Government College University, Faisalabad, Pakistan
Email: raheelmumtaz@gcuf.edu.pk

Imran Abbas Jadoon
Department of Management Sciences, COMSATS University Islamabad, Pakistan
Email: imran.jadoon@comsats.edu.pk

Nadeem Sohail
College of Commerce, Government College University, Faisalabad, Pakistan
Email: sohail5241@hotmail.com

Abstract

This study explores the influence of supervisory powers and structure of a banking supervisor on the bank's risk-taking caused by the implementation of explicit deposit insurance (EDI). We explore the data of publically traded 1,936 banks of 96 countries, from the Bank scope during 2002 to 2015. Using the Hierarchical Linear Modeling (HLM), findings revealed that banking supervision reduces the moral hazard of bank's risk-taking in non-crisis affected countries, either allocated supervisory powers are low or high. Additionally, conferring the greater supervisory authority to banking supervisor strengthened the financial health of banks amongst both crisis and non-crisis affected countries. Furthermore, central bank working as a banking supervisor with greater supervisory powers seemed to mitigate the moral hazard of bank's risk-taking. While central bank's low supervisory powers have little or no impact to controlling the bank risk-taking. Hence, the allocation of greater supervisory powers to a central bank heightens the investors and depositors' confidence in the depository financial institutions.

Keywords: official supervisory powers, supervision structure, deposit insurance, bank risk-taking, moral hazard.

1. Introduction

The espousal of EDI reduces the possibility of bank-run which improves the social welfare and decreases the adverse shocks of financial crisis in the banks (Anginer & Demirguc-kunt, 2018; Boyle et al., 2015). Hence, the adoption of EDI offers guarantee to depositors for safety-nets of deposits and it uplifts the depositor's confidence in banking system (Calomiris & Jaremski, 2016; Prean & Stix, 2011). Conversely, the assurance of deposit insurer diminishes the incentives for creditors to observe bank's activities (Yan, Skully, Avram, & Vu, 2014). Thus, the absence of depositors' monito ring reduce the market discipline on bank's risk-taking (Anginer & Demirguc-kunt, 2018). Consequently,

the implementation of EDI upsurges the moral hazard of bank's risk-taking (Kusairi et al., 2018; Liu et al., 2016), because the cost of bank failure bear by a deposit insurer (Forssbaeck, 2011; Storbacka, 2018). Moreover, the bank's risk-taking arises from the implementation of EDI outweighs the positive effect of EDI on the prevention of bank run (Ngalawa et al., 2019).

Based on the discussion, the adoption of EDI lessens the possibility of bank-run (Grira et al., 2016), but it increases the moral hazard of bank's risk-taking which heightens the likelihood of financial crisis (Liu et al., 2016). This moral hazard of bank's risk-taking can be reduced by appropriate vigilant supervision of the banking supervisor (Chortareas et al., 2012). Therefore, the banking legislators design the supervision that strengthens the banks' financial soundness and promote the smooth economic development (Beck et al., 2006). Whereas, the deposit insurer depends on the banking regulator for supervision of bank's activities, to monitor and control the moral hazard of bank's risk-taking (Kahn & Santos, 2005). Banking supervision consists on the allocated supervisory powers and organizational structure of banking supervisor (Herring & Carmassi, 2008).

The EDI upsurges the moral hazard of bank's excessive risk-taking (Anginer & Demirguc-kunt, 2018). Therefore, bank's risk-taking behavior increases the likelihood of banking crisis that leads toward a decline in economic growth of a country. This adverse effect of EDI motivates the researchers; there should be some policy measures which may implement by the legislators to decrease the bank's risk taking. The global financial crisis of 2007-09 highlighted the adverse effect of EDI on bank's risk-taking which needs to be addressed appropriately on timely manners to retain the depositor's confidence on financial system (Anginer et al., 2014b).

There is limited body of literature which investigates that either to confer low or high supervisory authority to a banking supervisor in order to reduce the bank's risk-taking engendered by EDI. Whereas, there are numerous countries which allocate the low and alternatively greater supervisory powers to a banking supervisor. Additionally, either to allocate the supervisory function to a central bank Masciandaro & Quintyn (2009) or outside of a central bank i-e Financial Supervisory Authority (FSA) which may likely to decrease the moral hazard of bank's risk-taking?

The objectives of this study are to examine which specific allocated supervisory powers and structure of a banking supervisor may declines the moral hazard of bank's risk-taking. We validate the economic theory by examining the influence of supervisory authority and structure of banking supervisor in the theoretical paradigm of EDI. It empirically recommends that the allocation of greater supervisory powers to a banking supervisor in a country and vesting the supervisory function to a central bank decreases the bank's risk-taking. Accordingly, the banking policymakers may devise surveillance policies in compliance with the findings of this study to enhance the soundness of banking sector. Resultantly, it will improve the investors and depositors' confidence in the depository financial institutions around the globe.

2. Literature Review

In economic theory, moral hazard is a state in which an agent (bank) taking the risk and principal (deposit insurer) pays the cost of this risk (Arrow, 1971). These parties are bound by a contractual arrangement between the state and the governed (Ross, 1973).

Therefore, the behavior of a bank may change after the transaction taken place to the detriment of other, because the bank has more information about its intentions than a deposit insurer. Hence, the bank may has the incentives to act according to its plans if deposit insurer does not monitor the bank's actions appropriately. Whereas, deposit insurer cannot completely monitor the behavior of banks. For the reason, deposit insurer relies on another agent (e-g central bank) to monitor the bank's activities and take corrective action to limit the negative effect of the outcomes (Miles, 2012). According to economic theory, the allocation of appropriate supervisory powers and organizational structure to a banking supervisor can minimize the bank risk-taking on behalf of deposit insurer.

The adoption of EDI increases the moral hazard of bank's risk-taking (Kusairi et al., 2018) in the absence of appropriate supervision (Merton, 1977). Subsequently, literature argue that the adoption of EDI reduces the bank invested capital which increases the bank's risk-level if there is no monitoring. This banking risk transfers to the government through deposit insurer fund (Diamond & Dybvig, 1986). Ronn & Verma, (1986) shows that strict supervision of banks might limit the bank's risk-taking. Consistent with this view, Gennotte & Pyle (1991) describes that the implementation of EDI leads to inefficient investment by banks while the higher capital requirement is not the substitute for the banks risk monitoring and control. Hence, there should be strong supervisory framework developed to cater the bank's risk-taking. In the light of economic theory, Demirgüç-Kunt & Kane (2001) recommended that the adoption of EDI reduces the negative effect of financial crisis, but it is necessary to establish a strong supervisory framework in a country, in conjunction with the inception of deposit insurance.

Banking supervisor has a responsibility to ensures the financial stability of the banks by analyzing their risk and subsequently compelling the corrective action for mitigation of the risk-taking (Herring & Carmassi, 2008). There are limited studies which analyzed the effect of appropriate banking supervision on the bank risk-taking provoked by EDI. The EDI increases the bank's risk-taking, while there are arguments which suggest that appropriate supervision can decline the of bank's risk-taking. The role of supervision for mitigation of bank's risk-taking depends on the allocated powers to a banking supervisor (Shehzad & Haan, 2015) and organizational structure of banking supervisor (Herring & Carmassi, 2008; Masciandaro & Quintyn, 2009).

2.1 Official Supervisory Power

Official supervisory powers include how much powers are vested to the banking supervisor to take wide array of actions to prevent problems, discipline banks, correct the problem perceived, including authority to meet, demand bank information, and punish external auditors of the banks, force banks to disclose information to the banking supervisor, order the directors of the banks to change its organizational structure, constituency of loan provisioning, suspend decision to pay fees, bonuses and dividend, and declare a bank insolvent or intervene in a problematic bank (Barth et al., 2006).

Proponents for the allocation of greater supervisory powers to a banking supervisor argue that extensive control may decrease the bank's risk-taking espoused by EDI. For the reason that banking supervisor have more authority to influence management, directors,

auditors, and shareholders of the banks (Barth et al., 2004). So, it suggests that to allocate the greater powers to a banking supervisor. Hence, forty-three countries increased the vested supervisory powers of the banking supervisor (Barth et al., 2013).

On the other hand, the critics for the allocation of greater powers to a banking supervisor highlight the various situations where banking supervisor used their authorities to extract a bribe, attract companion donation to benefit their favored constituents (Barth et al., 2004). In these cases, the greater supervisory powers might be related to in-efficiency of banks, promote corruption, decrease development, stability, and performance of the banking sector. Therefore, sixty-one countries reduced the conferred official supervisory powers of banking supervisor after the financial crisis of 2007-09 (Barth et al., 2013).

There is wide spread arguments in literature that the allocation of greater supervisory powers to a banking supervisor affect the bank risk via two ways, moral hazard and stabilization. While, allocated supervisory powers of banking supervisor varies among EDI adopted countries (Barth et al., 2013) but there are limited studies which determines that whether to confer the lower/higher supervisory powers to a banking supervisor which likely to reduce the bank's risk-taking. Empirical studies of official supervisory powers examine that reinforcement of official supervision is positively linked with banks' efficiency where financial supervisor worked independently (Barth et al., 2013), and increases the banks' soundness (Doumpos et al., 2015). Economic theory supports the view, the deposit insurer hires the banking supervisor (central bank of financial supervisory authority) to oversee the bank's activities and took corrective action to align the bank's actions according to the deposit insurer goals. Above discussion on the topic may deduce the following hypothesis:

- **H_1**: EDI upsurges the bank's risk-taking while it is reduced by the allocation of greater supervisory powers to a banking supervisor.

2.2 Supervisory Structure (Central Bank Involvement in Financial Supervision)

Supervision structure is based on characteristics, how the banking supervisory architecture designed in a country. Either central bank of a country performs the supervisory function, or these powers are conferred to the banking supervisor outside of a central bank (Doumpos et al., 2015). Although, central bank participation in banking supervision has its advantages and disadvantages for an alternative arrangement.

There are rational arguments which support allocation of the supervisory function to a central bank. It includes the economies of scale, access to timely and accurate information, the capacity of a independent central bank to enforce actions, the comparative advantage of a central bank to recruit and retain the best staff (Barth et al., 2004; Barth et al., 2002; Barth et al., 2013; Beck & Gros, 2012; Masciandaro & Quintyn, 2009). Based on the arguments above, it concludes that central bank can monitor bank's activities accurately and on timely basis and it has an advantage over other supervisory institutes to take a wide array of action against any discrepancy prevailing in the banking system.

Conversely, there are arguments which opposes to assign the supervisory responsibility to a central bank includes the moral hazard risk, scope diseconomies, increase of bureaucratic powers and loss of independence (Barth et al., 2002; Barth et al., 2003; Beck & Gros, 2012; Masciandaro et al., 2013; Masciandaro & Quintyn, 2009). Additionally,

central bank performs as the bank's supervisor can relax the financial policies to avoid the possible adverse effect of policies on the bank's solvency and profitability (Goodhart & Schoenmaker, 1995). Thus, the bank's management perceives that central bank supports the banks to avoid insolvency if liquidity problem arises under its' supervision (Klomp & de Haan, 2009). Consequently, the policymakers prevent the allocation of supervisory function within the central bank because it creates the excessive risk-taking (Barth et al., 2002). Therefore, thirty-nine countries vested the banks' supervisory powers outside of the central bank (Masciandaro & Quintyn, 2009). This trend is more significant in high-income countries and less in the low-income countries (Melecky & Podpiera, 2013). In a review of the revolutionary regime of supervisory structure in 88 countries through 1998 to 2010, it is revealed that there is a trend to transfer the supervisory function outside of a central bank (Masciandaro & Quintyn, 2009).

The implementation of EDI upsurges the bank's risk-taking (Anginer & Demirguc-kunt, 2018). Simultaneously, the countries where central bank is performing the supervisory function, it have added effect on the bank's risk-taking (Barth et al., 2002). Whereas, empirical studies scrutinize the effects of supervision structure on the banking crisis (Noy, 2004), banks' soundness (Barth et al., 2002; Doumpos et al., 2015), performance (Barth et al., 2003), and examine its' determinants (Melecky & Podpiera, 2013). Moreover, central bank oversight may reduce the liquidity risk & overhead cost of the banks and increased the non-performing loans (Barth et al., 2002). Furthermore, central bank working as lead supervisor raises the capital to asset ratio, non-performing loans to GDP ratio of the banks and decreases the banks' profitability (Barth et al., 2002; Dincer & Eichengreen, 2012). Gaganis & Pasiouras (2013) find that financial efficiency of the banks declines as the number of financial sectors supervises by a central bank went up. Whereas, central bank participation in the financial sector supervision increased the bank soundness during the crisis period in a country (Doumpos et al., 2015).

There is no consensus to separate the function of monetary policy and bank supervision from central bank (Beck & Gros, 2012). However, policymakers likely to face a trade-off between cost and benefit for the participation of central bank in banking supervision. Whereas, supervision structure of banking sector varies among EDI adopted countries (Barth et al., 2013). As this area of research received little attention from the researchers, hence above discussion on the topic may comprehend the following hypothesis:

- **H_2:** EDI upsurges the bank's risk-taking while this influence is reduced where central bank is working as a banking supervision.

3. Data and Empirical Methodology

3.1 Data and Sample

We perform the analysis on secondary data of 1,936 listed deposit-taking banks from 96 countries (including fifteen countries affected by the financial crunch of 2007-09). We employ the annual data for the period of 2002-2015 covered by the Bank scope database which covers about 90% data of all banks in the world. The sample is selected on the following criteria: 1) the bank has more than $400 million as total asset to exclude the regional banks (Storbacka, 2018), 2) the World Bank published the data of official

supervisory powers in their survey conducted over time, and 4) World Bank released the cross-country variables data in the GFDD.

Bank level financial variables data are abstracted from Bank scope database. Cross-country variables data are obtained from the two sources. First, the crisis affected country data is collected from Laeven & Valencia, (2013) database, which accounts for the banking crisis affected countries. It reports the period when a nation experience the banking crisis (Leaven & Valencia, 2013). For the reason that global financial crisis (2007-09) adversely affect the profitability of banks in crisis-affected countries and decreased the strength of banking system. Second, The data of country-level variables are composed from the World Bank's GFDD. The data of EDI variables are collected from IADI database. Whereas, the official supervisory power data is collected from the surveys conducted by the World Bank's over time.

3.2 Variables Measurement

3.2.1 Explicit deposit insurance

EDI is measured by dummy variable which adopts the value one if a nation established the deposit insurance corporation and creditors were adequately rewarded in the past event of bank failure (Anginer & Demirguc-kunt, 2018).

3.2.2 Official Supervisory Power

Barth et al., (2004) developed the official supervisory powers index that shows the extent by which supervisory institute has the power to restraint banks by performing specific activities to avoid and correct the problems. This index is based on individual questions of the World Bank's survey, which was conducted by the researchers from 1999 to 2012. Index takes the value from 0 to 14, where higher score denotes the higher supervisory powers of the banking supervisor. Official supervisory power index widely uses in the literature as a measure of bank's corrective decision (Doumpos et al., 2015; Gaganis & Pasiouras, 2013; Shehzad & Haan, 2015). So, we used the official supervisory powers index to measure the supervisory authority of a banking supervisor.

3.2.3 Supervision Structure

Supervision structure dummy is based on the index of central bank's involvement in the banking supervision, developed by the Masciandaro, (2007). We use this index to develop the dummy variable which take the value of one if central bank involved in the banking supervision and zero otherwise. Central bank participation in financial supervision index is widely used to examine the supervisory architecture of a central bank in the country (Doumpos et al., 2015).

3.2.4 Bank Risk

Z-score is used to measure the bank risk, which is equal to the sum of Return On Assets(ROA) and the capital to asset ratio divided by the three year rolling window standard deviation of ROA (Laeven & Levine, 2009). The z-score values are highly skewed, so we take the natural log of z-score. The greater value shows the strength of a bank while lower value demonstrates that the bank indulges in risk-taking activities (Anginer & Demirguc-kunt, 2018; Ngalawa et al., 2019).

3.2.5 Bank-level Control Variables

We employ the financial variables to control the possible effect of bank level characteristics on the bank risk. It includes the bank size, leverage, reliance on deposits for funding and liquid assets. Bank size is calculated by the natural log of total assets (Anginer & Demirguc-kunt, 2018; Kusairi et al., 2018; Ngalawa et al., 2019). Leverage measures as the liabilities of a bank divided by total assets (Guizani & Watanabe, 2016). Deposits measure as the total deposits in percentage of total assets. Liquid assets measure by liquid assets of a bank divided by total assets (Davis & Obasi, 2009; Forssbaeck, 2011).

3.2.6 Country-Level Control Variables

We include the control variables at country level that control the potential omitted variable problem to measure the true affect of banking supervision on the bank risk. Dummy variable is employed to control the impact of global crisis of 2007-09 which adopt the value of one when a country experience the banking crisis and zero otherwise (Storbacka, 2018). For the reason that global financial crisis (2007-09) adversely affect the profitability and decreased the stability of banking industry in the crisis-affected countries. Financial development of an economy is calculated as the Ln of GDP per capita (Anginer & Demirguc-kunt, 2018), as healthy economies improve the strength of banking sector (Barth et al., 2013). Ln(population) is employed to calculate the country size (Pellegrina, Masciandaro, & Pansini, 2013) because it influence the decisions of policy-makers in the banking sector (Masciandaro & Quintyn, 2009).

We concentrate on the banking sector development and structural control variables to incorporate the potential error of omitting variables. Stock market cap. to GDP is employed for the financial development of a country (Masciandaro, 2007). Central bank assets to GDP is used to measure central bank's powers to implement policies in the banks. The higher ratio indicates, the more fabulous resource of the central bank to supervise banks and conduct strategies (Doumpos et al., 2015). Furthermore, concentration of banking sector measures by the total assets of three large banks in percentage of total assets of all banks. For the reason that greater banking concentration negatively influence the banks efficiency (Barth et al., 2013).

3.3 Methodology

We used the multilevel dataset where banks data are nested in a country over the number of years. Therefore, HLM is better than ordinary least square (OLS) regression because it considers that data based on different ranks of aggregation (two cross-sections i-e bank and country level). Furthermore, it presents the error terms that account for the dependency effect of the nested data while it is not in the case of OLS output. Specifically, by applying HLM regression on the banks and country level simultaneously, it considers that banks in the same country are more similar as compared to the banks of another country. Additionally, HLM permits the division of the deviation in the bank risk explicated by the time, bank and country level features. Accordingly, HLM is employed for estimation of research models and this technique is widely used in the cross-country studies (Doumpos et al., 2015; Kayo & Kimura, 2011).

The model is estimated by employing the iterative maximum likelihood algorithm, where the random and fix effects are estimated concurrently till the model converges. It can be written in compact form as follows:

$$BRT_{ijt} = \alpha + \beta X_{ijt-1} + \gamma W_{jt-1} + \mu_{ij} + e_i + \mu_{ijt}$$

Fixed Random

Where $BRT_{i,j,t}$ is the bank risk for *i* bank, in *j* country, in t_{th} year, $X_{i,j,t-1}$ is the combination of lagged bank-level variables, and $W_{j,t-1}$ is the combination of lagged country-level variables. The random parts of the model ($\mu_{i,j}$ & e_j) permits the intercept (country-specific effect + bank-specific effect + intercept) to be random and have distinctive values for all banks and countries. Hence, research models assume that intercept value can deviate but slope values are fixed. Moreover, we winsorize the financial variables at 1st and 99th percentile level of distribution to eliminate the potential effect of the outlier and remove the likelihood of data error. Moreover, we use the lagged financial variables by a year to remove the reverse causality problem (Iyer, Puri, & Ryan, 2016).

3.4 Research Models

We extend the research model of Anginer et al., (2014) by adding the effect of lower/high supervisory powers of a banking supervisor on the bank's risk-taking. This section splits data into two parts on the basis of the median value of official supervisory powers, where below median values consider that banking supervisor have low authority and above median values show that banking supervisor have greater powers to align banks with the banking regulations. Furthermore, the banking crisis vibrated the effect of supervisors' official supervisory powers on the moral hazard of banks' risk-taking and adversely influenced the soundness of banking system (Doumpos et al., 2015; Laeven & Valencia, 2013). So, the dummy variable is generated which represents the non-crisis affected countries, to differentiate between the crises vs. non-crisis affected countries. Henceforth, we analyze the influence of (lower vs. greater) official supervisory powers on the bank risk in crisis and non-crisis affected countries separately.

$$\begin{aligned} BRT_{i,j,t} = {} & \alpha_{o,o,o} + \Omega_{1,i,j}(\text{Year}_{i,j,t}) + \gamma_{o,o,1}(\text{Deposit insurance dummy}_{o,o,j}) \\ & + \gamma_{o,o,2}(\text{Official supervisory powers in crisis/non-crisis affected countries}_{o,o,j}) + \gamma_{o,o,3}(\text{Economic development of country}_{o,o,j}) \\ & + \gamma_{o,o,4}(\text{Banking concentration}_{o,o,j}) + \gamma_{o,o,5}(\text{Log(Population)}_{o,o,j}) \\ & + \gamma_{o,o,6}(\text{Stock market capitalization/GDP}_{o,o,j}) \\ & + \beta_{1,j}(\text{Size}_{i,j,t-1}) + \beta_{2,j}(\text{Leverage}_{i,j,t-1}) \\ & + \beta_{3,j}(\text{Deposits}_{,j,t-1}) + \beta_{4,j}(\text{Liquidity}_{i,j,t-1}) + e_{o,o,j} + \mu_{o,i,j} + \mu_{i,j,t} \end{aligned} \quad (3a)$$

Where $i = 1,2,3.....N,$ $j = 1,2,3.....N,$ $t = 1,2,3.....T$

$BRT_{i,j,t}$ = is the bank's risk-taking, which measured by the z-score,

Ω = represent the slope coefficients of year dummies (except for the first year),
γ = represent the slope coefficients of country-level variables,
β = represent the slope coefficients of bank-level control variables, $e_{o,\,o,\,j}$ = country-specific effect,
$\mu_{o,\,i,\,j}$ = bank-specific effect, & $\mu_{i,\,j,\,t}$ = error term

The dependent variable of the study is risk-taking of i's bank (in j country and t year) and bank's risk-taking is calculated by the z-score. The explanatory variables of interest are EDI and official supervisory powers in the banking crisis/non-crisis affected countries. This specification permits us to analyse the influence of low and high official supervisory powers on the bank's risk-taking in EDI adopted countries. Therefore, this analysis uses to identify that either to vest low or high official supervisory powers to a banking supervisor which reduces the bank risk. Therefore, the negative coefficient of deposit insurance dummy reports that it increases the bank risk and declines soundness of the banks. Whereas, the positive coefficient of deposit insurance dummy indicates that it decreases the bank's risk-taking.

The positive coefficient of low/high official supervisory powers present that allocation of specific supervisory powers enhance the bank soundness and decreases the moral hazard of bank's risk-taking. Whereas, the negative value indicates that specific supervisory powers enlarge the moral hazard of bank's risk-taking and shrank the soundness of banks. So, this model allows us to compare the coefficient of low and high official supervisory powers effect on the bank's risk-taking provoked by EDI.

3.4.1 EDI and Bank's Risk-Taking: in Cross Section of Supervision Structure

This subdivision presents the research model for analyzing the effect of central bank's supervision on the bank risk. So, we include the central bank supervision variable into the base model (3a), presented in the section 3.4. This section reports the effect of supervision structure which is most likely to link with the soundness of banking system, either supervisory powers allocate to the central bank or outside of the central bank?

Furthermore, the banking crisis shaken the effect of central bank's supervisory powers on the moral hazard of banks' risk-taking and adversely impact the soundness of banking system (Doumpos et al., 2015; Laeven & Valencia, 2013). So, the dummy variable is generated which represents the non-crisis affected countries, to differentiate between the crises and non-crisis affected countries. Hence, we consider the effect of central bank's supervisory powers on the bank risk in crisis and non-crisis affected countries separately.

$$BRT_{i,j,t} = \alpha_{o,o,o} + \Omega_{1,i,j}(Year_{i,j,t}) + \gamma_{o,o,1}(Deposit\,insurance\,dummy_{o,o,j}) + \gamma_{o,o,2}(Central\,bank's\,supervisory\,powers\,in\,crisis/non\text{-}crisis\,affected\,countries_{o,o,j}) + \gamma_{o,o,3}(Economic\,development\,of\,country_{o,o,j}) + \gamma_{o,o,4}(Banking\,concentration_{o,o,j}) + \gamma_{o,o,5}(Log(Population)_{o,o,j}) + \beta_{1,j}(Size_{i,j,t-1}) + \beta_{2,j}(Leverage_{i,j,t-1}) + \beta_{3,j}(Deposits_{,j,t-1}) + \beta_{4,j}(Liquidity_{i,j,t-1}) + e_{o,o,j} + \mu_{o,i,j} + \mu_{i,j,t} \quad (3b)$$

Where $i = 1,2,3.....N,$ $j = 1,2,3.....N,$ $t = 1,2,3.....T$

$BRT_{i,j,t}$ = is the bank's risk-taking, which measured by the z-score,

Ω = represent the slope coefficients of year dummies (except for the first year), γ = represent the slope coefficients of country-level explanatory variables,

β = represent the slope coefficients of bank-level control variables, $e_{o,o,j}$ = country-specific effect, $\mu_{o,i,j}$ = bank-specific effect, & $\mu_{i,j,t}$ = error term

The dependent variable of the study is risk-taking of i's bank (in j country and t year). The explanatory variables of interest are EDI and central bank supervision in the crisis/non-crisis affected countries. This specification uses to scrutinize the effect of central bank supervision on the bank's risk-taking during the crisis/non-crisis affected countries. Therefore, the negative coefficient of deposit insurance dummy reports that it increases the bank risk while a positive value indicates that it enhances the soundness of banks and decreases the bank's risk-taking. Whereas, the positive coefficient of central bank supervision specifies that it decreases the bank's risk-taking (measured by z-score) in the presence of EDI.

5. Results and Discussion

4.1 Summary Statistics

Table 1 presents the descriptive analysis of the dataset employed in this research. It illustrates the central tendency (Mean & Median), percentile points and standard deviation (variation among variables) of variables in the dataset. Column "N" provides the number of all banks yearly observations, column "P25" reports the 25th percentile, column "Mean" shows the average value, column "P75" provides the 75th percentile, and column "STD" presents the standard deviation of the sample.

Table 1: Descriptive Analysis

Variables	N	P25	Mean	Median	P75	STD
Ln(z-score)	13369	2.964	3.741	3.824	4.569	1.631
Size	13224	6.801	8.495	7.864	9.710	2.137
Leverage	13224	0.883	0.896	0.908	0.928	0.067
Deposits	13224	0.637	0.701	0.758	0.831	0.194
Liquidity	13221	0.037	0.128	0.075	0.174	0.134
Banking Crisis Country	13369	0	0.300	0	1	0.458
Ln (GDP per Capita)	13300	9.098	9.851	10.628	10.700	1.341
Ln (Population)	13369	17.661	18.482	19.477	19.523	1.656
Banking Concentration	13265	29.306	46.916	35.133	64.389	24.801
Stock Market Cap./GDP	13369	56.577	90.653	106.907	125.554	46.275
Deposit Insurance Dummy	13369	1	0.855	1	1	0.352
Official Supervisory Power	13369	11	11.880	13	13	1.984
Central Bank's Supervision	12193	1	0.780	1	1	0.414

The mean value of bank's Ln(z-score) is 3.74, and average banks have total assets of 4.915 billion US$. Moreover, eighty-nine percent of bank's assets are financed by debt, out of which 70 percent is funded by the customer deposits alone. Average value of GDP per capita of sample banks among all countries is 18,958 US$, wand the means population is 106 million in the sample countries. Twenty-five percent of the bank's z-score values lies below the 2.964. Likewise, twenty-five percent value lies above the 4.569, and its middle value is 3.824 with 1.631 deviations from the mean. The value presented in the table 2 are comparable with the literature (Anginer & Demirguc-kunt, 2018).

4.2 Sub-sample Comparison of Means

Table 2 reports the sub-sample comparison in the difference of mean amongst the variable of interest in the dataset of all banks yearly observations. Primary insight can extract from the Table 2 which reports the difference of means of explained variable (z-score) used in this research. Table 2 states that bank's z-score values deviate amongst the difference in official supervisory powers of a banking supervisor in a country. Furthermore, z-score value changes by variation in the supervision structure of a banking supervisor.

Table 2: Sub-Sample Comparison of Means of Z-Score

Official Supervisory Powers	**Crisis Period**	**No**	**Yes**	**Diff in Mean**	**p-value**
Panel A					
Low	Ln(z-Score)	3.5943	3.1088	0.4855	0.0000
High		4.1442	3.4623	0.6819	0.0000
Crisis Period Dummy	Central Bank's Supervision	No	Yes	Diff in Mean	p-value
Panel B					
0	Ln(z-Score)	3.5944	4.0079	0.4136	0.0000
1		3.0413	3.4401	0.3988	0.0000

Table 2 reports the univariate analysis of the influence of low vs. high supervisory powers amongst crisis and non-crisis affected countries on the mean values of ln (z-score) in the sample of banks. Additionally, it presents the effect of central bank participation in the supervision of banks during the crisis and non-crisis period. Table 2 reports the average value of Ln (z-score) for the subsample of banks, difference between mean and p-value for the test of difference in means. We use the data of 1,936 banks from 96 countries in the period of 2002 to 2015.

In Panel A of Table 2, we divide the sample, either the legislator allocate the low or high supervisory authority to the banking supervisor and whether a country affected by global crisis in the given year. Finding shows that bank risk increases in the crisis period and banks have greater soundness during the non-crisis period. Additionally, banks have greater soundness where banking supervisor has greater powers to discipline banks. Conversely, bank risk-level goes up if banking supervisor has lower powers to monitor & influence the management, directors, and auditors of the banks.

In Panel B of Table 2, we partition the sample, either banking supervisory function allocates to the central bank or outside of the central bank of a country (i-e financial supervisory authority) and whether a country experience a banking crisis in a given year. Result reveals that banks have greater soundness in the subsample of non-crisis period and bank risk increases in the crisis period. Moreover, banks have greater soundness where central bank performs the supervisory functions, and banks risk goes up where supervisory function allocated to the banking supervisor outside of a central bank.

4.3 Deposit Insurance and Bank Risk: In Cross-Section of Supervisory Power

Table 3 presents the findings of HLM that report the estimation of the year, bank and country levels for the fixed effect. First column of Table (3) reports the variables name and model (1) reports that the adoption of EDI increased the moral hazard of bank's risk-taking. Furthermore, we divide the data into two groups based on the official supervisory powers where below median values are considered as low supervisory powers vested to the banking supervisor, as reported in the model (2) and (3). Whereas, equal or above the median value is considered as high supervisory powers vested to the banking supervisor, as reported in the model (4) and (5). Furthermore, variance decomposition analysis reports the relative importance of each level (bank, country and time level) in the deviation of bank risk. AIC and BIC were used for selection of best fit model in the study. We employ the Variance Inflation Factors (VIF) to examine the multicollinearity problem in the multiple regression to select the control variables. The VIF value ranges

from 1.23 to 2.48, it reasonably suggests that control variables of model 1 through 5 of Table 3 can be included in the analysis (Chortareas et al., 2012).

Model (2) and (3) report the results for the effect of low official supervisory powers on the bank's risk-taking during the banking crisis and non-crisis affected countries respectively. Whereas, model (4) and (5) shows that the effect of high official supervisory powers on the bank's risk-taking in the banking crisis and non-crisis effected countries respectively. From model (2) through (5) of Table 3, it can extract that the adoption of EDI increased the moral hazard of bank's risk-taking in the case where banking supervisor has lower powers. Whereas, banks take less negative effect (risk) of the deposit insurance where supervisory powers are high. This effect may exist because banks perceive that banking supervisor has fewer powers to take a wide array of action against banks if they indulge in the malpractice (Barth et al., 2006).

Table 3: Deposit Insurance and Bank Risk-Taking: In Cross-Section of Supervisory Power

		Low Supervisory Quality		High Supervisory Quality	
Fixed-effects parameters	(1)	(2)	(3)	(4)	(5)
Constant	4.238	1.777	1.437	5.458	4.816
	(0.822)	(0.967)	(0.981)	(1.073)	(1.107)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Deposit Insurance Dummy	-0.222**	-0.399***	-0.396***	-0.321**	-0.329**
	(0.103)	(0.135)	(0.135)	(0.141)	(0.141)
Official Supervisory Powers * Banking Crisis Affected Country		-0.038***		-0.045***	
		(0.010)		(0.006)	
Official Supervisory Powers * Countries not affected by Banking Crisis			0.037***		0.045***
			(0.009)		(0.006)
Banking Crisis Country	-0.624***				
	(0.050)				
Economic Development of Country	0.072*	0.134***	0.140***	-0.065	-0.060
	(0.041)	(0.050)	(0.050)	(0.047)	(0.048)
Ln(Population)	0.016	0.069*	0.066*	0.063	0.065
	(0.034)	(0.040)	(0.040)	(0.040)	(0.040)
Banking Concentration	-0.009***	-0.003	-0.003	-0.006*	-0.007*
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)
Stock market Cap./GDP	0.003***	0.002**	0.002**	0.003**	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln(Size)	-0.002	0.026	0.029	-0.030*	-0.029*
	(0.013)	(0.022)	(0.022)	(0.018)	(0.018)
Leverage	-1.283***	-1.144**	-1.153**	-1.960***	-1.957***
	(0.296)	(0.461)	(0.461)	(0.46)	(0.460)
Deposits	0.410***	0.533***	0.513***	0.493**	0.495***
	(0.126)	(0.187)	(0.187)	(0.198)	(0.198)
Liquidity	-0.772***	-0.406*	-0.423*	-1.091***	-1.101***
	(0.152)	(0.230)	(0.230)	(0.227)	(0.227)
Variance Decomposition Analysis					
Country-level	0.113***	0.077**	0.080**	0.079**	0.081**
	(0.037)	(0.037)	(0.037)	(0.036)	(0.038)
Bank-level	0.473***	0.895***	0.893***	0.521***	0.520***

	(0.026)	(0.070)	(0.070)	(0.036)	(0.036)
Residual variance	1.996***	1.831***	1.830***	1.823***	1.823***
	(0.026)	(0.041)	(0.041)	(0.031)	(0.031)
Model-fit Statistics					
AIC	51113.4	17811.2	17809.2	29134.0	29134.5
BIC	51063.4	17761.2	17759.2	29084.0	29084.5
Countries	96	83	83	47	47
Banks	1936	895	895	1262	1262
Yearly Observations	13941	4847	4847	8112	8112

Dependent Variable: Ln (z-score)
Table 3 presents the estimates of hierarchical research model by employing the maximum likelihood method. Sample consists on the data of 1,936 banks from 96 countries during 2002-2015. The values in the parenthesis reports the standard errors underneath their coefficients.
*, **, *** shows the significant level at 10, 5 and 1% respectively

Based on the model (3) and (5) of Table 3, official supervisory powers decrease the risk-taking of banks in EDI adopted countries which are not affected by the banking crisis, either vested supervisory powers are low or high. It might be the reason that the allocation of greater supervisory authority to banking supervisor not misused by the banking supervisor and it played the role as vigilant banking supervisors (Barth et al., 2006). Furthermore, it revealed that allocation of lower supervisory powers to banking supervisor reduced the bank's soundness, while greater supervisory powers boost the soundness of banks in a country. It may be the reason that countries where banking supervisory powers are low, banks take excessive risk in those countries to enrich the bank's return. Alongside, it is supposed that banking supervisor has fewer powers to take action which prevent banks from risk-taking (Barth et al., 2004).

Conversely, in the model (2) and (4), bank's risk-taking activities went up in the crisis-affected countries, either vested supervisory powers of banking supervisor is low or high. It indicates that official supervisory powers of the banking supervisor enhances the bank's risk-taking in the banking crisis-affected countries. It may be the reason that financial supervisors indulge in to extract bribe and companion donation to their favored constituents which increases the negative effect of EDI (Barth et al., 2006). It may be the reason that financial crisis reduces the bank's profit and their capital to asset level, so this leads to the increase of bank risk (Laeven & Valencia, 2013).

4.4 Deposit Insurance and Bank Risk-Taking: In Cross-Section of Structure of Banking Supervisor

Model (1) through (4) of Table 4, reports the role of central bank's supervision on the bank's risk-taking initiated by the implementation of EDI. We divide the data into two groups based on the official supervisory powers, where below median values are considered as low supervisory powers are vested to a banking supervisor, reported in the model (1) and (2). Whereas, above or equal to the median value is considered as greater

supervisory authority is vested to the central bank, as reported in column (3) and (4). The VIF values ranges from 1.30 to 2.51 for the model (1) through (4).

Model (1) of Table 4, reveals that the implementation of EDI upsurges the bank's risk-taking. Moreover, the allocation of low supervisory powers to central bank magnify the bank risk among crisis-affected country, but it is significant at the level of 10 percent. Likewise, model (2) reports that low supervisory authority of central bank decreases the bank's risk-taking in non-crisis affected countries, but this effect is significant at the level of 10 percent. It might be the reason that central bank's supervision has limited powers to limit the banks from indulging into excessive risk-taking.

Model (3) of Table 4 presents that allocation of greater supervisory powers to central bank enlarges the moral hazard of bank's risk-taking among crisis-affected countries. It might be the reason that central bank with greater supervisory powers indulges in extract bribe, companion donations to benefit their favored constituents during economic down turn, consequently this will increase the negative effect of EDI. However, model (4) shows that EDI increases the moral hazard of bank's risk-taking while a central bank with greater supervision powers increases the bank's soundness in those countries which are not affected by the banking crisis. It may be the reason that central bank's supervisors have better control over bank because of their access to accurate information and influence on the bank's management.

Table 4: Deposit Insurance and Bank Risk-Taking: In Cross-Section of Supervisory Structure

	Low Supervisory Quality		High Supervisory Quality	
Fixed-effects parameters	(1)	(2)	(3)	(4)
Constant	1.513	0.923	7.252	8.588
	(1.226)	(1.110)	(1.171)	(1.138)
Year Fixed Effects	Yes	Yes	Yes	Yes
Deposit Insurance Dummy	-0.365**	-0.340**	-0.456***	-0.413**
	(0.153)	(0.143)	(0.158)	(0.161)
Central Bank's Supervision in Banking Crisis Affected Country	-0.024*		-0.044***	
	(0.015)		(0.007)	
Central Bank's Supervision in Non- Crisis Country		0.019*		0.027***
		(0.010)		(0.007)
Economic Development of a Country	0.177***	0.200***	-0.031	-0.059
	(0.062)	(0.062)	(0.046)	(0.047)
Ln(Population)	0.067	0.080*	-0.014	-0.087
	(0.048)	(0.043)	(0.037)	(0.036)
Banking Concentration	-0.001	-0.002	-0.010**	-0.013
	(0.003)	(0.003)	(0.004)	(0.004)
Ln(Size)	0.028	0.029	-0.027	-0.017
	(0.021)	(0.020)	(0.019)	(0.019)
Leverage	-1.271***	-1.328***	-1.824***	-1.830***
	(0.448)	(0.440)	(0.480)	(0.482)
Deposits	0.669***	0.650***	0.380*	0.364*
	(0.188)	(0.184)	(0.205)	(0.206)
Liquidity	-0.407*	-0.443*	-1.045***	-1.031***
	(0.234)	(0.231)	(0.248)	(0.249)
Variance Decomposition Analysis				
Country-level	0.139***	0.126***	0.129***	0.133***
	(0.056)	(0.053)	(0.051)	(0.049)
Bank-level	0.510***	0.521***	0.556***	0.567***
	(0.047)	(0.047)	(0.039)	(0.040)
Residual variance	1.757***	1.729***	1.857***	1.859***

	(0.042)	(0.041)	(0.032)	(0.032)
Model-fit Statistics				
AIC	14567.4	14871.7	28055.8	28076.7
BIC	14517.4	14872	28007.8	28028.7
Countries	66	69	38	38
Banks	749	770	1165	1165
Yearly Observations	4064	4164	7761	7761

Dependent Variable: Ln (z-score)

Table 4 presents the estimates of hierarchical research model by employing the maximum likelihood method. Sample consists on the data of 1,165 banks from 66 countries during 2002-2015. The values in the parenthesis reports the standard errors underneath their coefficients.

*, **, *** shows the significant level at 10, 5 and 1% respectively

5. Conclusion

In last two decades, a number of countries reform their banking supervision to strengthen the banks' soundness. Therefore, few countries increase the vested supervisory powers of banking supervisor, and few countries reduce the conferred powers of banking supervisor. Moreover, few countries allocate the banking supervision to the central bank while few rely on the financial supervisory authority (outside of the central bank). We have investigated that supervisory powers and its structure play a vital role in decreasing the bank risk which is incited by the adoption of EDI.

The allocation of greater supervisory powers to the banking supervisor decreases the bank's risk-taking aggravated by EDI. Moreover, banks are economically sound where banking supervisor has greater supervisory authority. On the other hand, the allocation of lower supervisory powers to banking supervisor decreases the moral hazard of bank's risk-taking in existence of EDI, but it condenses the overall financial strength of the banking system. The allocation of greater supervisory powers to a banking supervisor in order to reduce the risk-taking is supported by the economic theory (Miles, 2012). Additionally, the arguments for the allocation of greater supervisory powers enhance the bank soundness is reinforced by the existing literature (Doumpos et al., 2015).

Central bank as banking supervisor reduces the bank's risk-taking where vested supervisory powers are high, at the same time, increases the overall financial health of the banking sector in a country. Conversely, low supervisory powers of a central bank have little or no influence on the bank's risk-taking. Hence, the banks have low soundness where central bank has low supervisory powers. Resultantly, the allocation of greater supervisory powers to a central bank decreases the bank's risk-taking motivated by EDI and increases the overall soundness of banking system. In align with the findings, the literature on the bank's risk-taking favored to assign the supervisory function to a central bank of the country (instead of financial supervisory authority outside of the central bank) to reduce the risk in the banking system.

5.2 Limitations and Future Directions

This study considers the listed deposit-taking banks of IMF member countries because listed banks financial figures are more reliable as compared to the data of unlisted banks.

This data is collected from the Bankscope database which almost covers the 90 percent of banking data around the globe. Additionally, the Bankscope database has banks data at-least three years back to a given year because the cross-checking of the dataset takes time to update the database. Moreover, the time-varying data of the supervisory powers of the banking supervisor, and additional supervisory powers of 136 deposit insurer is not available. So, this study uses the data of the World Bank's surveys conducted over time, as it uses in the literature. The next phase in our study would be to classify further the precise mechanisms through which the supervision of a banking supervisor and allocation of additional supervisory powers to deposit insurer helps during the financial crisis.

REFERENCES

Agoraki, M. E. K., Delis, M. D., & Pasiouras, F. (2011). Regulations, competition and bank risk-taking in transition countries. *Journal of Financial Stability*, *7*(1), 38–48.

Anginer, D., & Demirguc-kunt, A. (2018). *Bank Runs and Moral Hazard: A Review of Deposit Insurance* (Policy Research Working Paper No. 8589). [ONLINE] Available at: http://documents.worldbank.org/curated/en/548031537377082747/Bank-Runs-and-Moral-Hazard-A-Review-of-Deposit-Insurance (March 17th, 2019).

Anginer, D., Demirguc-Kunt, A., & Zhu, M. (2014). How does deposit insurance affect bank risk? Evidence from the recent crisis. *Journal of Banking and Finance*, *48*, 312–321.

Arrow, K. J. (1971). *Essays in the Theory of Risk-Bearing*. Amsterdam: North-Holland Publishing Company.

Barth, J. R., Caprio, G., & Levine, R. (2004). Bank regulation and supervision: What works best? *Journal of Financial Intermediation*, *13*(2), 205–248.

Barth, J. R., Caprio, G., & Levine, R. (2013). Bank regulation and supervision in 180 countries from 1999 to 2011. *Journal of Financial Economic Policy*, *5*(2), 111–219.

Barth, J. R., Dopico, L. G., Nolle, D. E., & Wilcox, J. A. (2002). Bank Safety and Soundness and the Structure of Bank Supervision : A Cross-Country Analysis. *International Review of Finance*, *3*(4), 163–188.

Barth, J. R., Jr., G. C., & Levine, R. (2006). *Rethinking Bank Regulation Till Angels Govern* (2nd ed.). Cambridge University Press. [ONLINE] Available at: https://www.amazon.com/Rethinking-Bank-Regulation-Angels-Govern/dp/052170930X (April 19th, 2019).

Barth, J. R., Lin, C., Ma, Y., Seade, J., & Song, F. M. (2013). Do bank regulation, supervision and monitoring enhance or impede bank efficiency? *Journal of Banking and Finance*, *37*(8), 2879-2892.

Barth, J. R., Nolle, D. E., Phumiwasana, T., & Yago, G. (2003). A Cross-Country Analysis of the Bank Supervisory Framework and Bank Performance. *Financial Markets, Institutions & Instruments*, *12*(2), 67-120.

Beck, T., Demirguc-Kunt, A., & Levine, R. (2006). Bank supervision and corruption in lending. *Journal of Monetry Economics*, *53*, 2131-2163.

Beck, T., & Gros, D. (2012). *Monetary Policy and Banking Supervision: Coordination instead of separation* (Centre for European Policy Studies No. 286). [ONLINE] Available at: https://www.ceps.eu/ceps-publications/monetary-policy-and-banking-supervision-coordination-instead-separation/ (November 7th, 2018).

Boyle, G., Stover, R., Tiwana, A., & Zhylyevskyy, O. (2015). The impact of deposit insurance on depositor behavior during a crisis: A conjoint analysis approach. *Journal of Financial Intermediation*, *24*(4), 590–601.

Calomiris, C. W., & Jaremski, M. (2016). Deposit Insurance: Theories and Facts. *Annual Review of Financial Economics*, *8*(1), 97–120.

Chortareas, G. E., Girardone, C., & Ventouri, A. (2012). Bank supervision , regulation , and efficiency : Evidence from the European Union. *Journal of Financial Stability*, *8*(4), 292–302.

Davis, E. P., & Obasi, U. (2009). *Deposit Insurance Systems and Bank Risk* (No. 09–26). *Economics and Finance Working Paper Series*. [ONLINE] Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.425.5373&rep=rep1&type=pdf (January 17th, 2019).

Delis, M. D., & Kouretas, G. P. (2011). Interest rates and bank risk-taking. *Journal of Banking & Finance*, *35*, 840–855.

Demirgüç-kunt, A., & Kane, E. J. (2002). Deposit Insurance around the Globe : Where Does It Work ? *The Journal of Economic Perspectives*, *16*(2), 175–195.

Demirguc-Kunt, A., Kane, E. J., & Laeven, L. (2008). Determinants of deposit-insurance adoption and design. *Journal of Financial Intermediation*, *17*(3), 407–438.

Diamond, D. W., & Dybvig, P. H. (1986). Banking Theory, Deposit Insurance, and Bank Regulation. *The Journal of Business*, *59*(1), 55–68.

Dincer, N. N., & Eichengreen, B. (2012). The Architecture and Governance of Financial Supervision: Sources and Implications. *International Finance*, *15*(3), 309–325.

Doumpos, M., Gaganis, C., & Pasiouras, F. (2015). Central bank independence, financial supervision structure and bank soundness: An empirical analysis around the crisis. *Journal of Banking and Finance*, *61*(1), S69–S83.

Forssbaeck, J. (2011). Ownership structure, market discipline, and banks' risk-taking incentives under deposit insurance. *Journal of Banking and Finance*, *35*(10), 2666–2678.

Gaganis, C., & Pasiouras, F. (2013). Financial supervision regimes and bank efficiency: International evidence. *Journal of Banking and Finance*, *37*(12), 5463–5475.

Gennotte, G., & Pyle, D. (1991). Capital controls and bank risk. *Journal of Banking and Finance*, *15*, 805–824.

Goodhart, C., & Schoenmaker, D. (1995). Should the functions of monetary policy and banking supervision be separated? *Oxford Economic Papers*, *47*(4), 539–560.

Grira, J., Hassan, M. K., & Soumaré, I. (2016). Pricing beliefs: Empirical evidence from the implied cost of deposit insurance for Islamic banks. *Economic Modelling*, *55*, 152–168.

Guizani, B., & Watanabe, W. (2016). The effects of public capital infusions on banks' risk-shifting to the deposit insurance system in Japan. *Journal of Financial Stability*, *26*, 15–30.

Herring, R., & Carmassi, J. (2008). The Structure of Cross-Sector Financial Supervision. *Financial Markets, Institutions & Instruments*, *17*(1), 51–76.

Iyer, R., Puri, M., & Ryan, N. (2016). A Tale of Two Runs: Depositor Responses to Bank Solvency Risk. *Journal of Finance*, *71*(6), 2687–2726.

Kahn, C. M., & Santos, J. A. C. (2005). Allocating bank regulatory powers: Lender of last resort, deposit insurance and supervision. *European Economic Review*, *49*(8), 2107–2136.

Kayo, E. K., & Kimura, H. (2011). Hierarchical determinants of capital structure. *Journal of Banking and Finance*, *35*(2), 358–371.

Klomp, J., & de Haan, J. (2009). Central bank independence and financial instability. *Journal of Financial Stability*, *5*(4), 321–338.

Kusairi, S., Azura, N., & Ghafar, A. (2018). Dilemma of deposit insurance policy in ASEAN countries : Does it promote banking industry stability or moral hazard? *Borsa Istanbul Review*, *18*(1), 33–40.

Laeven, L., & Levine, R. (2009). Bank governance , regulation and risk taking. *Journal of Financial Economics*, *93*(2), 259–275.

Laeven, L., & Valencia, F. (2013). Systemic banking crises database. *IMF Economic Review*, *61*(2), 225–270.

Liu, L., Zhang, G., & Fang, Y. (2016). Bank credit default swaps and deposit insurance around the world. *Journal of International Money and Finance*, *69*, 339–363.

Masciandaro, D. (2007). Divide et impera : Financial supervision unification and central bank fragmentation effect. *European Journal of Political Economy*, *23*, 285–315.

Masciandaro, D., Pansini, R. V., & Quintyn, M. (2013). The economic crisis: Did supervision architecture and governance matter? *Journal of Financial Stability*, *9*(4), 578–596.

Masciandaro, D., & Quintyn, M. (2009). *Reforming financial supervision and the role of central banks: a review of global trends, causes and effects (1998-2008)* (Centre for Economic Policy Research No. 30). *Centre for Economic Policy Research*. [ONLINE] Available at: https://cepr.org/sites/default/files/policy_insights/PolicyInsight30.pdf (February 5th, 2019).

Melecky, M., & Podpiera, A. M. (2013). Institutional structures of financial sector supervision , their drivers and historical benchmarks. *Journal of Financial Statbility*, *9*, 428–444.

Merton, R. C. (1977). An analytic derivation of the cost of deposit insurance and loan guarantees: An application of modern option pricing theory. *Journal of Banking and Finance*, *1*, 3–11.

Miles, J. A. (2012). *Management and Organization Theory*. *Jossey-Bass* (First Edit). John Wiley & Sons, Inc. [ONLINE] Available at: https://www.wiley.com/en-us/Management+and+Organization+Theory%3A+A+Jossey+Bass+Reader-p-9781118008959 (February 17th, 2019).

Ngalawa, H., Tchana, F. T., & Viegi, N. (2019). Banking Instability and Deposit Insurance : The Role of Moral Hazard. *Journal of Applied Economics*, *19*(2), 323–350.

Noy, I. (2004). Financial liberalization, prudential supervision, and the onset of banking crises. *Emerging Market Review*, *5*, 341–359.

Pellegrina, L. D., Masciandaro, D., & Pansini, R. V. (2013). The central banker as prudential supervisor: Does independence matter? *Journal of Financial Stability*, *9*(3), 415–427.

Prean, N., & Stix, H. (2011). The effect of raising deposit insurance coverage in times of financial crisis - Evidence from Croatian microdata. *Economic Systems*, *35*(4), 496–511.

Ronn, E. I., & Verma, A. K. (1986). Pricing Risk-Adjusted Deposit Insurance : An Option-Based Model. *The Journal of Finance*, *41*(4), 871–895.

Ross, S. A. (1973). The Economic Theory of Agency: The Principal's Problem. *The American Economic Review*, *63*(2), 134–139.

Shehzad, C. T., & Haan, J. De. (2015). Supervisory powers and bank risk taking. *Journal of International Financial Markets , Institutions & Money*, *39*, 15–24.

Storbacka, N. (2018). *Deposit Insurance and Moral Hazard : An Analysis of Banks in the European Union (Masters' thesis*. [ONLINE] Available at: https://helda.helsinki.fi/dhanken/bitstream/handle/10227/222498/Storbacka.pdf?sequence=1&isAllowed=y (January 7th, 2019).

Yan, X., Skully, M., Avram, K., & Vu, T. (2014). Market Discipline and Deposit Guarantee: Evidence from Australian Banks. *International Review of Finance*, *14*(3), 431–457.