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Multilevel Drivers of Bank Risk Taking in Dual Banking Systems: Evidence From OIC Countries

by

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Multilevel Drivers of Bank Risk Taking in Dual Banking Systems: Evidence From OIC Countries

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Dedicated to my dear father, praiseworthy mother, brothers, sisters, childern and adorable nieces. My deepest gratitude to Dr. Beeya for her blessings, encouragements and prayers. I humbly profess without them, I would have stumbled long time ago.

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List of Publications

It is certified that following publication(s) have been made out of the research work that has been carried out for this thesis:-

1. Khan, M. H., Fraz, A., Hassan, A., & Abedifar, P. (2020). Female Board Representation, Risk-taking and Performance: Evidence from Dual Banking Systems. *Finance Research Letters, Volume 37, Pages 171-196, DOI: https://doi.org/10.1016/j.frl.2020.101541.*

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Abstract

This study aims to decompose the variance in bank risk taking at three levels and then go on to investigate whether bank regulation and supervision, macroeconomic environment and level of corruption channeled through industry and bank level factors to shape bank risk taking. Particularly, this study explores the three-level hierarchical structure of bank risk taking through nested data that contained 191 banks (level 1) nested within 2 industries, *Islamic vs. conventional* (level 2) nested within 11 countries (level 3) and paid particular attention to assessing the possible causal effects of the country, industry and bank specific variables on risk taking. The sample period of this study comprises of 11 years from 2007 to 2017. This study uses a sample of 191 (71 Islamic and 120 conventional) banks with 2,101 observations operating in 11 OIC countries with dual banking systems where Islamic and their conventional counterparts operate alongside each other.

In order to decompose the variance in bank risk taking at three levels, a one-way ANOVA model with random effects is used in which all independent variables are initially ignored. Particularly, the study employs a null model, an unconditional means model for computing the intra-class correlation coefficients. The results show that banks from the same country, or even the same industry, are not especially similar in their risk taking and three-level model therefore offers a significantly better fit to the data than the single-level model.

To explore the multilevel determinants of risk taking this study uses hierarchal linear modeling. The findings show that bank regulation and supervision, macroeconomic environment and corruption channeled through industry and bank level factors to shape bank risk taking. Specifically, at country level, the findings show that bank regulations and supervision, such as, supervisory power and creditor rights help to mitigate the risk taking and make a sound and stable banking system. Further, a detrimental impact of corruption is found for conventional banks that supports the *sand the wheel* hypothesis of corruption whereas, the findings provide support for the positive contribution of Shari'ah supervision boards to

overcome the adverse effect of corruption on riskiness of Islamic banks. At industry level, results exhibit that competitive banking systems improve the stability and banks face less risk taking. Moreover, bank level variables also exert significant influence on risk taking.

The findings of this study are helpful to regulators and policy-makers in formulating and enforcing suitable policies and strategies regarding risk management and improvement of the stability of banks for the betterment of the banking industry in particular and stability of financial system in general.

Keywords: Risk Taking, Bank-specific Attributes, Ownership Structure, Governance Indicators, Macroeconomic Environment, Bank Regulation and Supervision, Corruption, Dual Banking Systems, Financial Crisis, Hierarchal Linear Modeling, and OIC Countries.

JEL classification code: C18; D73; G20; G30; G32; G33; O10

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Abbreviations

HLM	Hierarchal Linear Modeling
OLS	Ordinary Least Squares
GLS	Generalized Least Squares
ICCs	Intra-class Correlation Coefficients
UMM	Unconditional Means Model
ANOVA	Analysis Of Variance
NPLs	Non-performing Loans
LLPs	Loan-loss Provisions
HHI	Herfindahl-Hirschman Index
CAR	Capital Adequacy Requirement
BIS	Bank of International Settlements
ID	Islamic Dummy
LR	Likelihood Ratio
TI	Transparency International Corruption Perception Index
CCI	Control of Corruption Index
WGI	Worldwide Governance Indicators
SSBs	Shari'ah Supervision Boards
PLS	Profit and Loss Sharing
IAHs	Investment-Account-Holders
IFIs	Islamic Financial Institutions
OIC	Organization of Islamic Cooperation
CEE	Central and Eastern European Countries

Chapter 1

Introduction

In order to channeling limited financial resources from savers to investors, banks play a crucial role. More importantly, the stability and efficiency of the financial sector is considered to have direct influence on prosperity of any economy, particularly in developing economies (Kroszner et al., 2007; Boyd and De Nicolo, 2005; King and Levine, 1993). The recent financial crisis (2007-2008) during last decade have stimulated a healthy literature that assumes risk taking of bank as one of the prominent sources of financial distress (Teixeira et al., 2019; Vazquez and Federico, 2015; Acharya and Naqvi, 2012; Schularick and Taylor, 2012; Diamond and Rajan, 2009), because banks face risk inherently in number of its core operations. Furthermore, financial turmoils are contagion and costly events that make devastating social and financial impacts and change the lives of numerous people and families, even in developed economies to the edge of poverty (Ötker-Robe and Podpiera, 2013).

Over the past 25 years, almost two-third of the IMF countries suffered some kind of financial distress, a fact that has attracted the attention of scholars (Lindgren et al., 1996). It is estimated that the direct cost of bank bailouts in the Asian crisis are approximately 30 percent of the GDP of Indonesia, Thailand and South Korea (Beim and Calomiris, 2001), whereas the resolution cost is close to 20 percent for Japan's GDP (Calomiris and Mason, 2003). Moreover, unexpected bust cycle and credit boom are experienced by banking sectors of Central and Eastern European countries (CEE) that ended with the 2007-08 financial crisis, which, in

turn, significantly reduced bank lending in this region (Cull and Peria, 2013). Particularly, during 2011 financial sector of CEE region also suffer from an increase of 11 percent in the non-performing loans (Andries and Brown, 2017).

Interestingly, during the sample period of this study, 2007-2017, a crisis in banking sector (2007-2008) occurred, although countries selected in sample of this study do not have experienced the influence of the crisis in those years. However, investigation of crisis period is essential, as documented by Rege et al. (2013), Tanna et al. (2017) and Teixeira et al. (2018), moreover, Ashraf (2017) and Chen et al. (2017) find a greater risk taking by banks during banking turmoil.

The extant literature on bank risk taking identifies determinants of risk taking at three different levels; country, industry, and bank-level. For example, at country level; *bank regulation and supervision* (Noman et al., 2018; Barth et al., 2013; Ellul and Yerramilli, 2013), *corruption* (Chen et al., 2015, 2013; Park, 2012; Méon and Weill, 2010; Barth et al., 2009), and *macro-economic characteristics* (Dell'Ariccia et al., 2013; Bruno and Shin, 2015; Drakos et al., 2016; Fang et al., 2014). At industry level; *banking industry competition* (Berger et al., 2017; Fu et al., 2014; Weill, 2011; Boyd and De Nicolo, 2005). Finally, at bank-level; *diversification* (Chen et al., 2018; Deng and Elyasiani, 2008; Lepetit et al., 2008), *firm size* (Bhagat et al., 2015; Demsetz and Strahan, 1997), *liquidity* (Khan et al., 2017; Drehmann and Nikolaou, 2013; Acharya and Naqvi, 2012), *ownership structure* (Zheng et al., 2017; Drakos et al., 2016), and *efficiency* (Fiordelisi et al., 2012; Berger and DeYoung, 1997), among others.

Undoubtedly these studies contributed to the body of knowledge, however, existing studies investigate factors impacting risk taking in an insolated way. In simple words, researchers have not yet explored the multilevel impact of national regulations, macroeconomic characteristics and level of corruption on risk taking that may be channeled through industry and bank-specific variables. This study argues that analysis at single level leads to model misspecification and biased estimations. Because a standard ordinary least squares (OLS) assumes that when predictors correlate with the residual term, it leads to a spurious and biased estimates (Agresti and Finlay, 1997). The violation of this assumption occurs

when a significant predictor that is related with outcome variable is missing from the model, or alternatively speaking an omitted variable bias make the estimates spurious (Kennedy, 2003). Importantly, OLS regression ignores the nested data structures (Raudenbush and Bryk, 2002) and assumes the units of analysis as independent observations. Thus, failing to distinguish hierarchical structures may result in underestimation of the regression estimates and standard errors and cause an overstatement of statistical significance.

It is therefore important to explore simultaneous effect of three levels using appropriate estimation technique such as hierarchal linear modeling (HLM) because if data have the problem of within-cluster-correlation, HLM effectively accounts for this issue (Raudenbush and Bryk, 2002; Snijders and Bosker, 1999). This study argues that risk taking is a multilevel issue because risk taking within countries may be more similar, on average, than risk taking across countries, and banks operating in the same industry are subject to the same level of macroeconomic and regulatory constraints. However, across the countries bank risk taking may be different due to difference in macroeconomic environment, particularly, exchange rate regimes, and monetary policy. Likewise, in dual banking systems the structure and nature of the Islamic and conventional banking is also expected to influence the extent to which banks take risk.

Contrary to conventional banking, Islamic banking is based on Shari'ah principles and offers Shari'ah compliant financial products thereby risk taking of banks operating in Islamic banking industry may differ from conventional counterparts. Sustainability and soundness of Islamic banks in the long run is the major concern for practitioners and regulators because growth of Islamic banking established a fierce competition with conventional counterparts to survive (Elgari, 2003). Furthermore, as Islamic banking is incepted based on Shariah principles (Islamic law), therefore, some Islamic financial products exert additional credit risk on practicing banks (Kabir et al., 2015; Sundararajan and Errico, 2002). Non-standardized financial contracts, complexity in risk management and different modes of financing with the implementation of Shariah impose additional threats on the soundness of

Islamic banks. Hence, the investigation of risk-taking for Islamic banks is important in order to improve prudential regulations on the management of risk-taking that may help both conventional and Islamic banks.

It is imperative to study the dual banking system as both competing banking system entails different levels of risk taking. Essentially, conventional banking incepted on interest while Islamic banking is mainly based on markup financing and profit and loss sharing (PLS). Moreover, Islamic banking is based on equity participation concept, profit and loss sharing (Musharaka) and profit-sharing (Mudaraba) (Farag, 2016; Archer et al., 1998). Mudaraba is considered as the riskiest kind of Islamic contracts and further divided into two types unrestricted and restricted contracts (Karim, 2001; Archer et al., 1998). On the one hand, the restricted contracts allow investment account holders to have say in the use of capital provided by them and included as off balance sheet item (Karim, 2001). On the other hand, bank management has their discretion to make investment decisions in case of unrestricted contracts and included in the liabilities of Islamic banks (Farag, 2016). However, in both contracts, investment account holders are liable to financial losses but have no right to interfere in fund management (Safieddine, 2009).

As a result, risk averse borrowers can avoid the risk by choosing Islamic banks (Hasan and Dridi, 2011). But, in case of sharing losses with depositors, Islamic banks may face credit (withdrawal) risk (Siddiqui, 2008). With this scenario, Islamic banks may have a greater credit risk than conventional counterparts. The alternate explanation of higher credit risk for Islamic banks could be as follows. Because in Islamic banking borrowers have the opportunity to share losses with banks that creates moral hazard problem thereby increase the credit risk in PLS financing modes (El-Hawary et al., 2007). Apart from the restriction of interest, Islamic banks face other prohibitions, particularly the use of derivative products *Gharar*, because all contracts should be free from excessive uncertainty (Obaidullah, 2005). Thus, Islamic banks cannot use the credit risk mitigation tools such as credit derivatives due to religious restriction, which, in turn, increase Islamic bank's credit risk (Errico and Farahbaksh, 1998). Contrary, for Islamic banks,

information asymmetry between borrowers and banks can be lower in case of partnership type of contracts, hence, the creditworthiness of borrowers will be improved and also resolves the adverse selection problem (Errico and Farahbaksh, 1998). Moreover, the religious beliefs of borrowers about the Islamic banking system may induce loyalty of borrowers and discourage bank defaults (Baele et al., 2014).

Moreover, Islamic banks have Shari'ah supervision boards (hereafter, SSBs) as a key feature of their governance and represent an additional layer of governance (Choudhury, 2006), which might further restrain management from taking the risk. In addition to operational committees and regular board, the institution of SSBs in Islamic banks make conventional governance into a multi-layer governance (Mollah and Zaman, 2015). This is different compared to single-layer governance structure in conventional banks, which usually consists of subcommittees of the board and board of directors, therefore, additional layer of SSBs and underlying assumption of Islamic banking as a theoretical commitment to ethical behavior may also help to reduce risk taking.

To the best of my knowledge, this study is one of the pioneering that simultaneously examines all levels and use a methodology that adequately accounts for the hierarchical effects between these levels. To this end, this study addresses multilevel issue of risk taking of banks through multilevel model in order to explain intra-class correlation, even after accounting for the baseline differences in their national regulations, macroeconomic conditions and level of corruption across countries and competition between Islamic and conventional banking systems. Before examining the predictors from various levels, it is important to take a step back and understand what level (s) account for the major variation in risk-taking of banks. In this regard, Short et al. (2007) state that: "If a study includes only one or two of the levels, the resulting portrayal of the interwoven systems that collectively shape firm outcomes is incomplete".

Thus, aim of current research is first to decompose variance in risk taking at three levels and then go on to investigate whether bank regulation and supervision, macroeconomic environment and level of corruption channeled through industry

and bank level factors to shape bank risk taking. Particularly, this study attempts to explore multilevel risk taking drivers from a sample containing Islamic and their conventional counterparts operating in 11 OIC countries with dual banking systems where Islamic and conventional banks operate alongside each other. More precisely, this study explores the three-level hierarchical structure of bank risk taking through nested data that contained 191 banks (level 1) nested within 2 industries-Islamic vs. conventional (level 2) nested within 11 countries (level 3) and paid particular attention to assessing the possible causal effects of the country, industry and bank specific variables on risk taking.

1.1 Theoretical Background

On the one hand, the traditional theory of finance presented by Modigliani and Miller (1958) assumes that recognition of securities is based on their cash flows and exhibits different risk characteristics. For instance, equity provides right to owner to receive dividends while debt entitles bondholders a promised fixed interest stream. Moreover, studies have argued that most of the securities have an important feature, the *rights*, they provide to their owners (Hart, 1995). For example, the selection of company's directors is dependent of the shareholders, that is the right, a share provides to its owner, while debt gives power to creditors to receive the collaterals in case of liquidation of the companies.

On other hand, law and finance theory founded by LaPorta et al. (1997, 1998) argues that only focus on the intrinsic rights of securities ignores the important effect of legal rules of the jurisdictions on these rights in which securities are issued. They further argue that differences in legal protections of investors, bank regulations and level of corruption vary across countries and might help explain the difference in risk taking of banks operating in different countries. Based on the notion of law and finance theory, this study argues that country level variables (bank regulations and supervision, level of corruption and macroeconomic environment) vary across countries and have direct influence on risk taking. Moreover,

the indirect effect of regulations and supervision, corruption and macroeconomic characteristics on risk taking depends on industry as well as bank level variables.

In case of direct effect, the theoretical relationship of bank regulations and supervision such as official supervisory power, deposit insurance and creditor rights with risk taking suggests that bank regulations and supervision overcome adverse selection in the credit market and reduce moral hazard problem. In this regard, Barth et al. (2004) demonstrate that supervisory power help to increase monitoring on the operations of the bank, protecting them from systematic run, overcome moral hazard problem and taking excessive risk in existence of insurance coverage. In their seminal paper, Beck et al. (2006) propose the two views regarding official supervisory power, namely, *Private interest view* and *Public interest view* that may influence bank risk-taking. The former view assumes that powerful supervisors are unlikely to protect banks from financial distress. Instead, they increase their political agenda or personal interests and force banks to lend to specific borrowers on easier terms. Thus, this perspective suggests that powerful supervision backed by government tend to be linked with greater bank risk taking and adversely affects financial stability. However, the later view suggests that powerful supervisors may overcome information asymmetries, enforcement impediment and transaction costs in order to prevent banks form market failures. Hence, this perspective argues that powerful supervision tend to be associated with lower bank risk taking and enhance financial stability.

Likewise, creditor's right also overcome moral hazard and adverse selection problems linked with lending of banks. Djankov et al. (2007) hypothesize stronger creditor rights bring more power to creditors in case of bankruptcy, which encourages them to grant more credit. Alternatively speaking, the weak creditor's rights may lead to high defaults and increase credit risk. Supporting this hypothesis, Acharya et al. (2011) document that greater creditor rights usually decrease firm's risk-taking. Moral hazard problem may also occur when countries use deposit insurance regulation or safety nets regarding capital requirements. Barth et al. (2006) and Ioannidou and Penas (2010) argue that deposit insurance increases the problem of moral hazard in banking because insured depositors no more face the

risk of losing their savings, which reduces their incentives and efforts of monitoring bank activities. In this situation, banks may have incentives to take more risk because of low monitoring.

Moreover, based on the LaPorta et al. (1997) arguments, current study also expects direct influence of corruption on bank risk taking. Beck et al. (2006) further argue that *private interest view* of supervision raises bank lending corruption. The *private interest view* suggests supervisors and politicians maximize their own personal welfare rather to maximize social welfare. Hence, if supervisory agencies of banks attempt to discipline banks from taking risk and financial distress, the supervisors and politicians may encourage banks for granting loans to firm that have more political connections by using power (Becker and Stigler, 1974; Stigler, 1975; Haber et al., 2003). In this scenario, banks may not properly allocate capital based on the criteria of risk and return. Unfortunately, supervisory agencies have the power to effect the allocation of bank loans, then corruption and political ties may shape the allocation of bank credit, therefore, bank stability may be adversely affected.

The macroeconomic environment also directly influence bank risk taking. Previous research studies conjectured that an expansionary phase of the economy features comparatively low non-performing loans, because in this situation both firms and consumers have sufficient income stream to service their debts. As for as the boom period continues, nevertheless, credit is granted to lower quality debtors and afterward, when recession sets in, non-performing loans increases.

In case of indirect effect, this study argues that country level variables influence the industry level variable (competition), which, in turn, exerts influence on bank level variables to shapes risk taking and financial stability. In this regard, the link among competition, regulations and soundness of banks is originally discuss by Keeley (1990) and argues higher risk taking for US financial industry in 1980s is caused by the deregulation and increased competition that tend to erode profit margins and "franchise value" of banks. One such regulation is deposit insurance that could raise competition through build public confidence in the financial system thereby raising the level of intermediation. Similarly, the competition may also

influenced by capital requirements by restricting new firms and increasing existing banks' market power (Northcott, 2004), thereby shape risk taking and soundness of financial system. In addition, the increase in overall capital requirements may also increase cost for banks to function, as a result, only small chunk of banks may afford such costs (Agoraki et al., 2011).

In addition, Shleifer and Vishny (1993) explain the association between corruption and competition and its influence on credit lending. They discuss two types of corruption: without theft and with theft. In the former type, for providing briber goods, a government official receives additional money to which he is entitled without the bribe. In the later type, for reducing the payments, like tariffs or taxes, a government official takes money and government owes this briber. Hence, corruption with theft decreases costs and corruption without theft increases costs. Consequently, the former kind of corruption spreads when markets are competitive and in a competitive market, therefore, every firm must itself pay bribes or go out of business. The keener is the competition, the higher is the pressure to reduce costs, and the more pervasive is corruption. Similarly, corruption in bank lending in competitive environment may influence the credit lending to customers and impact on risk taking and stability.

Moreover, competition may interact with bank level variables, for instance, bank efficiency to exert influence on risk taking. Competition-efficiency hypothesis presented by Demsetz (1973) assumes that rise of competition lead to enhance efficiency regarding profits. In simple word, banks with higher efficiency having more production technologies as well as skilled management tend to enhance profits by increasing their market share at the cost of less efficient banks, thereby lead to greater risk taking of less efficient banks Vennet (2002). Contrary, competition-inefficiency hypothesis argues that increase in competition is linked with decrease in bank efficiency because higher competition is probably related to short-term and instable relationships between financial institutes and customers (Boot and Schmeits, 2006). This phenomenon will translate into asymmetries of information, which needs additional resources for monitoring and screening borrowers that adversely affect bank stability and efficiency.

In sum, the theoretical underpinnings regarding the direct and indirect effect of variables from three levels on risk taking suggest bank risk-taking as multi-level issue because risk taking depends not only on banks' own attributes but also on industry and country level factors.

1.2 Gap Analysis and Research Problem

Existing studies used multilevel approaches in estimating the multilevel drivers of ownership structure, dividend policy, profitability to corporate governance in finance and banking literature. For instance, Erkan et al. (2016) use hierarchal linear model (HLM) and examine the variance decomposition of firm-year, firm, industry, and country of dividend policy. Second, Tennant and Sutherland (2014) investigate the drivers of profit from bank fees at bank, industry and country levels using HLM. Third, Ramirez et al. (2012) investigate the determinants of foreign ownership by employing HLM for a sample of Japanese firms. Fourth, Luo et al. (2009) examine the effect of governance practices on foreign investment in emerging economies through multilevel analysis. Finally, to the best of my knowledge, Li et al. (2013) examine the multilevel drivers of corporate risk taking for manufacturing firms using HLM.

Contrary to Li et al. (2013), this study contained the banking sector and risk taking instead of manufacturing firms. The selection of the banking industry is based on the following reasons. *First*, although the banking industry is considered as heavily regulated as argued by Li et al. (2013) but the bank regulatory framework varies from country to country because of institutional settings and legal environment such as investor protection laws, creditors' rights, etc. (Gonzalez and González, 2008). *Second*, banks tend to dominate the financial systems in the developing economies, thus banks are the major source of finance provider to companies rather bond markets, hence, the failure of banks may lead to the failure of the overall economy. *Third*, bank is considered as main mechanism through which Central Bank of a country applies its regulatory application, monetary policy, inflation stability and expectations management for the betterment of the

society (Molnár and Santoro, 2014). Consequently, it is important for banks to have better risk management practices compared to non-financial firms (Birge and Júdice, 2013). *Fourth*, in interbank market, banks are associated together, and their failure exposing them to contagion risk (Mistrulli, 2011; Upper, 2011; Iori et al., 2006), and the difference in the regulatory framework, institutional settings and legal environment across countries create room for managers to increase bank risk.

Borrowing the idea of multilevel approach from aforementioned studies, this study is the first to decompose variation in risk taking at three levels-bank, industry and country, and then takes a step ahead to add the explanatory variables of each level to see the causal effect of each level variables on bank risk taking. Specifically, this study uses the hierarchal linear molding to examine whether national regulations, corruption and macroeconomic characteristics interact with industry and bank level factors to shape bank risk across countries. Thus, this study contributes methodologically in the body of literature of bank risk taking.

More importantly, this study attempts to investigate difference in risk taking of conventional and Islamic banks using multilevel approach. This study covers this gap in context of 11 OIC countries with dual banking systems where Islamic and their conventional counterparts operate alongside each other. Indeed, the Shari'ah supervisory board (SSB), is expected to have a constraint on banks operations that discourage excessive risk-taking. In this regard, Mollah and Zaman (2015) argue that Islamic banking is rooted on an underlying assumption of ethical deeds, a key expression is the implementation of profit and loss sharing schemes and restriction of interest. Hence, the spiritual underpinning of Islamic banking together with the refrain from generating poor quality lending as well as executives should be restrain from dishonest practices that increase bank risk taking.

Finally, a social psychological lens is used in this study for understanding the topical corporate governance issue regarding female representation on bank board, specifically in Islamic banks. No academic study has examined how different is the risk taking and stability of religiously conscious corporations such as Islamic banks with females in the board vis-a-vis conventional banks. Indeed, current study is

based on existing studies, contributing on the issue of female place in leadership ladder and corporate affairs Terjesen et al. (2016); Virtanen (2012); Torchia et al. (2010); Terjesen et al. (2009), among others.

1.3 Questions of the Study

In what follows are the research questions of the study:

1. What is the effect of country level factors on risk taking?
    (a) Do bank regulations and supervision influence risk taking?
    (b) Does corruption influence risk taking?
    (c) Does macroeconomic environment influence risk taking?
2. What is the effect of industry level factor on risk taking?
    (a) Does competition influence risk taking?
3. What is the effect of bank level factors on risk taking?
    (a) Does efficiency influence risk taking?
    (b) Does capital adequacy influence risk taking?
    (c) Does bank size influence risk taking?
4. What is the effect of governance indicators on risk taking?
    (a) Does board size influence risk taking?
    (b) Does female board representation influence risk taking?
    (c) Does audit committee independence influence risk taking?
    (d) Does risk management committee influence risk taking?
5. What is the impact of ownership structure on risk taking?
    (a) Does government ownership influence risk taking?
    (b) Does foreign ownership influence risk taking?

6. Whether bank regulations and supervision interact with industry and bank level factors to exert indirect influence on risk taking?
7. Whether macroeconomic environment interact with industry and bank level factors to exert indirect influence on risk taking?
8. Whether corruption interact with industry and bank level factors to exert indirect influence on risk taking?
9. Is there any difference in risk taking in Islamic and conventional banks?
10. Whether country, industry and bank level factors have different effect on risk taking during global financial crisis?

1.4 Research Objectives

In general, this study aims to test the direct and indirect effect of country, industry and bank level factors on risk taking. In particular, this study has following research objectives:

1. To study the direct effect of country level factors on risk taking.
   (a) To test the impact of bank regulation and supervision on risk taking.
   (b) To test the impact of corruption on risk taking.
   (c) To test the impact of macroeconomic environment on risk taking.
2. To investigate the direct effect of industry level factor on risk taking.
   (a) To test the impact of competition on risk taking.
3. To examine the direct effect of bank level factors on risk taking.
4. To explore the direct effect of governance indicators on risk taking.
5. To study the direct effect of ownership structure on risk taking.
6. To investigate whether bank regulation and supervision interact with industry and bank level factors to exert indirect effect on risk taking.

7. To investigate whether macroeconomic characteristics interact with industry and bank level factors to exert indirect effect on risk taking.

8. To investigate whether corruption interact with industry and bank level factors to exert indirect effect on risk taking.

9. To determine the difference in risk taking in Islamic and conventional banks.

10. To explore the impact of country, industry and bank level factors on risk taking during global financial crisis.

1.5 Contribution of the Study

This study is important because it contributes to previous literature in the following ways. First, this study uses a multilevel approach by combining factors from three levels (i.e., country, industry and bank) to theorize and empirically estimate the direct and indirect effect on bank risk-taking. Thus, this study provides a methodological contribution through multilevel analysis regarding the determinants of bank risk-taking using hierarchical linear modeling. Multilevel models provide numerical estimates of factors from each level, their relative weights, and simultaneous impact. The multilevel models such as hierarchal linear model (HLM) adequately accounts for within-cluster correlation once it is present in the data (Raudenbush and Bryk, 2002; Snijders and Bosker, 1999).

Second, this study contributes to the corporate finance literature more generally by highlighting the role played by corporate governance, specifically the presence of female members in boards of Islamic banks compared to the conventional banks. Drawing on the social role theory (Eagly, 1987) and recognizing the importance of social norms and religious values in either upholding or discouraging gender stereotypes, this study contributes to the debate by studying female board participation in Islamic banks that are based on religious doctrine. This theory assumes that behavior of an individual is determined by his/her gender. Based on this theory, "men and women respond differently to various aspects of social relationships, which can be categorized as either communal or agentic" (Koenig et al.,

2011). Research studies find that the constraints in gaining leadership position for females is related with cultural factors, above all religiosity, across countries (Inglehart et al., 2003). Moreover, Banaszak and Plutzer (1993) argues that: "most religions encourage and reinforce values consistent with traditional gender roles". This study, therefore, argues that religion matters for female's appointment on the board of a bank due to gender stereotypes. Similar to other religions, Islam also promotes gender stereotypes and assumes that the role and responsibility of women are in the family (Othman, 2006). Hence, the female board representation in Islamic banks might contradict with the religious perception of many Muslims. As a result, it is more likely that Islamic banks view traditional gender roles as the norm. Therefore, it is important to explore whether the risk taking in Islamic banks differently influenced if women sits on bank boards of Islamic banks vis-a-vis conventional banks.

Third, this study adds to the existing literature by investigating the impact of corruption on risk taking in dual banking systems. This is important because there are significant differences between conventional and Islamic banks. The latter provide Shari'ah compliant finance and have Shari'ah supervision Boards (SSBs) as an additional layer of monitoring and oversight as well as a constraint on boards of directors and management from engaging in aggressive lending and major risk-taking activities. Hence, the spiritual underpinning of Islamic banking together with the refrain from generating poor quality lending, their executives ought to be averse to unethical practice such as corruption.

Fourth, current study adds to the emerging Islamic banking literature by exploring the difference in risk taking for conventional vis-à-vis Islamic banks from selected OIC countries. Thus, by jointly examining both conventional and Islamic banks, this study complement the works of Abedifar et al. (2017), Mollah and Zaman (2015), Abedifar et al. (2013), Beck et al. (2013), Weill (2011), Čihák and Hesse (2010), and Hasan and Dridi (2011). The mentioned studies present comparative investigation of risk management, financial soundness, efficiency and performance between these two competing banking institutes.

Fifth, this study also aims to explore the impact of country, industry and bank level factors on risk taking during global financial crisis. Thus, this study proposes important policy implications, which may help regulators and supervisors to anticipate and prevent the banking crisis in the future. This is because, debate among regulators and academicians considers risk taking by banks as major contributor of the financial crisis (Fiordelisi et al., 2012; Beck et al., 2006; Mishkin, 1999).

1.6 Study Plan

The remaining part of this study is organized as follows: Chapter 2 describes the review of the literature and the development of hypotheses; Chapter 3 presents the construction of the sample, defines the major variables of interest and econometric specifications; Chapter 4 provides the results and discussion; and Chapter 5 conclusion and policy implications.

Chapter 2

Literature and Hypothesis Development

This chapter provides a review of literature regarding country level, industry level and bank level drivers of risk-taking.

2.1 Country-level Drivers of Risk Taking

In case of country-level drivers of risk taking, this study includes bank regulations and supervision, macroeconomic environment and corruption.

2.1.1 Bank Regulations, Supervision and Risk Taking

Bank regulations are designed to make the banking system sound by mitigating the risk taking (Repullo, 2013), because instability of banks adversely effect overall financial system by distorting both payment system and interbank loan market as well as reducing credit facilities (Khan et al., 2016). Following previous literature, three bank regulations and supervision variables, namely, official supervisory power, deposit insurance and creditor rights are included (Noman et al., 2018; Barth et al., 2013; Houston et al., 2010), among others.

2.1.1.1 Deposit Insurance and Risk Taking

By the end of 2013, 112 economies used some type of deposit insurance in explicit form (Demirgüç-Kunt et al., 2015). In response to recent financial crisis, various economies significantly expanded the inclusion of their deposit insurance schemes so as to build confidence of market and overcome likely runs in the financial sector. In this regard, economic theories propose that insured deposits bring the costs as well as advantages. Beginning with (Merton, 1977), various studies have examined the connection between banks soundness and deposit insurance. Deposit shields help to protect the benefits of depositors thereby aids in preventing failure of banks that may enhance the well-being of society. This beneficial and stabilization impact of the deposit insurance can be, naturally, more significant during financial distress (Anginer and Zhu, 2014). Proponents of this opinion, for example, Gropp and Vesala (2004) have noted that use of deposit insurance overcomes bank risk-taking in Europe. Likewise, Chernykh and Cole (2011) has documented that the use of insurance coverage for deposits improved financial intermediation during their study period for Russia.

Alternatively, a substantial amount of existing literature has noted that insurance coverage intensifies moral hazard problems in the banking industry by incentivizing banking institutions for taking more risk. Because of limited liability, shareholders are motivated to take even more risks since they can benefit from the payoffs created by holding risky portfolios without facing downside risk (Kane and Hendershott, 1996). Due to this problem of moral hazard, the nature of depositors (i.e., debt holders) collectively in the existence of deposit insurance schemes decreases monitoring incentives of the depositors. Demirgüç-Kunt and Huizinga (2004) have argued that insurance coverage results in moral hazard issues in the financial sector because depositors no more face the likelihood of the loss of their savings, which decreases their incentives to monitor the activities of the banks. Demirgüç-Kunt and Kane (2002) and Barth et al. (2004) have noted the consistent evidence regarding this perspective and report that the government may lack the resources and have information asymmetries to correctly judge riskiness of bank and insurance coverage premiums appropriately. Any risk-based premium

charged could be considered "unfair" resulting in inefficiencies and distortions in the financial sector. Demirgüç-Kunt and Kane (2002) and Houston et al. (2010) have noted as insurance coverage for deposits increased bank risk-taking.

Recent studies also documented that insurance coverage for deposits is associated with the bank risk-taking. For instance, Lopez-Quiles and Petricek (2018) have estimated the association between risk taking and insurance coverage schemes in the U.S. banks and found decreases bank risk-taking in case of insured banks. Aldunate (2019) have explored that whether deposit insurance impact riskiness of banks and do not find significant impact. Contrary, using a sample of 118 countries over the period 1980-2004, Ngalawa et al. (2016) have reported the insignificant relationship between deposit insurance with bank soundness measured through by Z-scores. Nevertheless, the interaction of deposit insurance and private sector credit is observed to have adverse effect on bank soundness and increase bank runs, implying that positive impact of deposit insurance outweighs by moral hazard. Liu et al. (2016) have explored the impact of deposit insurance schemes on the bank's credit risk, which is considered as a predictor of failure and a key element in the financial turmoil. They found that deposit insurance increase credit of banks have low liquidity and low asset quality. Likewise, Calomiris and Jaremski (2019) have observed a higher bank risk taking in case of insurance coverages because it declines market discipline. This is because deposit insurance schemes are considered credible by the depositors, hence, their deposits in insured banks will be higher in order to avoid risk. They further argued that insurance coverage schemes stimulates insolvency risk of banks as doing this may not protect them from the competition they faced by uninsured banks operates in the same industry.

Based on mixed evidence from empirical results, this study conjectures that:

H_1: Deposit insurance increases bank credit risk.

2.1.1.2 Supervisory Power and Risk Taking

The empirical research studies regarding risk taking and supervisory power show mixed results. Barth et al. (2001) have reported that official supervisory power

adversely affects bank performance and increases the non-performing loans. Later on, Barth et al. (2006) have noted that strong government oriented official supervisory power is particularly harmful in developing economies and adversely impact on credit lending. However, Fernández and Gonzalez (2005) have noted that official supervision with an increased disciplinary power minimizes the risk-taking in the banks by managing the accounting and auditing requirements. Likewise, Tabak et al. (2016) have documented that strong banking supervision enhance the financial stability and overcome the excessive risk taking. Similarly, Barth et al. (2013) have noted that in case of independent supervisors who are free from the political connection improves the efficiency of financial institutes. In support of this argument, Lee and Hsieh (2014) reported as the main reason of banking system to be fragile is weak supervision and private monitoring. Moreover, sound supervision efficiently decreases the risk-taking propensity of banking institutions in developing economies which may otherwise get worse due to intense competition (Cubillas and González, 2014).

Official supervisory power also improves the sharing of information among creditors thereby overcomes moral hazard and adverse selection, which, in turn, enhance lending and minimizes bank defaults. Jappelli and Pagano (2006) have argued that efficient allocation of credit can be prevented by the information asymmetries between lenders and borrowers. They further document that due to these information asymmetries lenders may not properly judge the characteristics of borrowers, particularly the risk appetite regarding investment in projects that induces problem of adverse selection.

Official supervisory power also acts as a disciplining device for borrowers. This is because supervisory power improves sharing of information between borrowers and lenders, thus, enhances their chance of getting credit in future. Therefore, by improving borrowers' incentives to repay, sharing of information will in general diminishes the problem of moral hazard which may occur after the contract is signed (Vercammen, 1995). Moreover, sharing of information, by giving historical data on the past conduct of borrowers, could also overcome adverse selection (Dierkes

et al., 2013) and disciplinary channel of effective supervisory power decreases borrower's moral hazard (Klein, 1992).

Recently, Guérineau and Leon (2019) have analyzed the impact of credit information sharing on financial stability based on a sample of 159 countries. The results show that sharing of information regarding credit also alleviates the unfavorable effect of a credit boom on fragility of financial sector however this finding valid for only for emerging and developed economies. Grajzl and Laptieva (2016) have explored the influence of supervisory power and sharing of information on bank lending during the period of 2002 to 2009 based on bank level data in Ukrainian. The results exhibit that information sharing through supervisory power enhance the bank lending, overcome the credit risk and improve stability of banks.

Based on above findings, this study conjectures as:

H_2: Supervisory power decreases bank credit risk.

2.1.1.3 Creditors Rights and Risk Taking

Creditor rights could diminish the asymmetry of information among lenders and borrowers, enhance bank performance and reduces the risk-taking by overcoming moral hazard and adverse selection problems. Dell'Ariccia and Marquez (2006) and Berger et al. (2011) have argued that an environment in which creditor rights are protected banks may use collateral requirements for comparable loan applicants in order to differentiate the level of risk of the projects. They further argue that this strong creditors protection environment generate signaling effect which reduces the adverse selection problem. The effectiveness of collateral as a signaling device in order to differentiate between low-risk and high-risk borrowers is documented for foreign banks in the theoretical model of Sengupta (2007). In this model, they argue that foreign banks face difficulty regarding information related to quality of domestic borrowers as compared to domestic banks. Foreign banks use the signaling nature of collateral requirements in order to decrease this shortcoming and therefore compete successfully with domestic banks.

Mathur and Marcelin (2015) have documented that creditor rights help to overcome the moral hazard of borrowers and thereby improve bank performance. In an analysis on 38 countries for the sample period over 1994 to 2004, Acharya et al. (2011) have found in case of strong creditor rights, corporate borrowers are likely to be reluctant to engage in risky activities. In similar vein of research, Cho et al. (2014) reported that corporate borrowers increase their leverage in case of strong creditor rights, which, in turn, positively affect bank performance and reduces default loan probabilities. Nevertheless, the literature also reports that bank lending also increases in case of stronger creditor rights (Djankov et al., 2007), and increase in lending helps wider set of borrowers to get credit that may be less creditworthy, this, in turn, impedes bank performance and results in higher loan default rates (Houston et al., 2010).

Moreover, Djankov et al. (2003) and Mulligan and Shleifer (2005) have argued that countries in in various legal customs could focus on several tactics of social control to run the business. Particularly, common law countries depend on private contracting, while civil law countries, and specifically French civil law countries, depend on regulation of government's ownership. Claessens and Klapper (2005) have noted that many components of the extensively used creditor rights indexes have a very differential influence on the probability of bankruptcy, whereas Brockman and Unlu (2009) have reported that in countries where creditor rights are weaker firms are less likely to pay dividends and also engaged in risky investments.

Current literature also provides evidence that creditor right is a determinant of bank risk taking. For instance, Biswas (2019) has explored the impact of creditor rights and its interaction with competition on bank-level stability across 13 countries between 1995 and 2004. They found mixed evidence that on the one hand, stronger creditor rights decrease risk-taking because stronger creditor rights improves bank recovery rates in case of borrower defaults, which positively affects bank stability. On the other hand, an increase in creditor rights also reduces the positive effect of competition on stability. Similarly, Olmo et al. (2018) have studied 1096 banks from 36 countries for the sample period spanning from 2003

to 2015 and have found that creditor rights improves the effectiveness of bank lending channel, however, do not impact directly on the supply of bank loans.

From above mentioned findings, this study assumes that:

H_3: Creditors' rights decreases bank credit risk.

2.1.2 Corruption and Risk Taking

On the one hand, corruption may raise the default probabilities of borrowers and hinder lending through increasing cost of debt, however, on the other hand, firm can offer higher bribes to get more loans for higher productivity and efficiency (Chen et al., 2015). The most popular justifications on the detrimental or favorable corruption effects rest on *sand the wheel* and *grease the wheels* hypotheses, pioneered by Leff (1964) and Leys (1965). Due to weak functioning of institutes in developing economies both hypotheses regarding corruption are considered as advantageous for these economies.

Corruption is "the misuse of the public power for personal benefits, is an economic, social and political phenomenon prevailing globally but pronounced more in less-developed economies. Moreover, in broader sense corruption is manifested in cronyism, deception, collusion, fraud, embezzlement, nepotism, and the misuse of governmental power." Literature on corruption-development nexus show that corruption is detrimental to economic growth and extensively assumed to be malevolent to incentives of entrepreneurs' investment, in foreign direct investment, for the accumulation of human capital, in arrangement of government expenditure, and the effectiveness of international aid (Reinikka and Svensson, 2006).

Empirically, Chen et al. (2013) have found supporting results with the *grease the wheel* hypothesis, corruption induces productive firms to extend higher loans, similarly, Méon and Weill (2010) have noted supportive results particularly in poorly governed countries. However, the evidence from business surveys and empirical studies supports the *sand the wheel* hypothesis. For instance, Khwaja and Mian (2005) have reported that politically linked firms get more loans from banks however result in higher default rate. Weill (2011) and Detragiache et al. (2008) have

reported in case of higher corruption in a country reduces growth in lending. Likewise, Park (2012) has documented that countries with higher level of corruption face more problem loans and credit risk.

Recently, Bougatef (2015) has estimated the association between insolvency risk (soundness) and corruption using a sample of 69 Islamic banks and finds that increase in level of corruption leads to decline in bank soundness and financial stability. Furthermore, Bougatef (2016) has analyzed the impact of corruption on the credit risk of 22 emerging countries and noted a deterioration effect of corruption on loan quality and increase in credit risk. In this stream of research, Atkins, Dou and Ng (2017) have argued that provisions of loan loss lower the lending corruption. Nevertheless, this advantageous effect of timely loan loss provisions is altered in countries with the existence of deposit insurance schemes and higher state-ownership in financial sector. Barry et al. (2016) have studied a sample of emerging and developed economies and document that countries having family and state owned banks face higher corruption in lending activities.

Based on above findings regarding corruption and risk taking this study conjectures following hypothesis:

H_4: Corruption increases bank credit risk.

2.1.3 Macroeconomic Characteristics and Risk Taking

There is a rich evidence that macroeconomic characteristics; GDP growth, inflation and exchange rates are important country level determinants of bank risk taking (Teixeira et al., 2019; Chen et al., 2013; Laeven and Levine, 2009; Boyd and De Nicolo, 2005; Gonzalez, 2005).

GDP growth is an important country-level macro-economic factor that is studied in existing literature regarding its impact on bank risk-taking. The literature reports that economic instability is mainly caused by lower growth in GDP, which may also induce bank risk taking (Mileris, 2014; Baselga-Pascual et al., 2015). This study includes GDP-growth in order to control the macroeconomic cycle. This is because, on the on hand, in expansion phase of economy both corporate

borrowers and individual investors need enough funds in order to service their debts. On the other hand, in recession phase the capability of servicing debt reduces, therefore, credit may be extended to the low quality debtors, as a result greater defaults occur. Argued by Dell'Ariccia et al. (2013), Borio and Zhu (2012) and Delis and Kouretas (2011), an expansionary monetary policy could lead banks to make more vulnerable through two main mechanisms. Firstly, the interest rate on lower side can improve the collateral value that may reduce the bank's risk appetite. Secondly, declining interest rates during monetary policy is relaxed lead bank rate of return targets could be sticky, so as to encourage risk-taking to get higher returns. Moreover, the decrease in interest rate especially for long run is linked to increased risk of the bank.

Inflation is another country-specific macro-economic factor that is included in this study regarding its effect on risk taking of banks and predicted impact of inflation on risk is uncertain. For example, Arpa and Giulini (2001) and Buch et al. (2010) have provided empirical evidence of a negative effect of inflation on banks' risk. Inflation is considered as an important indicator of bank risk that may adversely affect the performance of banks (Mourouzidou-Damtsa et al., 2019). Moreover, Uhde and Heimeshoff (2009) have suggested that the effect of inflation based on the expectation of the banking institutions, or related to the economic fragility, because the effect depends on how the banks may pass this inflation to its customers. Moreover, inflation may lead to deteriorating the capacity of borrowers' debt servicing by reducing their real income. Importantly, in countries having variable interest rates, inflation may adversely affect the borrower's loan servicing capacity thereby monetary policy actions are required to cope with adverse inflation effects, and to maintain real returns of lenders (Nkusu, 2011).

In addition, exchange rate is another country-specific macro-economic determinant of bank risk-taking used in this study. The rise in exchange rates show mixed results. Empirical studies by Castro (2013) and Nkusu (2011) have included exchange rate variable to control for external competitiveness. Moreover, Fofack (2005) has argued that the exchange rate could weaken the competitiveness

of companies and make them unable to pay their debts. Furthermore, the real appreciation of the local currency leads to local goods and services more expensive. However, the increase in the exchange rate can increase their capacity to borrow in foreign currency to service debt (Nkusu, 2011).

Based on above literature, this study formulates three hypotheses regarding macroeconomic characteristics and risk taking as:

H_{5a}: GDP growth decreases bank credit risk.

H_{5b}: Inflation increases bank credit risk.

H_{5c}: Exchange rates increases bank credit risk.

2.2 Industry-Level Driver of Risk Taking

This study includes competition as an industry level determinant of bank risk taking.

2.2.1 Competition and Risk Taking

Theoretically it has been argued that banking sector with low concentration having many banks face high risk as compared to banking sector with high concentration having few banks (Allen and Gale, 2004) due to following reasons. Frist, market power in concentrated banking will be high that enhance profits of banks. Therefore, increase in profits act as buffer against negative shocks and help to increase the franchise or charter value of banks, which, in turn, overcome the likelihood of systematic banking distress (Hellman et al., 2000; Matutes and Vives, 2000; Besanko and Thakor, 1993). Second, it is difficult to monitor large number of banks in diffuse banking as compared to monitor small number of banks in concentrated banking system. Thus, in this respect, the effectiveness of supervision of banks will be higher in concentrated banking as a result in low risk of systematic distress. However, the opponents of this argument document that bank fragility is found to be high in concentrated banking system. Boyd and De Nicolo (2005)

have noted that high market power in concentrated banking may allow banks to raise the interest rates, in case of high interest rates firms may assume higher risk that lead to greater loan defaults.

In existing literature, two opposing views regarding risk taking and banking industry competition nexus are; competition-fragility perspective and the contrary competition-stability perspective. According to the competition-fragility perspective, market power of banks may erodes in competitive environment, decreases the profit margins thereby enhance risk taking in terms of higher level of non-performing loans by reducing franchise value (Demsetz et al., 1996; Keeley, 1990; Marcus, 1984). In this situation, banks ease restrictions on loans to borrower in order to gain more market share, as a result, loan will be extended to low quality borrowers, generating higher non-performing loans. For instance, Petersen and Rajan (1995) have reported in case of high competition banks finance low quality younger firms , leading to greater problem loans and probability of defaults. In the similar vein, Breuer (2006) has noted that competition is positively related with non-performing loans. Likewise, Beck et al. (2013) have documented a positive link between banks' competition and banks' insolvency risk. Moreover, Craig and Dinger (2013) have found that in order to attract deposits in competitive market, banks tend to charge higher interest rates which as a result increases the optimum choice of banks riskiness. Thus, having high cost of liabilities incline to rise bank lending, usually tradeoff quality over quantity and brings financial distress and instability of banking sector (Jordà et al., 2011).

According to competition-stability perspective, in monopolistic banking system due to increased market power lead to high risk taking because banks usually recover bad loans by imposing higher interest rates. Consequently, low quality firms face problem to repay loans thereby enhance adverse selection and moral hazard problems. Empirically, Keeley (1990), studied banks from US during 1970-1986 and note that in competitive market, market power of banks induce them to increase equity capital in relation with assets, which, in turn, overcome bank failures. Agoraki et al. (2011) also studied a sample of Central and Eastern European countries for the sample period of 1998 to 2005 and reported lower default probabilities

and low problem loans in case of high competition.

Recent studies also reported the influence of competition on bank risk taking. For example, Phan et al. (2016) have reported that competition of banks is linked with capital requirement and impact risk taking. In similar vein, Oduor et al. (2017) have studied a sample of 37 African countries and argued that more regulatory capital requirement provides competitive advantage to foreign banks over domestic banks and also increase the financial stability of foreign banks due to low cost of capital sourcing. Alternatively, domestic banks tend to be less competitive due to high cost of capital. Kasman and Carvallo (2014) have studied a sample of 15 Latin American countries contains 272 banks over the period for 2001 through 2008 and reported that financial stability of banks improved in case of higher competition. Tan et al. (2017) have tested the association of competition and risk-taking over the period of 2003 to 2013 for a sample of Chinese banks. They found decrease in credit and insolvency risk in case of high competition, however, an increase in liquidity risk is observed.

More importantly, the competition between Islamic and conventional banking industry also effects bank risk taking. For example, Abedifar et al. (2016) have theoretically argued that in dual banking the performance of conventional banks might be influenced due to competition pressure imposed by the existence of Islamic banks. This pressure of competition will be stronger for conventional banks as compared to Islamic banks in dual banking system because Islamic finance would be preferred over conventional finance by Muslims with religious concerns. In this situation, one may expect that cost inefficiency and credit risk of conventional banks may be increased with raise in the market share of Islamic banks. Alternatively, the quality of conventional banks in a dual banking system may deteriorate because their competitors (Islamic banks), might be more inefficient but they offer Sharia-compliant financial products and Muslims with religious concerns have no other choice but to bank with them.

H_6: Competition decreases bank credit risk.

2.3 Bank-Level Drivers of Risk Taking

In case of bank level determinants of bank risk taking, this study includes bank size, efficiency, and capital adequacy.

2.3.1 Size and Risk Taking

The relationship between bank size and risk taking has been extensively discussed in existing literature. In this regard, Demsetz and Strahan (1997) have noted that firm-specific risk decreases when firms increases total assets and this is because of diversification benefit that may be offset in case of risky portfolios. Similarly, Stiroh (2004) and Mercieca et al. (2007) have documented that bank size also improves bank soundness and reduce the insolvency risk. However, Bertay et al. (2013) have noted that risk taking is not dependent of bank size. Furthermore, larger banks are found to usually have ability of generating cash-flows from wholesale or non-deposit funding to decrease overall riskiness.

Likewise, Boyd and Runkle (1993) have documented a significant and negative relationship between size and volatility of assets returns, suggesting that big banks with low volatility in their assets returns express less risk taking. Furthermore, De Haan and Poghosyan (2012) have studied the association of bank size and earning volatility during global financial crisis and find a strong negative relationship for both variables. In practice, in case of Basel II implementation, smaller banks are forced to take more risk as compared to large sized banks because larger banks have the right to choose between Internal Rating Based and Standardized Approach Hakenes and Schnabel (2011).

Recently, in this regard, Kamani (2019) has investigated the association between size and bank systemic risk for a sample period covers 2002-2016 for 82 banks in Europe. They noted that systematic risk for small banks increase due to non-traditional banking activities. Moreover, Varotto and Zhao (2018) have studied the sample of European and US banks over the period of 2004 to 2012, in order to investigate the relationship of bank size and risk taking. They noted bank

size as the primary indicator of systematic risk leading to an overriding concern for "too-big-to-fail" institutions. In similar research stream, number of studies have documented that big banks are usually considered as important driver of risk taking, see for instance, (Laeven et al., 2016; Sedunov, 2016; Zhang et al., 2015), among others.

Based on above cited literature, this study formulates following hypothesis for bank size and risk taking:

H_7: Bank size increases bank credit risk.

2.3.2 Bank Efficiency and Risk Taking

Existing literature has discussed mixed evidence on efficiency and bank risk taking, for instance, failed banks usually found far from efficient frontier and engaged in more risk taking (Barr and Siems, 1994; DeYoung and Whalen, 1994; Wheelock and Wilson, 1994; Berger and Humphrey, 1992). These researchers have argued that banks having higher problem loans and tend to fail due to low-cost efficiency. Likewise, other studies Hughes et al. (1996), Resti (1997) and Kwan and Eisenbeis (1994) note that bank efficiency is found to reduce non-performing loans. These studies have discussed following reasons for higher problems loans for cost-inefficient banks. On the one hand, due to inefficiencies of senior management face problems in monitoring costs and loans extended to the customers, hence, losses in capital created by both ways lead to problem loans and bank failure. On the other hand, events exogenous to the bank particularly economic downturn brings additional expenses (seizing and disposing of collateral, negotiating workout arrangements and monitoring, etc.) associated with problem loans because of low cost efficiency.

In developing countries, corruption may also influence bank efficiency that leads to credit risk. In spite of vast body of literature on the relationship between corruption and development, research on the role of corruption in banking and financial intermediation is scant. On the one hand, corruption may raise cost of loans thereby impede bank lending and increase the default probabilities of

borrowers. On the other hand, more productive and efficient firms can get more loans by bidding higher bribes (Chen et al., 2015).

Current studies also investigated the relationship between risk-taking and efficiency. For example, Cao et al. (2016) have studied influence of efficiency and bank risk for 2003 to 2011 period in Chinese banking industry. They found the efficient bank face less risk than inefficient banks. In the similar vein, Ben Zeineb and Mensi (2018) have explored the link between risk-taking and efficiency regarding 56 Islamic banks for over 2004 to 2013. They reported bank efficiency is positively linked with risk-taking. More recently, Partovi and Matousek (2019) have examined the association between credit risk and efficiency of banks over the period of 2002 to 2017 using 44 banks from Turkish banking industry. They report a negative relationship between technical efficiency and non-performing loans, which confirms the *bad management* hypothesis in the banking sector.

H_8: Bank efficiency decreases bank credit risk.

2.3.3 Capital Adequacy and Risk Taking

In previous literature, most of the studies dealing with capital adequacy focused on a both insolvency and credit risk (Keeley, 1990; Dewatripont and Tirole, 1994; Repullo and Suarez, 2000; Kim and Santomero, 1988; Koehn and Santomero, 1980). The existing research work has also discussed the importance of capital adequacy for banks survival in financial distress. For instance, banks having more equity portion in capital mix fared better in financial crisis in terms of stock returns (Beltratti and Stulz, 2012). Furthermore, Berger et al. (2010) have explored the survival probabilities of banks during bank and market related crisis for the sample of US banks. In both crises, they note more probability to survival for small banks having more capital, however, higher capital also found to be a safeguard for large and medium banks particularly in banking crisis. Banks can generate higher profits by pursuing business opportunities more effectively with a strong capital position and also cope with default problems occurring form unpredicted losses (Athanasoglou et al., 2008).

Moreover, according to the Bank of International Settlements (BIS) maintaining the adequate capital and minimum requirements act as shield against negative shocks and depositors. The purpose of capital adequacy is to set aside capital to resist banks from distress, therefore, higher the risk faced by banks, more the capital is required to guard from negative shocks. Consequently, in this case a safer return on investment for both depositors and shareholders may be better ensured. However, empirical studies, for instance, (Osei-Assibey and Asenso, 2015) have reported that banks with capital over minimum requirement lead to higher non-performing loan by encouraging banks to take more risk. In addition, equity capital assumed to be costly source of financing (Hellmann et al., 2000), therefore, inclusion of high portion of equity capital can adversely affect bank performance in terms of profitability.

Recent literature also reported the impact of capital adequacy on bank risk taking. For example, (Rahman et al., 2018) have examined the impact of capital regulations on bank risk-taking by employing a panel data of 32 Bangladeshi commercial banks over the period of 2000 to 2014. They reported that higher capital adequacy ratio requires more regulatory capital in banks that in turn lower banks' risk-taking. Moreover, Agénor and da Silva (2017) have investigated the effects of capital requirements on risk-taking and noted that setting the capital adequacy ratio above a structural threshold eliminates the risky loans thus reduces the risk-taking.

H_9: Capital adequacy decreases bank credit risk.

2.3.4 Governance Indicators and Risk Taking

Following previous studies, board size, audit committee independence, risk management committee and female board representation are used as governance indicators. Notably, previous literature has reported the association between risk-taking of banks and board size. For instance, Fernandes and Fich (2016), Adams and Mehran (2012) and Faleye and Krishnan (2017) have reported a significant association between risk taking and board size. On the one hand, according to

the agency theory, the capability of board monitoring is determined by the size of board. Coles et al. (2008) have argued that large and diversified firms with complex functions can be effectively monitored by larger board size and hence required specialized advice from diverse board. On the other hand, resource dependence theory assumes that boards having people from diverse fields bring human capital and inclusive culture on board through diverse experience and knowledge for better counsel and advice to firms (Dalton et al., 1999). Recently, Akbar et al. (2017) have examined the link of board size with corporate risk taking. They found insignificant relationship for risk taking and board size. Moreover, in a questionnaire-based study, McNulty et al. (2013) have reported a negative connection between board size and financial risk in their sample of UK firms.

Similarly, board committees have also used as determinants of bank risk-taking and performance, see for example, (Green and Homroy, 2018; Carter et al., 2010; Peterson and Philpot, 2007), among others. Empirically, García-Sánchez et al. (2017) have studied the relationship between the audit committee and insolvency risk in the banking sector using a sample of 159 banks for the period of 2004 to 2010. They found that presence of audit committee reduces the insolvency risk of banks. Moreover, Tao and Hutchinson (2013) have documented the influence of risk committee on risk taking. They noted that the risk committee minimizes the bank risk taking. Finally, female board representation is also included in this study because there is an ongoing debate in academia regarding female board representation and bank risk-taking, and empirical findings are inconclusive. In general, empirical studies analyzing the potential association of female on board and risk taking find mixed results. For instance, tougher monitoring, as a result of appointing female directors, may decrease shareholder value (Almazan and Suarez, 2003) by discouraging managers (Dixit, 1997). In addition, female board participation may weaken board effectiveness (DiTomaso et al., 2007; Herring, 2009). In this study, however, due to religious concerns and conservative views of some Muslims towards females in the work environment, this relationship may be different.

Presence of female directors may represent an inclusive culture of Islamic banks;

hence, one can expect significant and positive impact of female directors on performance of Islamic banks. However, there are some countervailing arguments that cast doubt on this expectation. On the one hand, the literature shows that religious people are more risk averse (Miller and Hoffmann, 1995). In addition, Shari'ah supervision boards (SSBs) are considered as the *Supra Authority* and represent an additional layer of governance (Choudhury, 2006) and might further restrain management. On the other hand, recent studies show that women are more risk-averse than men (Faccio et al., 2016; Perryman et al., 2016). Therefore, the presence of women in the boardroom of Islamic banks might persuade the management to adopt a too conservative strategy, and thereby make Islamic banks less competitive.

Based on above literature, this study formulates four hypotheses for governance indicators and risk taking as:

H_{10a}: Size of Board decreases bank credit risk.

H_{10b}: Audit committee independence decreases bank credit risk.

H_{10c}: Risk management committee decreases bank credit risk.

H_{10d}: Female board representation decreases bank credit risk.

2.3.5 Ownership and Risk Taking

According to agency theory, structure of ownership effects risk taking of firms (John et al., 2008; Jensen and Meckling, 1976). This theory also suggests that firms with more dilute ownership (where owners do not invested their personal wealth in firms) face higher risk taking than firms with concentrated ownership. In similar way, Esty (1998) and Galai and Masulis (1976) have argued that in case of limited liability, firms with diversified owners tend to increase risk of banks after receiving funds from depositors and debt-holders. Research studies based on agency theory based explanation of ownership structure have also noted that higher risk taking is faced by state owned banks because banks having state ownership are suffered from weak managerial skills and inefficiencies in resource allocation (Barry et al., 2011; Iannotta et al., 2007; Shleifer and Vishny, 1986; Atkinson and Stiglitz,

1980). More precisely, agency theory suggests that when managers of state owned banks are not the owners of the assets then they put less managerial effort and may use banks resources for personal benefits. This misallocation of funds and weak managerial skills of managers in state owned banks lead to high risk taking. Moreover, banks with foreign ownership have more risk taking as compared to domestically and state owned banks. In this regard, existing studies argue that due to market related factors of host country, for example, regulations, informal institutions and legal framework, foreign owned banks may assume greater risk taking (Berger et al., 2013; Méon and Weill*, 2005; Amihud et al., 2002; Winton, 1999), and information asymmetry issues and market imperfections in host country also create hurdles in better risk management of foreign owned banks (Gleason et al., 2006; Buch and DeLong, 2004).

Recent literature also documented the impact of ownership structure on bank risk taking. For example, Ghulam and Beier (2018) have studied the impact of government ownership of 721 savings banks on their risk-taking. They noted that state ownership does not increase the default risk of saving banks during global financial distress. However, Lassoued et al. (2016) have investigated the influence of government and foreign ownership on risk taking of 171 banks in the MENA countries during the 2006-2012 period. They reported foreign owned banks face less risk than state owned banks. Similarly, Shaban and James (2018) have investigated influence of the change of ownership on performance and risk of 60 banks in Indonesian for the period of 2005 to 2012. Their results show private and foreign owned banks tend to be more profitable and exposed to less risk taking than state owned banks.

H_{11a}: Government ownership increases bank credit risk.

H_{11b}: Foreign ownership increases bank credit risk.

Based on multilevel theoretical underpinnings and literature discussed above in general, and following Li et al. (2013), in particular, this study formulates the three level research framework presented below as:

Research framework of this study presents that the lower bank level is embedded in the upper industry and country levels. Particularly, at country-level, this study

includes macroeconomic characteristics, corruption and bank regulations and supervision such as deposit insurance policies, official supervisory power and creditor rights, that directly effect risk-taking of banks. These national regulatory framework variables, macroeconomic conditions and corruption then may also interact with industry and bank-level variables to exert indirect influence on bank risk taking.

Specifically, blue line indicates direct effects while black line indicates indirect effects. Moreover, red line indicates nested structure of three levels. In simple words, red line shows the three-level hierarchical structure of bank risk taking is in nested form; in which 191 banks (level 1) nested within 2 industries (level 2) nested within 11 countries (level 3).

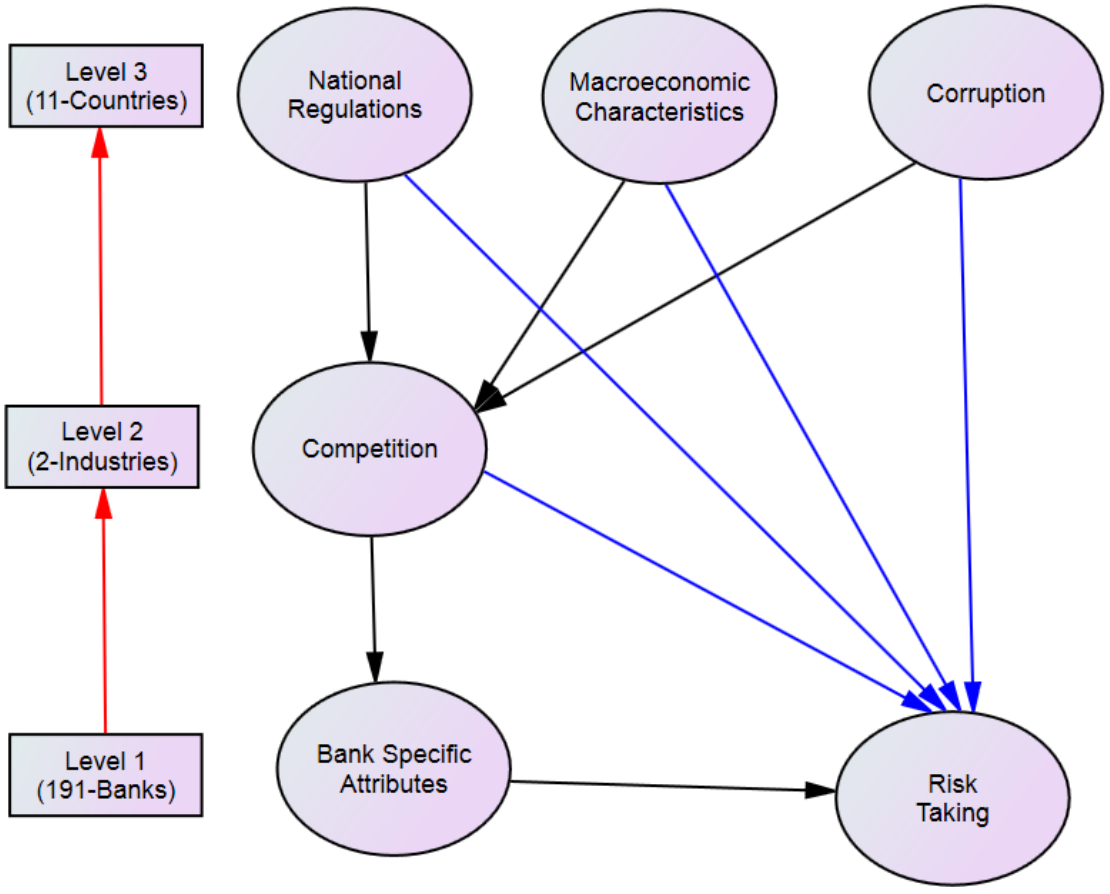

FIGURE 2.1: Research Framework.

Chapter 3

Data and Research Methodology

The aim of current study is to examine whether regulations and supervision, macroeconomic characteristics and corruption channeled through industry and bank level factors to shape bank risk taking. The study also explores the difference in risk taking for Islamic vis-a-vis conventional banks. In this chapter, following sections provide discussion on the choice and construction of the sample, measurement of variables and methodology, in detail.

3.1 Construction of the Sample

To conduct an empirical investigation, this study combines data from several sources. Bank-level financial statements data is obtained from the BankScope Financials data file and board structure data from the BankScope Directors data file. Data on board structure variables is also collected from the web-sites of the banks.

The sample period of this study comprises of 11 years from 2007 to 2017. This study uses a sample of commercial Islamic banks and conventional banks operating in 11 OIC countries[1] with dual banking systems where Islamic and their conventional counterparts operate alongside each other. Countries are included in

[1]It consists of Bahrain, Bangladesh, Yemen, Kuwait, Qatar, Lebanon, Saudi Arabia, Malaysia, Turkey, Pakistan, and United Arab Emirates

the sample on the basis of following section criteria. First, countries that have dual banking systems where both Islamic banks and conventional banks operating together are the part of the sample. Second, the sample countries are the member of Organization of Islamic Cooperation (OIC). Third, countries having less than three Islamic or conventional banks are excluded from the sample. Finally, countries that have only Islamic banking system are also excluded from the sample.

To ensure accuracy, data on the BankScope classification for Islamic banks are cross-checked with their websites. This study obtains bank-level financial statements data from the BankScope Financials data file and board structure data from the BankScope Directors data file from 2008 to 2014. For the remaining years (2015 to 2107), data on bank and board structure variables is collected from annual reports of the banks.

Data on corruption is obtained from Transparent International and World Bank's WGI (Worldwide Governance Indicators). Moreover, this study obtains data on supervision and regulatory variables from database constructed by Barth et al. (2001), Barth et al. (2006), Barth et al. (2008) and Barth et al. (2012). Data on bank regulatory framework variables for the remaining years (2013 to 2107) is collected from the database of Doing Business. Data on macroeconomic characteristics is extracted from the website of World Bank.

Filtering the bank level database and matching it with the country level databases yields a sample of 191 (71 Islamic and 120 conventional) banks with 2,101 observations operating in 11 OIC countries over the period from 2007 to 2017. Finally, all bank level variables are winsorized at a 1% tail to mitigate the effect of outliers.

3.2 Definition of Variables

This section includes the measurement of variables used in this study.

3.2.1 Dependent Variable

This study uses bank risk taking as dependent variable and used extensively in previous studies. This study examines two types of bank risks, particularly, insolvency risk and credit risk. Insolvency risk links with bank's stability while credit risk relates to loan quality.

3.2.1.1 Insolvency Risk

Z-score model is used as a measure of insolvency risk and this method is used extensively in banking literature, see for example, (Khan et al., 2017; Delis et al., 2014; Ramayandi et al., 2014; Houston et al., 2010; Boyd and Runkle, 1993), among others.

The mathematical expression is:

$$z - scores = (ROA + ETA)/\sigma(ROA) \tag{3.1}$$

"Where, ROA is the return on assets, ETA is the equity divided by total assets and σ(ROA) is the standard deviation of return on assets". This can be interpreted as: "the number of standard deviations by which returns would have to fall to wipe out all equity of the bank (Roy, 1952), the *Z-score* can be viewed as the inverse of the probability of bank insolvency. A higher value denotes a higher level of the soundness of the bank, or alternatively speaking, a lower value denotes the bank's higher exposure to insolvency risks". Thus, *Z-score* captures the probability of bank's insolvency as an inverse measure of bank soundness. In addition, when a value of bank's asset drops from its debt it becomes in solvent. The inverse probability insolvency is written as:

$$P(ROA < -ETA) \tag{3.2}$$

Hence, according to Houston et al. (2010): "it represents the number of standard deviations below the mean by which profits would have to fall so as to just deplete

equity capital". *Z-score*, the measure of insolvency risk is computed by standard deviation of return on assets over the last three years.

3.2.1.2 Credit Risk

To measure credit risk *Non-performing Loans* is computed by dividing non performing loans with average gross loans, alternatively loan loss provisions are divided by average gross loans in order to measure *Loan Loss Provisions*. Existing literature has been broadly used both measures of credit risk or loan quality (Abedifar et al., 2018; Sila et al., 2016; Park, 2012; Fiordelisi et al., 2011; Delis and Kouretas, 2011; Carbó Valverde et al., 2007; Gonzalez, 2005; Kwan and Eisenbeis, 1997).

3.2.2 Independent Variables

This study uses independent variables from bank, industry and country levels.

3.2.2.1 Country-level Determinants

This study contains bank national regulations (namely, *Official Supervisory Power*, *Creditor Rights*, and *Deposit Insurance*), macroeconomic characteristics and level of corruption as country level variables. Bank national regulatory variables are measured in following manner. Following Barth et al. (2013) and Noman et al. (2018), *Official Supervisory Power* is measure using an index having 14 dichotomous variables and these variables measures the specific actions taken by the bank supervisors against bank owners, bank auditors, and bank management in both distress and normal situations. In case the answer is reported as YES the value will be one and zero otherwise. The questions included in the index are: (1) Is the regulatory agencies have the right to meet with the external auditors to discuss their report without the consent of the bank? (2) Whether the auditor is required by law to communicate directly to the alleged involvement of regulatory bodies bank directors or senior managers in the illegal activity, fraud, or abuse of

insider? (3) Is there any provision of taking legal action by supervisors against the negligence of external auditors? (4) Is there any provision to forcefully change the internal structure of the organization by supervisory body? (5) Is disclosure of off balance sheet elements is required to supervisors? (6) Whether regulatory agencies order the directors or management of the bank to establish provisions to cover actual or potential losses? (7) Is there any provision for supervisory agency to suspend the decision of directors regarding distribution of dividends? (8) Is there any provision for supervisory agency to suspend the decision of directors regarding distribution of bonuses? (9) Is there any provision for supervisory agency to suspend the decision of directors regarding distribution of management fees? (10) Whether supervisory body declare bank as insolvent by superseding the rights of the shareholders of the banks? (11) Does the suspension the partial of full ownership of problem bank is given to supervisory agency by banking law? (12) Surpass shareholder privileges? (13) Replace and remove directors? (14) Replace and remove management?

Index having smaller value shows low authority of bank supervisors and vice versa.

In order to measure *Deposit Insurance*, a dummy variable is used that takes value 1 if the deposit insurance scheme exists in a country and 0 otherwise. It is calculated from Demirguc-Kunt et al. (2008). Moreover, *Creditor Rights* is captured by index computed by the four binary variables. The higher value indicates the stronger creditor rights while the lower value means weaker creditor rights. In order to construct index a value of one is given to each of the following indicator variables; (i) if asset have no automatic stay, (ii) if before government workers secured creditors are paid, (iii) if constraints are imposed on debtor to file for reorganization, minimum dividends, or creditor consent, and (iv) if management has no stay on administration of property and undecided resolution of the reorganization.

Regarding macro-economic condition in a country, this study includes *GDP Growth*, *Inflation* and *Exchange Rates*. *GDP Growth* is the annual GDP growth per capita, *Inflation* is captured through consumer price inflation rate, and *Exchange Rates* are measured as currency of sample countries per dollar term.

Finally, the main indicator of *corruption* used in this study is Transparency International Corruption Perception Index (hereafter, TI index), that has been widely used in existing literature such as Chen et al. (2015), Aidt (2009) and Mo (2001). TI index range from 0 to 10 with a lower value means high corruption and vice versa. This study rescales the corruption index by letting 10 deducted by the TI index in order to show a higher value means high corruption in a country. The new index is denoted by CI and mathematical expression is as follows:

$$CI = 10 - TI\ index \tag{3.3}$$

Importantly, simply a comparison of corruption index on yearly basis cannot be used. This is because, CI score in a country may be driven on the basis of the methodology adopted by Transparency International or changing number of surveys (Lambsdorff, 2008). However, the effect could be minor or less probably cause a significant deviation in corruption index in a country, an adjusted CI index to reduce this biased effect is important (Chen et al., 2015; DeBacker et al., 2015). This study computes the adjusted CI index as:

$$Adj.CI = \frac{CI_{jt}}{\sum_{j=1}^{N} CI_{jt}/N} \tag{3.4}$$

In addition, as an alternative measure of corruption, by following Kaufmann (2010), this study also obtained data on CCI as sub-index of corruption from Governance Indicators of World Bank, scaled from "-2.5" to "2.5", a lower value of CCI exhibits high corruption. Borrowing the idea from Chen et al. (2015), in this study CCI is also subtracted from 0, and in new CCI index with a greater value implies high corruption and represented by WBCI (World Bank Corruption Indicator).

3.2.2.2 Industry-level Determinant

This study uses *competition* as industry level determinant of risk taking. Existing literature has documented number of proxies of banking industry competition through Herfindahl-Hirschman (HHI) Index (Abedifar et al., 2016; De Nicolo and

Loukoianova, 2006; Boyd and De Nicolo, 2005), the share of largest five banks' assets to assets of total banks in an industry (Delis and Kouretas, 2011; Boudriga et al., 2009), Lerner index (Agoraki et al., 2011; Soedarmono and Tarazi, 2016) and the Panzar-Rosse H-statistic (Panzar and Rosse, 1987). This study employs the HHI Index as measure of competition.

3.2.2.3 Bank-level Determinants

The bank level determinants of risk taking used in this study are *Bank efficiency*, *Capital adequacy*, *Bank size*, *Ownership structure* and *Governance indicators*. The cost-to-income ratio is used as a measure of the *Bank efficiency*, in a way similar to Ghosh (2015), Louzis et al. (2012), and Espinoza and Prasad (2010), among others. Importantly, Maudos and Solís (2009) use a similar measure of bank efficiency and note that: "high levels of operating cost per unit of gross income reflect banks that are not efficient in their management, they select less profitable assets and high-cost liabilities". Following Basel III, *Capital adequacy* is measured by dividing equity capital over total assets. Under this ratio, shareholders portion of equity is reflected by equity capital and the purpose of the use of more equity is to prevent banks from excessive debt. A bank can resist more against a negative shock if it has higher equity on its balance sheet. Moreover, following Andreou et al. (2016), Anginer and Zhu (2014), and Agoraki et al. (2011), this study also uses natural logarithm of total assets as measure of *Bank Size*.

This study captures heterogeneity among banks regarding ownership by including three dummies, i.e. *State Bank Dummy*, *Domestic Bank Dummy* and *Foreign Bank Dummy*. Particularly, the value of "1" assumes that banks is either *State-Owned*, *Domestically-Owned* or *Foreign-Owned* and otherwise "0".

Finally, based on previous studies, governance indicators are proxied as; *Board Size* is measured as number of directors on the board of each bank. In the case of *Audit Committee Independence*, a dummy variable is used that takes value "1" if an audit committee comprised solely of independent outsiders and "0" otherwise. Similarly, the *Risk Management Committee* is measured using a dummy variable that takes value "1" if the risk management committee exists and "0" otherwise.

Finally, *Female Board Representation* is computed by dividing female members to total directors for each bank.

3.3 Description of the Data

The sample comprises of 71 Islamic commercial banks and 120 conventional commercial banks. In sample countries, both Islamic and conventional banks operate alongside each other. The largest number of observations is from Malaysia and Lebanon and the lowest from Yemen and Kuwait. Approximately, 37 percent of the total observations are for Islamic banks and the remaining 63 percent relate to conventional banks (see Appendix A for details).

Table 3.1 presents the descriptive statistics and T-Stat. of mean equality test describes the mean difference in the risk taking between Islamic and conventional banks. The data shows that Islamic banks are, on average, have higher *Capital Asset Ratio* or alternatively speaking Islamic banks have more equity capital than conventional counterparts, however, they have slightly lower *Z-score*, *Loan Loss Provision* and *Non-performing Loans*. In contrast, Islamic banks have a higher *Efficiency* compared to conventional counterparts. The data shows that Islamic banks, on average, have significant and smaller bank size. Moreover, *Audit Committee* is less independent and *Board Size* is on average smaller than conventional banks, whereas *Risk Management Committee* is appeared to be larger for Islamic banks. In terms of ownership structure, the study finds that about 65 percent of Islamic banks are domestically owned. Foreigners and Governments have, on average, 18 percent and 17 percent weights in the ownership of Islamic banks. However, merely 44 percent of conventional banks are domestically owned, whereas 30 percent and 26 percent of conventional banks owned by States and foreigners, respectively.

TABLE 3.1: Descriptive statistics: Islamic vs. conventional banks.

Variables	Islamic Banks					Conventional Banks					
	N	**Mean**	**SD**	**Min**	**Max**	**N**	**Mean**	**SD**	**Min**	**Max**	**T-test**
Z-scores	781	7.48	8.68	0.36	34.55	1320	8.06	9.31	0.36	35.20	3.89***
Loan Loss Provision (%)	781	4.58	6.12	0.00	20.92	1320	4.67	6.19	0.00	20.82	6.68***
Non-performing Loans (%)	781	5.27	5.10	0.00	20.81	1320	5.39	4.82	0.00	21.02	2.99***
Bank Efficiency (%)	781	0.26	0.09	0.02	0.58	1320	0.24	0.08	0.05	0.55	-6.12***
Capital Asset Ratio (%)	781	0.13	0.04	0.12	0.28	1320	0.10	0.04	0.09	0.25	2.92***
Bank Size	781	8.12	1.48	7.14	14.61	1320	9.15	1.47	6.92	15.32	7.26***
Board Size	781	9.49	3.12	4.00	21.00	1320	9.87	2.61	4.00	22.00	2.40**
Female Ratio (%)	781	0.03	0.07	0.00	0.38	1320	0.04	0.08	0.00	0.50	2.47**
Audit Committee	781	0.46	0.50	0.00	1.00	1320	0.50	0.50	0.00	1.00	2.85**
Risk Management	781	0.66	0.48	0.00	1.00	1320	0.61	0.49	0.00	1.00	-1.01
Foreign Ownership	781	0.18	0.39	0.00	1.00	1320	0.26	0.44	0.00	1.00	3.38***
Govt. Ownership	781	0.17	0.38	0.00	1.00	1320	0.30	0.46	0.00	1.00	6.13***
Domestic Ownership	781	0.65	0.48	0.00	1.00	1320	0.44	0.50	0.00	1.00	-8.32***

Note: This table reports general descriptive statistics for Islamic and conventional banking systems over 2007-2017. T-Stat. of mean equality test describes the mean difference in the performance between conventional and Islamic banks.
*** if $P < 0.01$, ** if $p < 0.05$ and * if $p < 0.1$, *respectively.*

Table 3.2 presents the general summary for bank, industry and country level variables over 2007-2017. Meanwhile, the study reports mean values of all variables country by country in Table 3.3. The mean value of the bank risk taking, for example, the *Z-score* is 7.842 and the standard deviation of the *Z-score* is 9.084. Moreover, the range of *Z-scores* is from the minimum 0.360 to the maximum 35.201. Likewise, the mean value of *Loan Loss Provisions* is 4.677 and the standard deviation of the *Loan Loss Provisions* is 6.161. In addition, the range of *Loan Loss Provisions* is from the minimum 0.000 to the maximum 20.920.

TABLE 3.2: Overall descriptive statistics.

Variables	N	Means	SD	Min	Max	Kurtosis	Skewness
Z-Score	2101	7.84	9.08	0.36	35.20	2.23	1.76
Loan Loss Provision (%)	2101	4.68	6.16	0.00	20.92	0.19	1.26
Non-performing Loans (%)	2101	5.34	4.92	0.00	21.02	0.61	1.19
Bank Efficiency (%)	2101	0.25	0.09	0.02	0.58	0.33	0.68
Capital Asset Ratio (%)	2101	0.14	0.04	0.09	0.28	-0.06	0.95
Bank Size	2101	9.16	1.48	6.92	15.32	1.07	1.22
Board Size	2101	9.73	2.82	4.00	22.00	2.37	1.25
Female Ratio (%)	2101	0.04	0.08	0.00	0.50	5.57	2.25
Audit Committee	2101	0.49	0.50	0.00	1.00	-2.00	0.06
Risk Management	2101	0.63	0.48	0.00	1.00	-1.73	-0.52
Foreign Ownership	2101	0.23	0.42	0.00	1.00	-0.36	1.28
Govt. Ownership	2101	0.25	0.44	0.00	1.00	-0.71	1.14
Domestic Ownership	2101	0.52	0.50	0.00	1.00	-2.00	-0.07
Competition	2101	0.32	0.22	0.09	0.55	0.09	1.17
Official Supervisory Power	2101	0.81	0.39	0.00	1.00	0.56	-1.60
Creditor Rights	2101	2.45	0.97	0.00	4.00	-0.09	-0.52
Deposit Insurance	2101	0.74	0.44	0.00	1.00	-0.82	-1.09
CI	2101	4.07	1.55	1.40	7.80	-0.66	0.48
Adj. CI	2101	0.97	0.37	0.35	1.93	-0.61	0.49
WBCI	2101	-0.19	0.75	-1.66	1.57	-0.90	0.35
GDP Growth (%)	2101	4.24	3.09	1.08	7.86	1.61	-0.86
Inflation (%)	2101	4.71	3.04	2.14	11.25	-1.08	0.27
Exchange Rates	2101	168.60	423.67	0.27	1513.50	5.99	2.80

Note: This table reports general descriptive statistics for bank, industry and country level variables over 2007-2017.

The fairly high standard deviation and the wide range of both measures of bank risk taking; *Z-scores* and *Loan Loss Provisions* suggest a considerable variation in the level of bank risk taking. The sampled countries also show the variation in the level of bank risk taking. The highest bank risk taking in terms of *Z-scores* is observed in Bangladesh with the mean value of 5.192 while the lowest level of bank risk taking is found in Lebanon with the mean of 12.959. More precisely, *Z-score* is interpreted as a lower value of *Z-scores* denotes the bank's higher exposure to insolvency risks. In case of explanatory variables, the sampled countries also show variations in the bank efficiency, competition, level of corruption and regulatory framework variables. For example, take the corruption index, CI, in this study, its mean value is 4.074 with the standard deviation of 1.545. The highest corruption is observed in Qatar with the mean value at 7.105 while the lowest corruption is found in Yemen with the mean at 1.916 (see section 3.2.2 for interpretation of corruption index).

Finally, in Table 3.4, this study reports correlation analysis. Results show that the correlation coefficients between the measures of dependent variable are associated with explanatory variables. Moreover, country, industry and bank level predictors are not seen as to show high correlation with one another, confirming that the joint consideration of these factors has not cause collinearity issue. However, there is a strong correlation between corruption indicators; therefore, each corruption indicator is included in regression models individually to avoid the multicollinearity problems.

Table 3.3: Mean values of key variables by country.

Country	BHR	BGD	KWT	LBN	MYS	PAK	QAT	SAU	TUR	ARE	YEM
No. of Islamic Banks	7	8	4	2	15	10	3	4	6	9	3
No. of Conventional Banks	6	19	3	19	14	14	6	6	17	12	4
Total Banks	13	27	7	21	29	24	9	10	23	21	7
Z-Score	9.635	5.192	5.355	12.959	7.785	7.124	11.358	9.569	6.297	6.794	5.791
Loan Loss Provision (%)	6.366	6.845	10.023	1.888	1.637	6.454	1.878	4.400	5.593	4.330	4.736
Non-performing Loans (%)	4.754	5.578	4.464	6.134	3.737	8.244	2.857	2.768	3.895	6.198	9.832
Bank Efficiency (%)	0.271	0.237	0.213	0.272	0.233	0.309	0.168	0.229	0.264	0.214	0.250
Capital Asset Ratio (%)	0.134	0.143	0.121	0.149	0.136	0.124	0.129	0.118	0.138	0.140	0.129
Bank Size	9.051	8.644	9.200	9.682	9.266	9.107	8.306	9.233	9.065	9.702	9.251
Board Size	9.182	13.310	8.260	9.229	9.934	8.011	8.636	9.700	10.047	8.792	8.065
Female Ratio	0.013	0.086	0.009	0.045	0.062	0.018	0.000	0.008	0.051	0.027	0.006
Audit Committee	0.643	0.465	0.221	0.481	0.520	0.383	0.444	0.482	0.664	0.502	0.169
Risk Management	0.594	0.471	0.416	0.736	0.671	0.652	0.778	0.618	0.814	0.528	0.377
Foreign Ownership	0.308	0.259	0.143	0.238	0.345	0.167	0.222	0.100	0.304	0.095	0.143
Govt. Ownership	0.077	0.259	0.286	0.208	0.241	0.250	0.444	0.400	0.174	0.333	0.286
Domestic Ownership	0.615	0.481	0.571	0.554	0.414	0.583	0.333	0.500	0.522	0.571	0.571

Country	BHR	BGD	KWT	LBN	MYS	PAK	QAT	SAU	TUR	ARE	YEM
Competition	0.502	0.186	0.565	0.365	0.347	0.282	0.149	0.409	0.281	0.203	0.227
CI	4.755	2.517	4.282	2.605	4.628	2.643	7.105	4.672	4.465	6.629	1.916
Adj. CI	1.131	0.599	1.019	0.619	1.101	0.629	1.693	1.112	1.063	1.578	0.456
WBCI	0.184	-0.948	0.004	-0.909	0.142	-0.933	1.026	0.020	-0.005	1.092	-1.259
Official Supervisory Power	0.909	0.455	1.000	1.000	1.000	0.455	0.727	1.000	1.000	1.000	0.364
Creditor Rights	3.000	2.000	3.000	4.000	3.000	1.000	2.000	3.000	3.000	2.000	0.000
Deposit Insurance	1.000	1.000	0.000	1.000	1.000	0.000	0.000	0.000	1.000	1.000	1.000
GDP Growth (%)	4.276	6.336	1.543	4.309	4.884	3.842	3.183	3.443	5.085	2.950	0.966
Inflation (%)	2.425	7.100	3.864	2.933	2.530	7.298	2.819	3.908	7.847	2.485	6.088
Exchange Rates	0.377	75.801	0.288	1245.060	3.559	93.034	3.641	3.749	2.195	3.673	209.958

Note: This table presents the country by country mean values of bank, industry and country level explanatory variables and bank risk taking measures for 11 Muslim countries over 2007-2017.

3.4 Methodology

3.4.1 Multilevel Modelling and Nested Data

This study investigates the determinants of banks' risk taking at three levels; first at the individual bank level, and then at a higher industry and country levels. The dataset used in this study is structured hierarchically such that level-1 units (banks) are nested within the level-2 units (industries) and the level-3 units (countries), thus allowing for interaction among the three levels. This suggests that risk taking, on average, may be more similar within countries compared to the risk taking across countries, because in the same industry, banks are subject to, inter alia, face the same regulatory and macroeconomic constraints.

It is important to note that a statistical assumption of OLS regression is commonly known as *independence of observations* may be violated in case of multilevel effect present in data. Thus, to make the estimates more robust the use of Hierarchical Linear Modeling (HLM) with maximum likelihood (ML) and generalized least squares (GLS) estimations that adequately accounts for within-cluster correlation. Despite the attempt of existing studies to empirically analyze the drivers of bank risk taking, they largely focus on bank, industry and country-level characteristics in isolated way and typically underemphasize the multilevel effects of higher industry and country-level variables with lower bank level.

TABLE 3.4: Correlation analysis.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Supervisory Power	1																			
Creditor Rights	0.51**	1																		
Deposit Insurance	0.19**	0.36**	1																	
CI	0.40**	0.15**	0.03	1																
Adj.CI	0.39**	0.15**	0.04	0.98**	1															
WBCI	0.42**	0.18**	0.05*	0.97**	0.94**	1														
Competition	0.01	0.06*	-0.01	-0.14**	-0.15**	-0.10**	1													
Bank Efficiency	-0.01	-0.04*	-0.04*	-0.25**	-0.25**	-0.27**	0.08**	1												
GDP Growth	-0.09**	0.14**	0.02	0.12**	0.18**	0.12**	-0.28**	-0.01	1											
Inflation	-0.63**	-0.55**	-0.24**	-0.42**	-0.40**	-0.42**	0.14**	0.09**	-0.08**	1										
Exchange Rates	0.38**	0.46**	0.02	0.32**	0.32**	0.35**	0.19**	-0.08**	-0.01	-0.36**	1									
Bank Size	0.11**	0.08**	0.07**	0.03	0.03	0.04	0.03	0.05*	-0.09**	-0.07**	0.01	1								
CAR	0.01	0.09**	0.17**	-0.03	-0.03	-0.02	-0.05*	0.02	0.01	-0.07*	-0.06**	-0.09**	1							
Govt. Ownership	-0.01	-0.06**	-0.09**	0.07**	0.08**	0.06**	-0.03	-0.13**	0.01	0.02	-0.03	0.01	-0.01	1						
Domestic Ownership	-0.01	-0.02	0.05	-0.04	-0.04	-0.03	0.03	0.11**	-0.05*	0.02	-0.04	0.02	-0.03	-0.60**	1					
Foreign Ownership	0.02	0.09**	0.10**	-0.03	-0.03	-0.02	0.05	0.04	0.05*	-0.04*	0.08**	-0.01	0.04*	-0.32**	-0.56**	1				
Board Size	-0.09**	0.07**	0.26**	-0.14**	-0.17**	-0.15**	-0.18**	-0.17**	0.12**	-0.01	-0.02	-0.08**	0.07**	0.06**	-0.10**	0.05*	1			
Female Ratio	0.04*	0.08**	0.22**	-0.08**	-0.09**	-0.10**	-0.13**	0.01	0.07**	-0.04*	0.02	-0.01	0.05*	0.03	-0.08**	0.13**	0.16**	1		
Audit Committee	0.27**	0.13**	0.11**	0.10**	0.09**	0.08**	-0.11**	-0.07**	-0.01	-0.23**	0.14**	0.06	-0.01	-0.04	-0.05*	0.15**	0.19**	0.19**	1	
Risk Management	0.29**	0.13**	-0.01	0.07**	0.06**	0.04	-0.08**	-0.04	-0.01	-0.20**	0.07**	0.04	-0.03	-0.08**	0.05*	0.01	0.16**	0.12**	0.38**	1

*P < .001***, p < 0.05**, p < .01**

3.4.2 Data Analysis Strategy

Using steps outline by Leckie and Charlton (2013) on three-level multilevel models, the analysis of this study is carried out in following manner. In first step, the multilevel structure of the data is identified before introducing the explanatory variables of major interest. For this purpose, unconditional mean models (null models) are employed to find the country, industry and bank level residuals. Then, based on these residuals, intra-class correlation coefficients (ICCs) are computed which will assist in fixing ideas about how important structural aspects of the risk taking, the outcome variable. In second step, level 1, level 2 and level 3 predictor variables are introduced to extend the baseline null model. The three level explanatory variables are taken from country level, industry-level and bank-level. In third step, interaction terms between covariates form each level of analysis are included. Introducing cross-level interactions tests the indirect effects of country level variables channeled through industry and bank level variables to shape bank risk taking.

3.4.2.1 Unconditional Means Model (Null Model)

Following Erkan et al. (2016) and Tennant and Sutherland (2014), in the first step, the analysis builds up on ANOVA model having random effects and in this stage predictors from all levels are ignored. Specifically, the study employed a null model, Unconditional Means Model (hereafter, UMM) and calculated the Intra-class Correlation Coefficient (henceforth, ICC).

Because multilevel modeling involves predicting variance at different levels, it is important to begin analyses by determining the levels at which significant variation exists. Therefore, this study begins by examining slopes variability (Bryk and Raudenbush, 1992; Hofmann, 1997). Snijders and Bosker (1999) state that: "It is important to note that if slopes randomly vary even if intercepts do not, there may still be reason to estimate mixed-effects models". UMM serves to calculate the grand mean and ICC of the bank, industry and country levels as well as the baseline to evaluate subsequent models.

In this study, three levels are conceptualized as bank (j) is nested in the upper industry (k) and country (l) in which that bank operates. Particularly, the three levels HLM specification used for analysis, with each level's constant (intercept) term α is decomposed into a fixed portion and a variance component as follows:

Level-1 Model

$$Risk - taking_{jkl} = \alpha_{0kl} + \eta_{jkl} \tag{3.5}$$

Level-2 Model

$$\alpha_{0kl} = \lambda_{00l} + \mu_{0kl} \tag{3.6}$$

Level-3 Model

$$\lambda_{00l} = \gamma_{000} + \epsilon_{00l} \tag{3.7}$$

Where, Risk-taking is the dependent variable, measured by Z-Score, Non-performing Loans and Loan Loss Provisions of bank (j) in industry (k) and country (l); (α_{0kl}) can be interpreted as the mean risk taking by bank (j) nested in industry (k); and an error term (η_{jkl}) is a random firm effect at level-1 (i.e., demonstrating that risk taking of bank (jkl) differs from industry's mean.

Similarly, average bank risk-taking (α_{0kl}) is explained at level-2 by average risk taking of industry k nested in country l, (λ_{00l}) and an error term (μ_{0kl}) representing the extent to which risk taking of bank j deviates from that industry's average.

Finally, a industry's average risk-taking (λ_{00l}) is explained at level-3 by the average risk taking by all banks, in all industries across all countries ((γ_{000}), the grand mean) and an error term (ϵ_{00l}) representing the extent to which risk taking of industry k deviates from the global average or grand mean.

The aforementioned equations (3.5 to 3.7) can be rewritten into a combined (or mixed) model as follows:

$$Risk_{jkl} = \gamma_{000} + \eta_{jkl} + \mu_{0kl} + \epsilon_{00l} \tag{3.8}$$

where (γ_{000}) is, once again, the global average (i.e., grand mean) risk taking (weighted by sample size), and the terms (η_{jkl}), (μ_{0kl}), and (ϵ_{00l}) represent the variance components at each of the three levels. Specifically, (η_{jkl}) is a random

firm effect (i.e., the deviation of bank jkl's mean from its industry's mean), (μ_{0kl}) is a random industry effect (i.e., the deviation of industry k's mean from its country l's mean), and (ϵ_{00l}) is a random country effect (i.e., the deviation of country l's mean from the grand mean).

Each variance component is modeled to help explain how risk taking of bank (jkl) deviates from the grand mean, and thus allows for a comparison of relative importance. In the UMM, the fixed portion of the model is (γ_{000}) (an intercept term) and the random component is ($\eta_{jkl} + \mu_{0kl} + \epsilon_{00l}$). The UMM provides between-group and within-group variance estimates in the form of (η_{jkl}), (μ_{0kl}) and (ϵ_{00l}), respectively.

3.4.2.2 Calculating Intraclass Correlation Coefficients (ICCs)

Based on null model, this study computed the ICC to determine the relative importance of each level in explaining the observed variation in risk taking. The ICC estimator $\hat{\rho}$ is computed using the estimates of Var (η_{jkl}) $=\sigma^2$, that is, the variance of the lowest level residuals, Var (μ_{0kl}) $= \tau^2$, that is, the variance of the second-level residuals, Var (ϵ_{00l}) $= \pi^2$, that is, the variance of the third-level residuals. Specifically, the three-level model used in this study divides variance in risk taking into three components: among banks operate in either conventional or Islamic banking industry ($\hat{\rho} = \frac{\sigma^2}{\sigma^2 + \tau^2 + \pi^2}$), industry within a country ($\hat{\rho} = \frac{\tau^2}{\sigma^2 + \tau^2 + \pi^2}$) and across countries ($\hat{\rho} = \frac{\pi^2}{\sigma^2 + \tau^2 + \pi^2}$).

Table 3.5 shows that the co-variances and correlations are functions of the three variance components. The variance components are, by definition, zero or positive and so the covariances will also be zero or positive, while the correlations will lie in the range zero to one. Moreover, *pairing 1* gives the correlation between a bank and themselves. This correlation is equal to one. *Pairing 2* gives the correlation between two banks in the same industry (and therefore the same country). This correlation is referred to as the industry ICC. *Pairing 3* gives the correlation between two banks in different industries, but in the same country. This correlation is referred to as the country ICC. Finally, *pairing 4* gives the correlation between

two banks in different countries (and therefore different industries). These two banks share no common sources of influence and are therefore assumed independent; they have an expected correlation of zero.

TABLE 3.5: Co-variances-correlations functions for three variance components

Pairing	Banks	Industries	Countries	Covariance	Correlation
1	$j = \acute{j}$	$k = \acute{k}$	$l = \acute{l}$	$\sigma^2 + \tau^2 + \pi^2$	1
2	$j \# \acute{j}$	$k = \acute{k}$	$l = \acute{l}$	$\tau^2 + \pi^2$	$\frac{\tau^2 + \pi^2}{\sigma^2 + \tau^2 + \pi^2}$
3	$j \# \acute{j}$	$k \# \acute{k}$	$l = \acute{l}$	π^2	$\frac{\pi^2}{\sigma^2 + \tau^2 + \pi^2}$
4	$j \# \acute{j}$	$k \# \acute{k}$	$l \# \acute{l}$	0	0

3.4.2.3 Adding Predictor Variables

Once the variance decomposition of Risk-taking is assessed, in the next step, this study then extends the basic one-way ANOVA model to include level-1, level-2, and level-3 covariates, with each level represented by its own regression equation. The coefficients (α_{pkl}) introduced in Equation (3.9) are allowed to vary across banks, industry and the countries to accommodate for between-country, within-country-between-industry and within-industry-between-banks variations in the baseline Risk-taking beyond that explained by predictors (π_{pkl}).

This study applied three-level hierarchical modeling with random coefficients/slopes suggested by Raudenbush et al. (2004), among others. Particularly, the outcome $Risk - taking_{jkl}$ at level-1 unit (j), bank, is nested in level-2 unit (k), industry, and finally industry is nested in level-3 (l), country, in which these banks operate can be expressed as:

$$Risk - taking_{jkl} = \alpha_{0kl} + \sum_{p=1}^{P} \alpha_{pkl}\, \pi_{pkl} + e_{jkl} \tag{3.9}$$

Where (α_{pkl}) level-1 coefficients, with corresponding π the level-1 predictors. e_{jkl} is the random effect.

At level-2, the α coefficients from level-1 are treated as outcomes to be predicted for level-2 as:

$$\alpha_{pkl} = \beta_{p0l} + \sum_{q=1}^{Q_p} \beta_{pql} \, X_{qkl} + \mu_{pkl} \tag{3.10}$$

Where β_{pql} are level-2 coefficients, the X_{qkl} level-2 predictor, and μ_{pkl} is the level-2 random effect.

At level-3, the β coefficients from level-2 are treated as outcomes to be predicted for level-3 as:

$$\beta_{pql} = \beta_{pq0} + \sum_{s=1}^{S_{pq}} \gamma_{pqs} \, W_{sk} + \epsilon_{pql} \tag{3.11}$$

Where γ_{pqs} are level-3 coefficients, the W_{sk} level-3 predictors, and ϵ_{pql} is the level-3 random effect.

Finally, Likelihood Ratio (LR) tests are used to compare null model to the model with random coefficients by introducing predictor variables for each level.

3.4.2.4 Adding Cross-level Interactions

In order to test the indirect effect of country level national regulations, macroeconomic characteristics and corruption on risk taking channeled through industry and bank level attributes (see Figure 2.1, research framework), cross level interactions from three levels are included. The econometric specification to test the indirect effect is as follows:

$$\begin{aligned} Y_{ijk} =& \beta_0 + \beta_1 Bank.Char_{ijk} + \beta_2 Competition_{jk} + \beta_3 Regulations_j + \beta_4 Macro \\ & .Char_j + \beta_5 Corruption_j + \beta_6 Bank.Char_{ijk} X Competition_{jk} \\ & + \beta_7 Competition_{jk} X Regulations_j + \beta_8 Competition_{jk} X Macro.Char_j \\ & + \beta_9 Competition_{jk} X Corruption_j + \epsilon_{ijk} \end{aligned} \tag{3.12}$$

Where Y_{ijk} represents bank risk-taking for bank (i) in industry (j) across country (k). Specifically, cross-level interactions are; *Bank.CharXCompetition* (Bank-Industry interaction between bank characteristics and competition); *CompetitionXRegulations* (Industry-Country interaction between competition and regulations); *CompetitionXMacro.Char* (Industry-Country interaction between competition and macroeconomic charateristics) and *CompetitionXCorruption* (Industry-Country interaction between competition and corruption).

3.4.3 Risk Taking: Conventional Versus Islamic Banks

Investigating the difference in risk taking for conventional and Islamic banks, dummy variable is introduced into the model by following existing studies, for example, Bitar and Tarazi (2019), Mollah and Zaman (2015) and Beck et al. (2013). Similarly, current study employs the Islamic dummy and its interaction terms with level 1, level 2 and level 3 predictors using Generalized Least Squares (GLS) regressions as:

$$\begin{aligned} Y_{ijk} =& \beta_0 + \beta_1 ID_{ijk} + \beta_2 Bank.Char_{ijk} + \beta_3 Competition_{jk} + \beta_4 Regulations_j \\ &+ \beta_5 Macro.Char_j + \beta_6 Corruption_j + \beta_7 Bank.Char_{ijk} XID_{ijk} \\ &+ \beta_8 Competition_{jk} XID_{ijk} + \beta_9 Regulations_j XID_{ijk} + \beta_{10} Macro.Char_j \\ &XID_{ijk} + \beta_{11} Corruption_j XID_{ijk} + \epsilon_{ijk} \end{aligned} \tag{3.13}$$

Where Y_{ijk} represents bank risk-taking for bank (i) in industry (j) across country (k). Bank Characteristics, Competition, Corruption, Regulations and Macroeconomic Characteristics are predictors from country, industry and bank levels, respectively, and slope parameters β_2 to β_6 in equation (3.13) capture the association in corruption, regulations and risk-taking for conventional banks. All variables, namely, risk taking, bank characteristics, corruption indicators, bank regulations, and macroeconomic characteristics are defined and discussed in detail in Section 3.2. ID is a dichotomous variable with value of one in case of Islamic bank, otherwise the value will be zero. It controls for difference between risk-taking of conventional and Islamic banks.

Bank.CharXID, CompetitionXID, RegulationsXID, Macro.CharXID, and CorruptionXID are the interaction terms among bank, industry and country level variables with Islamic Dummy, that is the variables of interest. The coefficients β_7 to β_{11} capture the difference in risk-taking between Islamic and conventional counterparts.

Finally, instead clustering standard errors at country level, current study follows Bitar and Tarazi (2019), Anginer and Zhu (2014) and Beck et al. (2013) to cluster standard errors at bank level due to following reasons; (i) countries have variation in number of observations and (ii) 11 countries are included in sample, thus country level clustering might cause biased estimation.

3.4.4 Risk Taking During Global Financial Crisis

In similar way, a dummy for crisis is included into the aforementioned model to test the difference in risk taking in crisis period. The use of a dichotomous variable for crisis period is followed Laeven and Valencia (2018) and Teixeira et al. (2019). The econometric specification for crisis impact is as follows:

$$\begin{aligned} Y_{ijk} =& \beta_0 + \beta_1 Crisis.Dummy_i + \beta_2 Bank.Char_{ijk} + \beta_3 Competition_{jk} \\ &+ \beta_4 Regulations_j + \beta_5 Macro.Char_j + \beta_6 Corruption_j + \beta_7 Bank.Char_{ijk} \\ &XCrisis.Dummy_i + \beta_8 Competition_{jk} XCrisis.Dummy_i + \beta_9 Regulations_j \\ &XCrisis.Dummy_i + \beta_{10} Macro.Char_j XCrisis.Dummy_i + \beta_{11} Corruption_j \\ &XCrisis.Dummy_i + \epsilon_{ijk} \end{aligned} \tag{3.14}$$

Where Y_{ijk} represents bank risk-taking for bank (i) in industry (j) across country (k). Bank Characteristics, Competition, Corruption, Regulations and Macroeconomic Characteristics are explanatory variables at bank, industry and country levels, respectively. Crisis Dummy is the dichotomous variable that captures the difference in risk taking in crisis period (2007-08).

Chapter 4

Empirical Results

Results section shows empirical findings regarding insolvency and credit risk. First, the result for credit risk is reported and then result regarding insolvency risk is presented, subsequently.

4.1 Credit Risk

This study first estimates the unconditional mean models and ICCs and then moves forward to estimate the HLM estimates for credit risk.

4.1.1 Unconditional Means Models and ICCs

Table 4.1 shows the findings of the ANOVA model for risk taking, where two alternative measures of credit risk are used, namely, *Non-performing Loans* (NPLs), and *Loan Loss Provisions* (LLPs).

This table reports a three-level variance components model to banks' risk taking. The model exhibits variance estimates for each of three levels: countries (ϵ_{00l}), industries (μ_{0kl}), and banks (η_{jkl}). These variance estimates are then used to calculate the fraction of variance (ICCs) explained by any given level, which is the ratio of the level's associated variance to the total variance for all levels. For example, results show that the percentage of variation in bank risk taking

TABLE 4.1: Unconditional means models for credit risk.

Mixed-effects ML regression		
Group Variable	**No. of Groups**	
Country_ID	11	
Industry_ID	2	
Bank_ID	191	
	(1)	**(2)**
	(NPLs)	**(LLPs)**
Log likelihood	-6076.096	-6356.539
Parameters		
Fixed-effects parameters		
Grand mean, Risk_taking,(γ_{000})	5.343	4.677
	(0.224)	(0.321)
Random-effects parameters		
Bank-level effect,(η_{jkl})	6.025	14.011
	(0.518)	(0.647)
Industry-level effect,(μ_{0kl})	1.733	2.976
	(0.112)	(0.102)
Country-level effect,(ϵ_{00l})	2.142	5.976
	(0.21)	(1.301)
Intra-class correlation coefficients (ICCs) %		
ICC Bank Level	60.86 %	61.02 %
ICC Industry Level	17.51 %	12.96 %
ICC Country Level	21.64 %	26.02 %
LR test statistic,χ^2	506.99	888.53
	[0.000]	[0.000]

Note: This table reports results for unconditional models for 191 banks nested in 2 industries nested in 11 countries. In columns (1) and (2), this study used Non-performing Loans (NPLs), and Loan Loss Provisions (LLPs) as the measures of credit risk. Parenthesis shows standard errors whereas p-values are in [.], respectively.

in case of *Non-performing Loans* (NPLs), explained by country is 21.64 percent ($\frac{2.142}{(6.025+1.733+2.142)}$), while industry and banks explain 17.51 and 60.86 percent, respectively.

This means that up to 21.64 and 17.51 percent of the variance in risk taking may be attributed to differences across industries and countries, with the remaining 60.86 percent is due to individual bank differences. Thus, risk taking by banks in the same industry is slightly correlated, while risk taking within the same country has a somewhat higher correlation. Put differently, banks from the same country, or even the same industry, are not especially similar in their risk taking.

This study also provides the likelihood (LR) ratio test statistic for comparison of single and multi-level models. In this study, a p-value of 0.000 of LR test strongly rejects the null hypothesis and implies that variation in risk taking exists across three levels. Thus the choice of using the HLM is better than single level analysis.

In sum, the three-level model therefore offers a significantly better fit to the data than the single-level model. This study can therefore conclude that the 191 banks do not act as 191 independent observations; rather, banks are nested in industries and countries to shape the bank risk taking.

4.1.2 HLM Estimates for Credit Risk

This section reports the results for two measures of credit risk; *Non-performing Loans* and *Loan Loss Provisions*.

4.1.2.1 Results for Non-performing Loans

Table 4.2 shows the baseline results of the HLM analysis with random slopes by including bank, industry and country level determinants. This study uses *Non-performing Loans* as credit risk proxy. The covariates from bank, industry and country levels are added in models (1) to (3). In order to avoid multicollinearity, three indicators of corruption (country level variable) are included in model 1-3 gradually because of the high correlation between these three indicators.

The results show that adding the predictor variables from each level reduces the three-variance parameters. The country level variance drops from 2.142 in the unconditional model (Table 4.1) to 1.896 in this model, a drop of 11%. The industry level variance drops from 1.733 to 1.340, a drop of 23%. The bank level variance drops from 6.025 to 5.592, a drop of 7%. The large decline in the industry level variance and the country level variance shows that there are large baseline differences in bank risk taking between industries and across countries.

TABLE 4.2: HLM estimates for non-performing loans.

Mixed-effects ML regression			
	(1)	**(2)**	**(3)**
Level 1 predictors (Bank-level), π_{pkl}			
Bank Efficiency	-6.161***	-5.742***	-5.794***
	(1.34)	(1.33)	(1.34)
Capital Asset Ratio	-4.028*	-3.978*	-3.89
	(2.38)	(2.38)	(2.38)
Bank Size	0.043**	0.041**	0.042***
	(0.02)	(0.02)	(0.01)
Board Size	-0.032	-0.026	-0.03
	(0.06)	(0.06)	(0.05)
Female Ratio	-1.13***	-1.23***	-1.28***
	(0.27)	(0.34)	(0.27)
Audit Committee	0.057	0.067	0.45
	(0.31)	(0.31)	(0.30)
Risk Management	-0.533*	-.513*	-0.16
	(0.30)	(0.30)	(0.31)
Foreign Ownership	0.278	0.282	0.26
	(0.49)	(0.48)	(0.48)
State Ownership	-1.11*	-1.11***	-1.10**
	(0.45)	(0.45)	(0.45)
Level 2 predictor (Industry-level), X_{qkl}			
Competition	-0.639**	-0.5882**	-0.614**
	(0.28)	(0.29)	(0.29)
Level 3 predictors (Country-level), W_{sk}			
Regulatory variables			
Official Supervisory Power	-0.433**	-0.473**	-0.481**
	(0.19)	(0.17)	(0.17)
Creditor Rights	-1.316***	-1.372***	-1.325***

	(0.35)	(0.33)	(0.35)
Deposit Insurance	1.093	1.048	1.014
	(0.75)	(0.83)	(0.74)
Mixed-effects ML regression			
	(1)	**(2)**	**(3)**
Macroeconomic characteristics			
GDP Growth	-0.02	-0.03	-0.02
	(0.02)	(0.04)	(0.03)
Inflation	0.091***	0.073**	0.054*
	(0.03)	(0.03)	(0.03)
Exchange Rates	0.66***	0.63***	0.64***
	(0.18)	(0.17)	(0.19)
Corruption indicators			
CI	0.600***		
	(0.20)		
Adj. CI		1.617***	
		(0.37)	
WBCI			1.015**
			(0.43)
Intercept	6.324***	6.202***	5.277***
	(1.02)	(1.02)	(1.07)
LR test statistic,χ^2	406.19	474.66	473.29
	[0.000]	[0.000]	[0.000]
Model diagnostics			
Bank-level effect, Var(e_{jkl})	5.592	5.288	4.936
Industry-level effect, Var(μ_{pkl})	1.34	1.14	1.121
Country-level effect, Var(ϵ_{pql})	1.896	1.679	1.581
Observations	2101	2101	2101

*Note: This table exhibits the estimation of the credit risk models. This study used Non-performing Loans as the dependent variable. Parenthesis shows standard errors whereas p-values are in [.]. $P < 1\%$***, $p < 5\%$**, $p < 10\%$*, respectively. Moreover, (π_{pkl}), (X_{qkl}) and (W_{sk}) are predictor variables from each level as mentioned in equations (3.9) to (3.11).*

Effect of Bank Level Predictors

As for as bank specific variables are concerned, bank efficiency has significant and negative coefficients in all models indicate that efficient banks face less credit risk than inefficient banks. In order to discuss the economic relationship between bank efficiency and risk taking, Berger and DeYoung (1997) proposed three hypotheses; skimping hypothesis, bad management hypothesis, and bad luck hypothesis. First, according to the *skimping hypothesis*, banks that devote fewer resources to monitor lending risks are considered to be more cost-efficient but with a high level of bad loans (NPLs) in the future suggesting a negative effect of efficiency on NPLs. This is because risk-avoiding managers are inclined to tradeoff between reduction in risk and earnings, particularly when their wealth depends on the bank's performance. As a result, for improving loan quality, they may increase higher costs of monitoring. Second, according to *bad management hypothesis* inefficiency increases non-performing loans because managers having poor skills in monitoring borrowers and credit scoring raise costs and generate poor quality loans and increase banks credit risk. Third, *bad luck hypothesis* of credit risk assumes that in circumstances beyond bank's control such as adverse economic conditions, banks spend more resources to recover the bad loans. The findings of this study confirms the *bad management* hypothesis, and consistent with the results of Berger and DeYoung (1997), Kwan and Eisenbeis (1997) and Williams (2004). This hypothesis assumes that inefficient banks face higher costs mainly because of inefficient control and inadequate credit monitoring of operating expenses. Therefore, reduction in revenue or cost efficiency thereby increases risk taking of banks due to credit, operational and reputational problems. However, this issue is low in efficient banks.

Similarly, capital assets ratio has significant and negative coefficient for model (1) and (2) suggest that banks having more equity portion in their capital face low credit risk or have high loan quality. Alternatively speaking, in reducing credit risk, capital requirements are found to be an effective tool. This in line with existing studies document that use of more equity capital reduces risk taking suggesting that regulatory capital requirement improves the efficiency and performance of

banks and act as a safeguard against risk (Barth et al., 2004; Kopecky and Van-Hoose, 2006; Agoraki et al., 2011). Hence, the regulatory pressure of implementing Basel accord and available literature supports capital regulation as a defensive tool for risk taking.

Contrary, coefficient of bank size is found significant and positive in all regression specifications. The results show that larger banks face a higher risk taking. There are multiple reasons to explain why larger banks take more risk. First, according to the *Too-Big-To-Fail hypothesis*, regulators are unwilling to unwind or close large and complex banks, which , in turn, lead to moral hazard behavior and increase bank risk-taking in the expectation of government bailouts (Farhi and Tirole, 2012). Second, *agency cost perspective* suggests that complex and large banks usually engaged in multiple activities, for example, combining trading and lending, thus, face more agency issues and poor governance, translate into higher risk taking (Bolton et al., 2007; Laeven and Levine, 2007). Third, based on *unstable banking hypothesis*, large banks usually financed more with short-term debt and incline to engage more in risky activities which, in turn, makes them more vulnerable and cause market failures (Gennaioli et al., 2013; Boot and Ratnovski, 2012; Shleifer and Vishny, 2010; Kashyap et al., 2002).

Moreover, the coefficients of female ratio and risk management committee are significant and negative suggesting that banks with greater female board representation and having a risk management committee face lower risk taking. These findings are in line with existing literature as one can argue that since females are able to make stronger mutual trust (Beck et al., 2012) and hence can obtain more proprietary information from CEOs, they can deliver their duties as the board member more effectively and make banks more efficient (Adams and Ferreira, 2007). Moreover, recent studies show that females are less risk taker as compared to male counterparts (Perryman et al., 2016; Faccio et al., 2016). Therefore, the presence of women in the boardroom of banks might persuade the management to adopt a too conservative strategy, and thereby make banks to involve less in risky activities. As for as risk management committee is concerned, the extant literature shows that bank boards with a separate risk management committee

are more effective in monitoring managers and their risk-taking behavior, see for instance, (Green and Homroy, 2018; Carter et al., 2010; Peterson and Philpot, 2007), among others.

Finally, the state ownership has a negative and significantly significant suggests that banks having state ownership face lower risk than privately owned banks. These results are in-line with existing studies that report that meanwhile 2007 and the start of the global financial crisis, emerging, developed as well as some of the developing countries experienced bailouts of private banks and large scale nationalization (Erkens et al., 2012; Brunnermeier, 2009). These actions are considered important to overcome the distress in financial systems and large-scale bankruptcies. This indicates that banks have state ownership is not essentially risky and may even be more appropriate in case of financial distress.

Effect of Industry Level Predictor

In case of industry level variable, the coefficient of competition is significant and negative suggesting that in competitive banking systems banks face less risk taking in terms of non-performing loans, which confirms the findings of Boyd and De Nicolo (2005) and consistent with competition-stability hypothesis. More precisely, banks with more market power in a less competitive banking market are more likely to charge higher loan rates, which can cause the borrower to bear a greater risk may also associated to tend increase failures. In other words, in competitive banking market banks face less risk and higher stability.

Thus, it can also be concluded that the competition between conventional and Islamic banking industry may also reduce bank risk taking. As in dual banking, due to competition pressure enforced by the presence of Islamic banks improves the quality and efficiency of financial intermediation. Thus, conventional banks might operate more efficiently in a dual banking system due to competition pressure enforced by the presence of Islamic banks (Abedifar et al., 2016). This is also consistent with the competition-efficiency hypothesis, assumes that increases in competition lead to increase in bank efficiency (Demsetz, 1973) and hence the increased efficiency of banks may leads to lower bank riskiness and improves loan quality.

Effect of Country Level Predictors

Finally, the result further shows that country level predictors have also significant impact on bank risk taking. For instance, both official supervisory power and creditor rights have significant and negative impact on bank risk taking, implying that implementation of creditor rights and transparency in sharing of information reduce the bank credit risk. This study uses three different measures in order to capture the corrupt environment; original CI index, WBCI index taken from World Bank and adjusted CI index. The purpose of using three corruption indicators is to alleviate the issue of biased estimates because of CI index is based on number of surveys and compiling methodologies that can create variation in its readings (Chen et al., 2015). The coefficients of three indicators of corruption are statistically significant and positive implying that increase in the level of corruption in a country also leads to increase in bank risk taking. These findings would seem to support the *sand the wheel* hypothesis of corruption and are in-line with Detragiache et al. (2008) and Weill (2011) among others, who note that in case of severe corruption the growth of lending declines. Similarly, Park (2012) also report that countries facing higher corruption have more non-performing loans.

In case of macro-economic characteristics, the results show that both inflation and exchange rates have positive and significant coefficients. This finding is in-line with previous literature document that the higher level of inflation and exchange rate might make the firms unable to service their debts, deteriorates competitiveness and increase credit risk (Fofack, 2005).

In addition, the LR test (χ^2) confirms that the three-level model is again more appropriate compared to single-level model ($\chi^2 = 406.19$, $p < 0.000$). Thus, it is important to retain the country and industry random effects in the model, even after adjusting for bank specific attributes.

4.1.2.2 Findings for Cross-level Interactions

Table 4.3 reports the results for HLM estimation with random slopes where interactions from cross-levels are included. The purpose of introducing the cross-level

interactions is to investigate whether country level regulatory framework, corruption and macroeconomic characteristics interact with industry and bank level variables to exert indirect influence on bank risk taking. In model (2), (4) and (6) cross-level interactions among country, industry and bank level variables are introduced. In order to avoid the multicollinearity, corruption indicators and its interactions are included progressively.

The results show that coefficient of interaction terms between bank specific attributes particularly efficiency and capital adequacy with industry level competition *(Bank EfficiencyXCompetition, Capital Assets RatioXCompetition)* are significant and negative. The negative coefficient of *EfficiencyXCompetition* implying that joint effect of competition and bank efficiency decreases bank credit risk. The possible explanation for this relationship could be as follows. On the one hand, competition-efficiency hypothesis suggests that increases in competition lead to increase in bank efficiency (Demsetz, 1973). This is because efficient banks with skilled management and robust production technologies earn higher profits and increases the market share at the cost of inefficient banks thereby result in higher market concentration (Vennet, 2002).

TABLE 4.3: Testing the cross-level interactions.

Mixed-effects ML regression						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Level 1 (Bank-level)						
Bank Efficiency	-6.161***	-6.178***	-5.742***	-5.723***	-5.794***	-5.767***
	(1.34)	(1.34)	(1.33)	(1.33)	(1.34)	(1.33)
Capital Asset Ratio	-4.028*	-4.23*	-3.978*	-4.09*	-3.89	-4.06*
	(2.38)	(2.38)	(2.38)	(2.38)	(2.38)	(2.38)
Bank Size	0.043**	0.041**	0.041**	0.042***	0.042***	0.041**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
Board Size	-0.032	-0.01	-0.026	-0.02	-0.03	-0.03
	(0.06)	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)
Female Ratio	-1.13***	-1.80***	-1.23***	-1.56*	-1.28***	-1.34*
	(0.27)	(0.58)	(0.34)	(0.68)	(0.27)	(0.67)
Audit Committee	0.057	0.15	0.067	0.1	0.45	0.09
	(0.31)	(0.30)	(0.31)	(0.30)	(0.30)	(0.30)

Risk Management	-0.533*	-0.52*	-.513*	-0.52*	-0.16	-0.53*
	(0.30)	(0.29)	(0.30)	(0.30)	(0.31)	(0.30)
Foreign Ownership	0.278	0.32	0.282	0.31	0.26	0.31
	(0.49)	(0.48)	(0.48)	(0.48)	(0.48)	(0.48)
State Ownership	-1.11*	-1.10**	-1.11***	-1.10**	-1.10**	-1.10**
	(0.45)	(0.43)	(0.45)	(0.42)	(0.45)	(0.44)
Level 2 (Industry-level)						
Competition	-0.639**	-0.781**	-0.5882**	-1.327***	-0.614**	-1.366***
	(0.28)	(0.34)	(0.29)	(0.34)	(0.29)	(0.26)
Bank EfficiencyXCompetition		-1.813**		-1.745**		-1.681**
		(0.73)		(0.76)		(0.70)
Capital Asset RatioXCompetition		-2.82**		-2.91**		-2.78**
		(1.37)		(1.40)		(1.15)
Bank SizeXCompetition		0.049***		0.052***		0.051***
		(0.01)		(0.01)		(0.01)
Board SizeXCompetition		-0.02		-0.02		-0.04
		(0.05)		(0.05)		(0.06)
Female RatioXCompetition		-1.52		-1.64		-1.6
		(1.61)		(1.59)		(1.65)
Audit CommitteeXCompetition		0.15		0.17		0.18
		(0.30)		(0.32)		(0.30)
Risk ManagementXCompetition		-0.68*		-0.66*		-0.68*
		(0.35)		(0.34)		(0.35)
Foreign OwnershipXCompetition		0.38		0.38		0.39
		(0.49)		(0.49)		(0.47)
State OwnershipXCompetition		-1.11		-1.47		-1.5
		(1.01)		(1.21)		(1.02)
Level 3 (Country-level)						
Official Supervisory Power	-0.433**	-0.394**	-0.473**	-0.491**	-0.481**	-0.392**
	(0.19)	(0.18)	(0.17)	(0.19)	(0.17)	(0.09)
Creditor Rights	-1.316***	-1.475**	-1.372***	-1.501***	-1.325***	-1.485***
	(0.35)	(0.59)	(0.33)	(0.45)	(0.35)	(0.41)
Deposit Insurance	1.093	0.897	1.048	0.824	1.014	0.897
	(0.75)	(0.90)	(0.83)	(0.76)	(0.74)	(0.90)
CompetitionXSupervisory Power		-0.044		-0.051		-0.044
		(1.44)		(1.24)		(1.44)
CompetitionXCreditor Rights		-0.47		-0.349		-0.47

		(0.60)		(0.70)		(0.60)
CompetitionXDeposit Insurance		0.266		0.266		0.266
		(1.28)		(1.33)		(1.31)
Mixed-effects ML regression						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
GDP Growth	-0.02	-0.01	-0.03	-0.04	-0.02	-0.02
	(0.02)	(0.02)	(0.04)	(0.05)	(0.03)	(0.03)
Inflation	0.091***	0.090***	0.073**	0.079**	0.054*	0.056*
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Exchange Rates	0.66***	0.66***	0.63***	0.65***	0.64***	0.66***
	(0.18)	(0.17)	(0.17)	(0.19)	(0.19)	(0.18)
CompetitionXGDP Growth		0.071		0.078		0.075
		(0.10)		(0.09)		(0.10)
CompetitionXInflation		0.057		0.054		0.057
		(0.09)		(0.09)		(0.08)
CompetitionXExchange Rates		0.61		0.61		0.61
		(0.75)		(0.73)		(0.76)
CI	0.600***	0.522***				
	(0.20)	(0.13)				
CompetitionXCI		1.790***				
		(0.39)				
Adj. CI			1.617***	0.719**		
			(0.37)	(0.27)		
CompetitionXAdj. CI				7.526***		
				(1.65)		
WBCI					1.015**	1.305**
					(0.43)	(0.51)
CompetitionXWBCI						2.329***
						(0.76)
Intercept	6.324***	3.654***	6.467***	6.784***	5.277***	6.202***
	(1.02)	(0.67)	(1.01)	(1.12)	(1.07)	(1.02)
LR test statistic,χ^2	406.19	529.96	478.52	412.19	473.29	474.66
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Model diagnostics						
Bank-level effect	5.592	5.288	5.288	5.236	4.936	5.293
Industry-level effect	1.34	0.34	1.14	0.501	1.121	0.296

Country-level effect	1.896	2.779	1.679	0.581	1.581	1.753
Observations	2101	2101	2101	2101	2101	2101

*Note: This table exhibits the estimation of the credit risk models. This study used Non-performing Loans as the dependent variable. Parenthesis shows standard errors whereas p-values are in [.]. P < 1%***, p < 5%**, p < 10%*, respectively. Moreover, see equation (3.12) for cross level interactions.*

Moreover, a negative association between the interaction term *Capital Assets RatioXCompetition* and risk taking show that the initial capital requirement of high stringency can impose barriers to entry for entrants. This would limit competition and allow the existing bank to accumulate power, so it is more prudent and exhibits less risky behavior. Moreover, in competitive market, higher overall capital requirements may associated with a higher fixed cost for operating banks , therefore, only larger banks may pay this cost (Agoraki et al., 2011).

In case of cross-level interactions of industry and country levels factors, the interactions among competition, regulatory framework and macroeconomic variables are found to be insignificant. Whereas, the coefficients of the interaction terms among competition and corruption indicators *(CompetitionXCI, CompetitionXAdj. CI and CompetitionXWBCI)* are significant and positive. These results show that corruption and competition jointly have adverse effect on bank risk taking. These results suggest that banks' credit risk increases in competitive environment if the severity of corruption increases. This is because corruption is linked with competition that further leads to bank risk taking. Vishny and Shleifer (1993) argue that corruption spreads when markets are competitive and a firm's competitor can reduce their costs through corruption, or paying bribes. In a competitive market, then, every firm must itself pay bribes to avoid higher default rates, which make these banks more inefficient. Thus, the keener is the competition, the higher is the pressure to reduce costs, and the more pervasive is corruption. The significant interaction terms confirm that country level corruption variable channeled through industry level variable (competition) and bank-level variable (bank efficiency) to exert indirect influence on bank risk taking.

4.1.2.3 Results for Loan Loss Provisions

Table 4.4 shows the results of the HLM analysis with random slopes. This study uses *Loan Loss Provisions* as alternative measure of credit risk proxy.

TABLE 4.4: HLM estimates for loan loss provisions.

Mixed-effects ML regression			
	(1)	**(2)**	**(3)**
Level 1 predictor (Bank-level), π_{pkl}			
Bank Efficiency	0.188	1.476	1.575
	(1.52)	(1.52)	(1.54)
Capital Asset Ratio	-2.024*	-2.189*	-2.89*
	(2.38)	(1.02)	(1.32)
Bank Size	2.798**	2.891**	2.642**
	(1.02)	(1.01)	(1.01)
Board Size	-0.034	-0.028	-0.03
	(0.06)	(0.06)	(0.07)
Female Ratio	-1.15***	-1.26***	-1.30***
	(0.29)	(0.32)	(0.20)
Audit Committee	0.059	0.069	0.49
	(0.32)	(0.34)	(0.66)
Risk Management	-1.524*	-1.957*	-1.16*
	(1.31)	(1.10)	(0.51)
Foreign Ownership	1.214	1.282	1.257
	(2.25)	(1.68)	(1.25)
State Ownership	-2.14*	-2.11***	-1.91**
	(1.47)	(1.41)	(0.45)
Level 2 predictor (Industry-level), X_{qkl}			
Competition	-1.107**	-1.355**	-1.376**
	(0.54)	(0.54)	(0.55)
Level 3 predictors (Country-level), W_{sk}			
Regulatory variables			
Official Supervisory Power	-3.086***	-3.102***	-3.124***
	(0.32)	(0.32)	(0.33)
Creditor Rights	-0.937	-0.945	-0.944
	(0.70)	(0.76)	(0.75)
Deposit Insurance	-1.018	-1.048	-1.075
	(1.53)	(1.61)	(1.56)

Mixed-effects ML regression			
	(1)	**(2)**	**(3)**
Macroeconomic characteristics			
GDP Growth	-0.051	-0.062	-0.052
	(0.06)	(0.08)	(0.08)
Inflation	0.12***	0.13**	0.15*
	(0.02)	(0.04)	(0.07)
Exchange Rates	0.25***	0.23***	0.27***
	(0.08)	(0.07)	(0.08)
Corruption indicators			
CI	2.146***		
	(0.27)		
Adj. CI		4.668***	
		(1.20)	
WBCI			0.517
			(0.53)
Intercept	4.454***	4.918***	5.584***
	(0.79)	(0.83)	(2.00)
LR test statistic, χ^2	918.48	924.52	941.94
	[0.000]	[0.000]	[0.000]
Model diagnostics			
Bank-level effect, Var(e_{jkl})	13.05	13.145	13.052
Industry-level effect, Var(μ_{pkl})	1.947	1.725	1.629
Country-level effect, Var(ϵ_{pql})	4.243	3.599	3.68
Observations	2101	2101	2101

"Note: This table exhibits the estimation of the credit risk models. This study used Loan Loss Provisions as the dependent variable. Parenthesis shows standard errors whereas p-values are in [.].

*$P < 1\%$***, $p < 5\%$**, $p < 10\%$*, respectively. Moreover, (π_{pkl}), (X_{qkl}) and (W_{sk}) are predictor variables from each level as mentioned in equations (3.9) to (3.11)".*

Tables 4.4 and 4.5 report the results for alternative measure of credit risk, *Loan Loss Provisions*. Table 4.4 presents the results HLM estimates while in table 4.5 cross level interactions are included. The covariates from bank, industry and country levels are added in models 1-3. In order to avoid multicollinearity, three

indicators of corruption (country level variable) are included in model 1-3 progressively because of the high correlation between these three indicators.

The results show that adding the predictor variable from bank, industry and county level reduce the three-variance parameters. The country level variance drops from 5.976 in the unconditional model (table 4.1) to 4.243 in this model, a drop of 29%. The industry level variance drops from 2.976 to 1.947, a drop of 35%. The bank level variance drops from 14.011 to 13.050, a drop of 7%. The large decline in the industry level variance and the country level variance shows that there are large baseline differences in bank risk taking between industries and across countries.

TABLE 4.5: Testing the cross-level interactions.

Mixed-effects ML regression						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Level 1 (Bank-level)						
Bank Efficiency	-0.188	0.694	1.476	1.303	1.575	1.425
	(1.52)	(1.51)	(1.52)	(1.52)	(1.54)	(1.54)
Capital Asset Ratio	-2.024*	-2.031*	-2.189*	-2.121*	-2.89*	-2.68*
	(2.38)	(2.35)	(1.02)	(1.00)	(1.32)	(1.31)
Bank Size	2.798**	1.697**	2.891**	1.992**	2.642**	1.984*
	(1.02)	(1.02)	(1.01)	(1.02)	(1.01)	(1.01)
Board Size	-0.034	-0.036	-0.028	-0.03	-0.03	-0.05
	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.09)
Female Ratio	-1.15***	-1.18***	-1.26***	-1.21***	-1.30***	-1.39***
	(0.29)	(0.31)	(0.32)	(0.28)	(0.20)	(0.19)
Audit Committee	0.059	0.061	0.069	0.067	0.49	0.86
	(0.32)	(0.31)	(0.34)	(0.36)	(0.66)	(0.62)
Risk Management	-1.524*	-1.534*	-1.957*	-1.862*	-1.16*	-1.19*
	(1.31)	(1.30)	(1.10)	(1.10)	(0.51)	(0.53)
Foreign Ownership	1.214	1.15	1.282	1.301	1.257	1.356
	(2.25)	(2.51)	(1.68)	(1.81)	(1.25)	(1.45)
State Ownership	-2.14*	-2.17*	-2.11***	-2.16***	-1.91**	-1.822**
	(1.47)	(1.50)	(1.41)	(1.39)	(0.45)	(0.71)
Level 2 (Industry-level)						
Competition	-1.107**	-3.454***	-1.355**	-4.954***	-1.376**	-3.816**
	(0.54)	(1.49)	(0.54)	(1.78)	(0.55)	(1.80)

Bank Efficiency XCompetition		-3.794***		-3.658***		-3.402***
		(1.27)		(1.30)		(1.02)
Capital Asset RatioXCompetition		-4.82**		-3.91**		-2.94**
		(1.81)		(1.40)		(1.11)
Bank SizeXCompetition		1.042***		0.047***		0.071***
		(0.11)		(0.02)		(0.02)
Board SizeXCompetition		-0.04		-0.06		-0.08
		(0.08)		(0.09)		(0.11)
Female RatioXCompetition		-2.32*		-2.64**		-1.92**
		(0.68)		(0.95)		(0.67)
Audit CommitteeXCompetition		0.19		0.21		0.22
		(0.43)		(0.38)		(0.39)
Risk ManagementXCompetition		-1.68*		-1.66*		-1.68*
		(0.91)		(0.84)		(0.91)
Foreign OwnershipXCompetition		0.42		0.45		0.47
		(0.56)		(0.58)		(0.55)
State OwnershipXCompetition		1.911		2.97		1.2
		(2.01)		(2.11)		(1.40)
Level 3 (Country-level)						
Official Supervisory Power	-3.086***	-5.716***	-3.102***	-5.825***	-3.124***	-4.562***
	(0.32)	(0.52)	(0.32)	(0.42)	(0.33)	(0.49)
Creditor Rights	-0.937	-1.607**	-0.945	-1.714**	-0.944	-1.524**
	(0.70)	(0.77)	(0.76)	(0.66)	(0.75)	(0.65)
Deposit Insurance	-1.018	0.175	-1.048	0.251	-1.075	0.182
	(1.53)	(1.62)	(1.61)	(1.62)	(1.56)	(1.61)
CompetitionXSupervisory Power		-9.071***		-8.024***		-8.071***
		(1.57)		(1.42)		(1.60)
CompetitionXCreditor Rights		1.892		1.625		1.825
		(0.67)		(0.56)		(0.67)
CompetitionXDeposit Insurance		-2.993		-2.652		-1.992
		(2.42)		(2.84)		(2.26)
Mixed-effects ML regression						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
GDP Growth	-0.051	-0.06	-0.062	-0.09	-0.052	-0.03
	(0.06)	(0.04)	(0.08)	(0.10)	(0.08)	(0.04)
Inflation	0.12***	0.094***	0.13**	0.081**	0.15*	0.058*
	(0.02)	(0.01)	(0.04)	(0.03)	(0.07)	(0.03)

Exchange Rates	0.25***	0.68***	0.23***	0.69***	0.27***	0.64***
	(0.08)	(0.15)	(0.07)	(0.18)	(0.08)	(0.17)
CompetitionXGDP Growth		0.056		0.074		0.061
		(0.14)		(0.09)		(0.09)
CompetitionXInflation		0.062		0.057		0.059
		(0.09)		(0.09)		(0.08)
CompetitionXExchange Rates		0.681		0.65		0.66
		(0.75)		(0.74)		(0.71)
CI	2.146***	2.876***				
	(0.27)	(0.33)				
CompetitionXCI		1.675***				
		(0.45)				
Adj. CI			4.668***	7.015***		
			(1.20)	(1.40)		
CompetitionXAdj. CI				5.784***		
				(1.91)		
WBCI					0.517	0.867
					(0.53)	(0.68)
CompetitionXWBCI						2.986***
						(0.89)
Intercept	4.454***	5.922***	4.918***	4.251**	5.584***	4.009**
	(0.79)	(1.01)	(0.83)	(2.08)	(2.00)	(1.88)
LR test statistic, χ^2	918.48	926.51	924.52	926.99	941.94	964.39
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Model diagnostics						
Bank-level effect	13.05	13.058	13.145	13.128	13.052	13.072
Industry-level effect	1.947	1.942	1.725	1.828	1.629	1.972
Country-level effect	4.243	3.83	3.599	3.579	3.68	2.35
Observations	2101	2101	2101	2101	2101	2101

*Note: This table exhibits the estimation of the credit risk models. This study used Loan Loss Provisions as the dependent variable. Parenthesis shows standard errors whereas p-values are in [.]. P < 1%***, p < 5%**, p < 10%*, respectively. Moreover, see equation (3.12) for cross level interactions.*

Moreover, the LR test (χ^2) confirms that the three-level model is still preferred to its single-level counterpart ($\chi^2 = 918.48$, $p < 0.000$). Thus, it is important to retain the country and industry random effects in the model, even after adjusting

for bank level attributes. This finding of tables 4.4 and 4.5 remains qualitatively valid when this study uses the ratio of loan loss provisions to gross loans as an alternative measure of credit risk.

4.2 Insolvency Risk

This study first estimates the unconditional mean models and ICCs and then takes a step forward to estimate the HLM estimates for insolvency risk.

4.2.1 Unconditional Means Models and ICCs

Table 4.6 reports the results of the ANOVA model for bank risk taking, and this study uses *Z-Score* as measure of risk taking. This table specifies a three-level variance components model of banks' risk taking. The model provides variance estimates for each of three levels: countries (ϵ_{00l}), industries (μ_{0kl}), and banks (η_{jkl}). Estimates of this variance is then used to calculate the fraction of variance (ICCs) described by each level, which is the ratio of the variance for each level related to the total variance from all levels.

The results show that the percentage of variation in bank risk taking explained by country was 29.75 percent, while industry and banks explained 13.51 and 56.15 percent, respectively. This means that up to 29.75 and 13.51 percent of the variance in risk taking is attributed to differences across industries and countries, with the remaining 56.15 percent is due to individual bank differences. Thus, risk taking by banks from the same country, or even the same industry, are not especially similar in their risk taking. Moreover, a significant p-value of LR test provides support for the choice to use the HLM. Hence, it is concluded from the null model for insolvency risk that the use of three-level model therefore offers a significantly better fit to the data than the single-level model. Thus, 191 banks do not act as 191 independent observations; rather, these banks are nested in industries and countries to shape the bank risk taking.

TABLE 4.6: Unconditional means models for insolvency risk.

Mixed-effects ML regression			
Group Variable		**No. of Groups**	
Country_ID		11	
Industry_ID		2	
Bank_ID		191	
Log likelihood		-7538.578	
Parameters			
Fixed-effects parameters			
Grand mean, Risk_taking,	7.841		
	(0.321)		
Random-effects parameters		**Intra-class correlation coefficients (ICCs)** %	
Bank-level effect, (η_{jkl})	4.294	ICC Bank Level	0.5615
	(0.935)		
Industry-level effect, (μ_{0kl})	1.022	ICC Industry Level	0.1351
	(0.064)		
Country-level effect, (ϵ_{00l})	2.251	ICC Country Level	0.2975
	(0.069)		
LR test statistic, χ^2	155.94		
	[0.000]		

Note: This table reports results for unconditional model for 191 banks nested in 2 industries nested in 11 countries. This study used Z-Scores as the measures of insolvency risk. Parenthesis shows standard errors whereas p-values are in [.], respectively.

4.2.2 HLM Estimates for Insolvency Risk

Table 4.7 shows the results of the HLM analysis with random slopes where *Z-score* is used as risk taking proxy.

4.2.2.1 Results for Z-score Models

The covariates from bank, industry and country levels are introduced in models (1) to (3). In order to avoid multicollinearity, three indicators of corruption (country level variable) are included in model (1) to (3) individually because of the high correlation between these three indicators.

The results present that adding the predictor variable from three levels reduce the three-variance parameters. The country level variance drops from 2.251 in the unconditional model (table 4.6) to 1.951 in this model, a drop of 13%. The industry level variance drops from 1.022 to 0.924, a drop of 10%. The bank level variance drops from 4.294 to 3.981, a drop of 7%. The large decline in the industry level variance and the country level variance shows that there are large baseline differences in bank risk taking between industries and across countries. Moreover, the LR test (χ^2) confirms that the three-level model is preferred to its single-level counterpart ($\chi^2 = 248.85$, $p < 0.000$). Thus, it is important to retain the country and industry random effects in the model, even after adjusting for bank level attributes.

Effect of Bank Level Predictors

TABLE 4.7: HLM estimates for Z-scores.

Mixed-effects ML regression			
	(1)	**(2)**	**(3)**
Level 1 predictor (Bank-level), π_{pkl}			
Bank Efficiency	2.185***	3.220***	3.541***
	(0.419)	(0.417)	(0.561)
Capital Asset Ratio	1.94	1.97	2.08
	(2.330)	(2.340)	(2.310)
Bank Size	-0.28**	-0.25**	-0.27**
	(0.100)	(0.100)	(0.100)
Board Size	-0.01	-0.01	-0.01
	(0.060)	(0.070)	(0.060)
Female Ratio	0.55**	0.54**	0.56**
	(0.210)	(0.220)	(0.200)
Audit Committee	-0.21	-0.2	-0.18
	(0.340)	(0.340)	(0.340)
Risk Management	1.02**	1.01**	1.05**
	(0.400)	(0.400)	(0.410)
Foreign Ownership	-1.58	-1.58	-1.57
	(1.780)	(1.760)	(1.780)
State Ownership	1.98***	1.98***	1.95***
	(0.560)	(0.560)	(0.570)
Level 2 predictor (Industry-level), X_{qkl}			
Competition	0.910**	0.581***	0.689***

	(0.426)	(0.186)	(0.235)
Level 3 predictors (Country-level), W_{sk}			
Regulatory variables			
Official Supervisory Power	0.36***	0.37***	0.36***
	(0.100)	(0.090)	(0.080)
Creditor Rights	1.05***	1.07***	1.06***
	(0.270)	(0.240)	(0.250)
Deposit Insurance	1.32	1.3	1.29
	(2.070)	(2.080)	(2.120)
Mixed-effects ML regression			
	(1)	**(2)**	**(3)**
Macroeconomic characteristics			
GDP Growth	-0.01	-0.02	-0.04
	(0.060)	(0.040)	(0.040)
Inflation	-0.81***	-0.84***	-0.82***
	(0.220)	(0.250)	(0.260)
Exchange Rates	-0.82**	-0.85**	-0.81**
	(0.310)	(0.340)	(0.300)
Corruption indicators			
CI	-0.180***		
	(0.028)		
Adj. CI		-0.201***	
		(0.027)	
WBCI			-0.230*
			(0.130)
Intercept	9.248***	8.412***	5.841***
	(0.883)	(0.714)	(1.713)
LR test statistic, χ^2	248.85	971.15	852.65
	[0.000]	[0.000]	[0.000]
Model diagnostics			
Bank-level effect, Var(e_{jkl})	3.981	4.081	3.481
Industry-level effect, Var(μ_{pkl})	0.924	0.964	0.895
Country-level effect, Var(ϵ_{pql})	1.951	2.104	1.904
Observations	2101	2101	2101

Note: This table exhibits the estimation of the credit risk models. This study used Z-Score as the dependent variable. Parenthesis shows standard errors whereas p-values are in [.].

*$P < 1\%$***, $p < 5\%$**, $p < 10\%$*, respectively. Moreover, (π_{pkl}), (X_{qkl}) and (W_{sk}) are predictor variables from each level as mentioned in equations (3.9) to (3.11).*

In case of bank level variables, the positive and significant coefficients of bank efficiency in all models indicate that bank efficiency is associated with higher bank stability and lower insolvency risk. These findings are in line with existing literature on bank efficiency and risk taking nexus. Particularly, these studies found that unstable and failing banks due to high insolvency risk tend to be less efficient, see for example, (Barr and Siems, 1994; DeYoung and Whalen, 1994; Wheelock and Wilson, 1994; Berger and Humphrey, 1992).

Contrary, the result shows that in all regression specifications, the coefficient of bank size is negative and statistically significant. This means that larger banks have a lower bank stability and higher insolvency risk, which is similar to the finding of Kane (2010) and De Nicolo (2001), who note that larger banks might be riskier, since they may try to exploit Too-Big-To-Fail safety net subsidies.

Furthermore, the coefficients of female ratio and risk management committee are significant and positive implying that banks with greater female board representation and having a risk management committee increase bank stability and lowers the bank insolvency risk. Results of this study are in-line with studies of Faccio et al. (2016),Green and Homroy (2018) and Perryman et al. (2016), who argue that banks having female board representation and strong risk management committee face lower risk taking.

Finally, in order to captures heterogeneity among banks in terms of ownership structure, two dummies i.e. Foreign and State-owned banks are included. This study considered domestically private banks as the benchmark. A positive and significant coefficient is found for state ownership suggests that state-owned banks more stable and less risky than privately owned banks.

Effect of Industry Level Predictor

As for as the industry level influence is concerned, competition has positive and significant coefficient implying that the stability of banks is lower in markets that are more concentrated or alternatively speaking, competitive banking systems lead to stability of banks and lower the default probabilities (Berger et al., 2017; Beck et al., 2013).

Effect of Country Level Predictors

At country level, importantly, as mentioned earlier, due to the high correlation among three corruption indicators these indicators are introduced into the models separately to avoid the multicollinearity issue. The result further shows that country level predictors exert significant impact on risk taking of banks. For example, both official supervisory power and creditor rights have significant and positive coefficients suggest that official supervisory power and creditor rights are linked with higher stability of banks. Similar to the credit risk models, in insolvency risk models, the study used three indicators of corruption, namely, CI Index Adj. CI index and World Bank based WBCI index.

The interpretation for the relationship of corruption and Z-score is can be viewed in following manner. On the one hand, the Z-score is inverse probability of insolvency of bank. A lower value suggests a lower level of the bank stability or soundness or alternatively speaking, higher value means greater exposure to banks' insolvency risk. On the other hand, a greater value of corruption index shows higher corruption, this study rescales it by letting 10 deducted by the TI index. From all regressions, model (1) to (3), measures of corruption have significant and negative coefficients. The estimation results indicate that the stability of banks decreases in case of increase in the severity of corruption. In other words, the bank found to be involved in risky activities in the corrupt economic environment, therefore, become more vulnerable. Quantitatively, the influence of corruption on risk-taking of banks is also salient. Particularly, the findings show that one unit increase in corruption raises Z-scores by 18% to 23%. This result is consistent with the existing studies that documents the *sand the wheel* effect of corruption, but does not support the view of a *grease the wheel* impact of corruption (Acemoglu and Verdier, 2000; Lui, 1986).

4.2.2.2 Findings for Cross-level Interactions

Table 4.8 presents the findings of the HLM estimates with random slopes where cross level interaction terms are included. The purpose of introducing the cross-level interactions is to investigate whether country level regulatory framework,

corruption and macroeconomic characteristics interact with industry and bank level variables to exert indirect influence on bank risk taking. In case of cross level interaction between bank and industry levels, for example, the results show that coefficient of interaction term *EfficiencyXCompetition* is significant and positive suggesting that joint effect of competition and bank efficiency increases bank stability. As for as cross-level interactions of country and industry levels are concerned, the interactions among competition and regulatory framework variables and competition and macroeconomic characteristics are found to be insignificant. Whereas, the coefficients of the interaction terms among competition and corruption indicators *(CompetitionXCI, CompetitionXAdj. CI and CompetitionXWBCI)* are also significant and negative. These results show that corruption and competition jointly have significant impact on risk taking. These results can be interpreted as the stability of the banks declined as increased severity of corruption and the bank is found to be involved in risk-taking in corrupt economic environment with increase in competition among banks. Moreover, the significant LR test (χ^2) confirms that the three-level model is preferred to its single-level counterpart. Thus, it is important to retain the country and industry random effects in the model, even after adjusting for bank level attributes and their cross level interactions.

TABLE 4.8: Testing the cross-level interactions.

Mixed-effects ML regression						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Level 1 (Bank-level)						
Bank Efficiency	2.185***	2.024***	3.220***	3.156***	3.541***	4.025***
	(0.42)	(0.40)	(0.42)	(0.42)	(0.56)	(0.62)
Capital Asset Ratio	1.94	2.22	1.97	2.25	2.08	2.39
	(2.33)	(2.32)	(2.34)	(2.32)	(2.31)	(2.29)
Bank Size	-0.28**	-0.29**	-0.25**	-0.26**	-0.27**	-0.28**
	(0.10)	(0.11)	(0.10)	(0.10)	(0.10)	(0.10)
Board Size	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	(0.06)	(0.06)	(0.07)	(0.06)	(0.06)	(0.07)
Female Ratio	0.55**	0.55**	0.54**	0.55**	0.56**	0.55*
	(0.21)	(0.21)	(0.22)	(0.22)	(0.20)	(0.25)
Audit Committee	-0.21	-0.22	-0.2	-0.22	-0.18	-0.2
	(0.34)	(0.34)	(0.34)	(0.34)	(0.34)	(0.34)
Risk Management	1.02**	0.96**	1.01**	0.96**	1.05**	1.00**
	(0.40)	(0.41)	(0.40)	(0.41)	(0.41)	(0.42)

Foreign Ownership	-1.58	-1.59	-1.58	-1.59	-1.57	-1.59
	(1.78)	(1.78)	(1.76)	(1.78)	(1.78)	(1.77)
State Ownership	1.98***	2.00***	1.98***	2.00***	1.95***	1.96**
	(0.56)	(0.57)	(0.56)	(0.57)	(0.57)	(0.57)
Level 2 (Industry-level)						
Competition	0.910**	0.856**	0.581***	0.572***	0.689***	0.675***
	(0.43)	(0.26)	(0.19)	(0.18)	(0.24)	(0.14)
Bank Efficiency XCompetition		1.395**		1.382**		1.385**
		(0.64)		(0.65)		(0.62)
Capital Asset RatioXCompetition		3.94*		3.98*		3.96*
		(2.03)		(2.04)		(2.01)
Bank SizeXCompetition		-0.34***		-0.35***		-0.32***
		(0.10)		(0.11)		(0.09)
Board SizeXCompetition		-0.01		-0.03		-0.01
		(0.06)		(0.08)		(0.06)
Female RatioXCompetition		0.68**		0.67**		0.66**
		(0.25)		(0.23)		(0.22)
Audit CommitteeXCompetition		-0.21		-0.22		-0.21
		(0.34)		(0.36)		(0.35)
Risk ManagementXCompetition		1.18**		1.16**		1.15**
		(0.42)		(0.40)		(0.41)
Foreign OwnershipXCompetition		-1.59***		-1.53***		-1.56***
		(0.52)		(0.48)		(0.50)
State OwnershipXCompetition		-1.82***		-1.75***		-1.78***
		(0.56)		(0.53)		(0.55)
Level 3 (Country-level)						
Official Supervisory Power	0.36***	0.34***	0.37***	0.32***	0.36***	0.33***
	(0.10)	(0.08)	(0.09)	(0.06)	(0.08)	(0.08)
Creditor Rights	1.05***	1.02***	1.07***	1.02***	1.06***	1.05***
	(0.27)	(0.24)	(0.24)	(0.20)	(0.25)	(0.22)
Deposit Insurance	1.32	1.31	1.3	1.29	1.29	1.33
	(2.07)	(2.05)	(2.08)	(2.08)	(2.12)	(2.09)
CompetitionXSupervisory Power		-0.276		-0.281		-0.282
		(1.12)		(1.15)		(1.13)
CompetitionXCreditor Rights		-1.681		-1.714		-1.681
		(2.76)		(2.76)		(2.77)
CompetitionXDeposit Insurance		1.024		1.567		1.027
		(1.92)		(1.95)		(1.92)
Mixed-effects ML regression						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
GDP Growth	-0.01	-0.03	-0.02	-0.03	-0.04	-0.01
	(0.06)	(0.07)	(0.04)	(0.08)	(0.04)	(0.06)
Inflation	-0.81***	-0.82***	-0.84***	-0.85***	-0.82***	-0.82***

	(0.22)	(0.21)	(0.25)	(0.23)	(0.26)	(0.19)
Exchange Rates	-0.82**	-0.83**	-0.85**	-0.83**	-0.81**	-0.80**
	(0.31)	(0.32)	(0.34)	(0.33)	(0.30)	(0.29)
CompetitionXGDP Growth		0.45		0.43		0.45
		(1.25)		(1.21)		(1.22)
CompetitionXInflation		0.37		0.33		0.35
		(2.01)		(1.09)		(2.23)
CompetitionXExchange Rates		0.32		0.39		0.31
		(1.81)		(1.23)		(1.21)
CI	-0.180***	-0.160***				
	(0.03)	(0.02)				
CompetitionXCI		-0.274**				
		(0.12)				
Adj. CI			-0.201***	-0.191***		
			(0.03)	(0.03)		
CompetitionXAdj. CI				-0.134***		
				(0.05)		
WBCI					-0.230*	-0.228*
					(0.13)	(0.10)
CompetitionXWBCI						-0.307***
						(0.12)
Intercept	9.248***	7.885***	8.412***	9.988***	5.841***	9.672***
	(0.88)	(2.62)	(0.71)	(2.90)	(1.71)	(2.78)
LR test statistic,	248.85	857.32	971.15	564.87	852.65	640.22
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Model diagnostics						
Bank-level effect	3.981	3.284	4.081	3.128	3.481	3.557
Industry-level effect	0.924	0.758	0.964	0.788	0.895	0.795
Country-level effect	1.951	1.248	2.104	1.975	1.904	1.857
Observations	2101	2101	2101	2101	2101	2101

Note: This table exhibits the estimation of the insolvency risk models. This study used Z-Score as the dependent variable. Parenthesis shows standard errors whereas p-values are in [.].

*P < 1%***, p < 5%**, p < 10%*, respectively. Moreover, see equation (3.12) for cross level interactions".*

4.3 Risk Taking: Islamic Versus Conventional Banks

This section discusses whether Islamic banks face different risk taking as compared to conventional banks. For this purpose, dummy variable approach is used to explore the difference in risk taking in both types of banking systems. First, this study provides the results for credit risk and then for insolvency risk, subsequently.

4.3.1 Credit Risk Models

The study begins by investigating the impact of bank, industry and country level determinants on bank risk for the sample of conventional banks, the sample of Islamic banks and for the full sample. Table 4.9 presents the results for the analysis of the difference in risk taking in Islamic vis-a-vis conventional banks. Particularly, column (1) to (3) of table 4.9 presents the results for the sample of conventional banks whereas column (4) to (6) exhibits the results for the sample of Islamic banks. Furthermore, *Non-performing Loans* is used as the loan quality/credit risk proxy. In case of bank, industry and country level variables, all else equal, the results for the sample of conventional banks and for the sample of Islamic banks confirm the findings of full sample analysis.

Moreover, in models (7) to (9) for full sample, *Non-performing Loans* is regressed on bank, industry and country level predictors, *Islamic Dummy* variable and its interactions with bank, industry and country level predictors. The result exhibits that the coefficient of *Islamic Dummy* is significant and negative suggesting that Islamic banks face lower credit risk than their conventional counter-parts, which is in line with previous studies (Baele et al., 2014; Abedifar et al., 2013).

In case of bank level variables, the interaction among capital adequacy ratio, female ratio and risk management committee with *Islamic dummy* is significant and negative which indicates that these variables have a different effect on the credit risk of Islamic banks as compared to conventional banks. As expected, for the sample of Islamic banks and full sample in models (4) to (9), the coefficients of

the corruption indicators and their interactions with *Islamic Dummy* are negative and statistically significant, suggesting that severity of corruption in a country do not adversely affect the loan quality in terms of credit risk of Islamic banks.

Table 4.9: Credit risk: Islamic vs. conventional banks.

Mixed-effects ML regression									
	Conventional Banks			**Islamic Banks**			**Full Sample**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Level 1 (Bank-level)									
Bank Efficiency	-7.85***	-7.04***	-7.31***	-4.90**	-4.55**	-4.46**	-6.29***	-5.76***	-5.83***
	(1.78)	(1.79)	(1.79)	(2.52)	(2.04)	(2.03)	(1.34)	(1.34)	(1.34)
Capital Asset Ratio	-3.41*	-3.09*	-3.06*	-1.82**	-1.91**	-1.78**	-4.028*	-3.978*	-3.89
	(1.42)	(1.38)	(1.38)	(0.37)	(0.40)	(0.15)	(2.38)	(2.38)	(2.38)
Bank Size	0.045**	0.041***	0.044**	0.049***	0.052***	0.051***	0.043**	0.041**	0.042***
	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Board Size	-0.01	-0.04	-0.04	-0.02	-0.01	-0.03	-0.032	-0.026	-0.03
	(0.05)	(0.07)	(0.06)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.05)
Female Ratio	-1.84***	-1.58*	-1.35*	-1.52*	-1.64**	-1.60**	-1.13***	-1.23***	-1.28***
	(0.52)	(0.70)	(0.68)	(0.67)	(0.62)	(0.65)	(0.27)	(0.34)	(0.27)
Audit Committee	0.16	0.11	0.12	0.15	0.15	0.19	0.057	0.067	0.45
	(0.34)	(0.31)	(0.35)	(0.30)	(0.32)	(0.30)	(0.31)	(0.31)	(0.30)
Risk Management	-0.54*	-0.54*	-0.55*	-0.68*	-0.66*	-0.68*	-0.533*	-.513*	-0.16

	(0.31)	(0.32)	(0.32)	(0.35)	(0.34)	(0.35)	(0.30)	(0.30)	(0.31)
Foreign Ownership	0.34	0.32	0.31	0.38	0.37	0.38	0.278	0.282	0.26
	(0.51)	(0.51)	(0.47)	(0.49)	(0.49)	(0.47)	(0.49)	(0.48)	(0.48)
State Ownership	-1.11**	-1.12**	-1.10**	-2.11**	-2.47**	-2.50**	-1.11**	-1.11**	-1.10**
	(0.42)	(0.44)	(0.44)	(1.01)	(1.21)	(1.02)	(0.44)	(0.45)	(0.43)
Level 2 (Industry-level)									
Competition	-0.52	-0.38	-0.45	0.89***	0.92**	0.86**	-0.639**	-0.5882**	-0.614**
	(0.60)	(0.60)	(0 .606)	(0.28)	0(.34)	(0.32)	(0.28)	(0.29)	(0.29)
Level 3 (Country-level)									
Regulatory variables									
Official Supervisory Power	-0.29	-0.31	-0.3	-0.65	-0.63	-0.64	-0.28	-0.29	-0.3
	(0.36)	(0.38)	(0.33)	(0 .479)	(0 .464)	(0 .452)	(0.36)	(0.38)	(0.39)
Creditor Rights	-1.14***	-1.16***	-1.15***	-1.80***	-1.82***	-1.81***	-1.16***	-1.14***	-1.15***
	(0.35)	(0.32)	(0.35)	(0.40)	(0.40)	(0.41)	(0.38)	(0.34)	(0.33)
Deposit Insurance	0.46	0.47	0.42	1.48	1.45	1.49	0.48	0.46	0.47
	(0.76)	(0.74)	(0.74)	(1.77)	(1.70)	(1.79)	(0.84)	(0.86)	(0.87)
Macroeconomic characteristics									
GDP Growth	-0.04	-0.05	-0.04	-0.12	-0.11	-0.13	-0.02	-0.03	-0.02

	(0.12)	(0.14)	(0.07)	(0.24)	(0.22)	(0.25)	(0.02)	(0.04)	(0.03)
Inflation	0.14	0.078	0.068	0.19	0.18	0.2	0.09	0.073	0.057
	(0.28)	(0.11)	(0.81)	(0.27)	(0.22)	(0.26)	(0.09)	(0.13)	(0.83)
Exchange Rates	0.12	0.24	0.63	0.42	0.43	0.45	0.62	0.64	0.65
	(0.22)	(0.91)	(0.75)	(0.47)	(0.51)	(0.48)	(0.84)	(0.98)	(0.79)
Corruption indicators									]
CI	0.55*			-0.68**			0.61***		
	(0.21)			(0.28)			(0 .21)		
Adj. CI		1.43			-2.70**			1.57*	
		(0.91)			(1.24)			(0.95)	
WBCI			0.86*			-1.53**			1.00**
			(0.45)			(0.61)			(0.47)
Mixed-effects ML regression									
Islamic Dummy (ID)							-1.68***	-0.25***	-0.31**
							(0.24)	(0.08)	(0.12)
Bank EfficiencyXID							-3.37	-3.35	-3.34
							(2.63)	(2.59)	(2.60)
Capital Asset RatioXID							-4.615*	-3.778*	-3.75

	(2.71)	(2.18)	(2.39)
Bank SizeXID	0.045**	0.041**	0.044***
	(0.02)	(0.02)	(0.01)
Board SizeXID	-0.037	-0.028	-0.05
	(0.06)	(0.06)	(0.06)
Female RatioXID	-1.19***	-1.25***	-1.28***
	(0.26)	(0.35)	(0.27)
Audit CommitteeXID	0.059	0.068	0.47
	(0.31)	(0.31)	(0.34)
Risk ManagementXID	-0.641*	-.515*	-0.18
	(0.31)	(0.30)	(0.35)
Foreign OwnershipXID	0.278	0.284	0.27
	(0.49)	(0.49)	(0.48)
State OwnershipXID	-1.11	1.1	1.1
	(0.95)	(0.90)	(1.02)
Competition XID	0.32	0.31	0.3
	(0.26)	(0.22)	(0.27)
Official Supervisory PowerXID	-0.42	-0.41	-0.41

							(0.58)	(0.58)	(0.54)
Creditor RightsXID							-0.36	-0.34	-0.32
							(0.47)	(0.49)	(0.42)
Deposit InsuranceXID							1.39	1.34	1.38
							(0.94)	(0.98)	(0.92)
GDP GrowthXID							-0.01	-0.04	-0.02
							(0.02)	(0.05)	(0.03)
InflationXID							0.09	0.091	0.056
							(0.14)	(0.03)	(0.08)
Exchange RatesXID							0.66	0.08	0.12
							(0.95)	(0.19)	(0.18)
CIXID							-0.06***		
							(0.02)		
Adj. CIXID								-0.096***	
								(0.02)	
WBCIXID									-0.08**
									(0.03)
Intercept	3.52***	3.36***	5.91***	4.21***	3.88***	3.39**	3.56***	3.73***	6.34***

	(0.65)	(0.67)	(1.03)	(0.85)	(0.88)	(1.16)	(0.72)	(0.68)	(1.08)
LR test statistic	302.58	300.23	245.49	214.06	214.49	237.95	531.62	528.01	387.34
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Model diagnostics									
Var (e_{jkl})	5.13	5.119	4.977	6.328	6.31	6.334	5.311	5.291	5.182
Var (μ_{pkl})	0.574	0.581	0.058	0.331	0.828	0.715	0.306	0.328	0.406
Var (ϵ_{pql})	1.68	1.611	1.73	0.272	0.178	0.742	2.922	2.782	2.606
Observations	1320	1320	1320	781	781	781	2101	2101	2101
Number of Banks	120	120	120	71	71	71	191	191	191

Note: This table exhibits the estimation of the insolvency risk models. This study used Non-performing Loans as the dependent variable. Parenthesis shows standard errors whereas p-values are in [.].

*$P < 1\%$***, $p < 5\%$**, $p < 10\%$*, respectively. Moreover, see equation (3.13) for estimation of difference in risk taking for Islamic vis-a-vis conventional banks".*

This is in line with the expected adherence of Islamic banks to ethical behavior, which is theoretically the cornerstone of Islamic banks, and plays a crucial role in possibly mitigating the negative effects of corruption on the credit risk/ loan quality of Islamic banks.[2] Particularly, the coefficient of Islamic dummy in model (13) to (18) for full sample and its interaction term with corruption indicators resides between (-0.06) to (-1.68) with significance level of 1% show that an Islamic banks' credit risk is about 2% lower than a comparable conventional bank.

4.3.2 Insolvency Risk Models

Table 4.10 presents the results for the analysis of the differential effects for risk taking in Islamic vis-a-vis conventional banks. Table shows the results for bank risk taking models where Z-score is used as the risk taking proxy. The study begins by examining the impact of bank, industry and country level determinants on bank risk for the sample of conventional banks, the sample of Islamic banks and for the full sample. The findings for bank level variables have almost similar findings as in table 4.9. Moreover, the results of industry level variable, competition, is positive and statistically different from zero for the sample of conventional banks and full sample, however, the results for the sample of Islamic banks are found insignificant. These results are in line with the main findings of table 4.9 that can be interpreted as in dual banking systems, the competition pressure enforced by the presence of Islamic banks help to discipline the conventional banks and improve the quality and efficiency of financial intermediation. Therefore, conventional banks might operate in efficient manner to overcome the riskiness.

In case of country level variables, for the sample of conventional banks, the study found consistent results that the coefficients on the corruption indicators are negative and statistically significant. As discussed earlier, these results are consistent with the research studies that supports the *sand the wheel* effect of corruption, implying that the stability of banks decreases as corruption increases. In simple

[2]This study also uses Loan Loss Provisions in lieu of Non-performing Loans and finds a similar result for the interaction terms. However, the results are not reported it here for the purpose of brevity.

words, the banks found to be involved in risky activities in more corrupt economic environment that increased the risk appetite.

The main finding of this analysis is to explore the difference in risk taking between Islamic and conventional banks. To this end, *Islamic Dummy* and its interaction terms with bank, industry and country level predictors are introduced into the models (7) to (9) for full sample. The result exhibits that the coefficients of Islamic Dummy and its interaction terms are insignificant. Thus, this study found no significant difference between Islamic and conventional banks in terms of insolvency risk and this is consistent with Abedifar et al. (2013).

4.4 Impact of Crisis on Bank Risk Taking

This section attempts to investigate the impact of country, industry and bank level factors on risk taking during 2008-09 global financial crisis by introducing crisis dummy. Table 4.11 shows the results on the impact of country, industry and bank level factors on credit risk while table 4.12 shows the results on the impact of country, industry and bank level factors on insolvency risk.

In table 4.11, Non-performing Loans is used as the measure of credit risk. The results for *Loan loss provisions* are qualitatively same as *Non-performing Loans*, thus for the purpose of brevity results of *Loan loss provisions* are not reported. While in table 4.12 *Z-score* is used as measure of insolvency risk. The overall results show that there is no effect of crisis on bank risk taking because the coefficients of interaction terms for bank, industry and country level variables and crisis dummies are insignificant. These results are consistent with Reinhart and Rogoff (2013) and Teixeira et al. (2018), who are of the view that the effect of 2008-09 crisis was significant for developed economies rather than developing economies.

In sum, the linkage of the results of this study with theory as well as existing empirical work is discussed as follows.

TABLE 4.10: Insolvency risk: Islamic vs. conventional banks.

Mixed-effects ML regression									
	Conventional Banks			**Islamic Banks**			**Full Sample**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Level 1 (Bank-level)									
Bank Efficiency	0.18*	0.16	0.19**	0.25	0.26	0.27	2.14***	2.22***	4.54***
	(0.10)	(0.15)	(0.10)	(0.45)	(0.41)	(1.10)	(0.39)	(0.41)	(0.94)
Capital Asset Ratio	1.22	1.25	1.39	3.94*	3.92*	3.96*	1.94	1.97	2.08
	(3.32)	(3.32)	(2.29)	(2.03)	(2.01)	(2.01)	(2.33)	(2.34)	(2.31)
Bank Size	-0.29**	-1.26**	-1.28**	-0.32***	-0.35***	-0.32***	-0.28**	-0.25**	-0.27**
	(0.11)	(1.10)	(1.10)	(0.10)	(0.11)	(0.09)	(0.10)	(0.10)	(0.10)
Board Size	-0.21	-0.01	-0.01	-0.03	-0.07	-0.08	-0.01	-0.01	-0.01
	(0.36)	(0.06)	(0.07)	(0.06)	(0.09)	(0.10)	(0.06)	(0.07)	(0.06)
Female Ratio	0.57**	0.57**	0.55*	0.69**	0.69**	0.66**	0.55**	0.54**	0.56**
	(0.23)	(0.23)	(0.25)	(0.27)	(0.24)	(0.21)	(0.21)	(0.22)	(0.20)
Audit Committee	-0.24	-0.24	-0.29	-0.22	-0.24	-0.21	-0.21	-0.2	-0.18
	(0.34)	(0.34)	(0.38)	(0.39)	(0.36)	(0.35)	(0.34)	(0.34)	(0.34)
Risk Management	0.98**	0.94**	1.25**	1.19**	1.16**	1.15**	1.02**	1.01**	1.05**

	(0.43)	(0.39)	(0.49)	(0.43)	(0.40)	(0.39)	(0.40)	(0.40)	(0.41)
Foreign Ownership	-1.54	-1.61	-1.59	2.19	2.53	2.56	-1.58	-1.58	-1.57
	(1.72)	(1.79)	(1.77)	(3.52)	(3.48)	(3.50)	(1.78)	(1.76)	(1.78)
State Ownership	2.36***	2.00***	1.90**	2.01***	2.75***	2.78***	1.98***	1.98***	1.95***
	(0.49)	(0.57)	(0.50)	(0.57)	(0.53)	(0.55)	(0.56)	(0.56)	(0.57)
Level 2 (Industry-level)									
Competition	1.16*	0.44**	0.47**	0.45	0.43	0.41	0.910**	0.581***	0.689***
	(0.64)	(0.21)	(0.22)	(1.11)	(1.08)	(1.02)	(0.43)	(0.19)	(0.24)
Level 3 (Country-level)									
Regulatory variables									
Official Supervisory Power	0.34	0.32	0.31	0.43**	0.45**	0.44**	0.36***	0.38***	0.37***
	(0.49)	(0.45)	(0.44)	(0.21)	(0.22)	(0.22)	(0.10)	(0.11)	(0.10)
Creditor Rights	1.63	1.58	1.54	1.31***	1.41***	1.35***	1.05***	1.07***	1.02***
	(1.35)	(1.24)	(1.33)	(0.23)	(0.24)	(0.21)	(0.27)	(0.24)	(0.25)
Deposit Insurance	1.03	1.01	1.15	1.41	1.45	1.43	1.32	1.3	1.34
	(2.37)	(2.14)	(2.27)	(2.59)	(2.54)	(2.55)	(2.07)	(2.09)	(2.03)
Macroeconomic characteristics									
GDP Growth	-0.21	-0.19	-0.21	-0.05	-0.04	-0.06	-0.01	-0.02	-0.04

	(0.66)	(0.17)	(0.22)	(0.06)	(0.07)	(0.08)	(0.06)	(0.04)	(0.04)
Inflation	0.81	0.77	0.82	0.66	0.69	0.68	0.81***	0.84***	0.82***
	(0.92)	(0.55)	(0.99)	(0.72)	(0.57)	(0.63)	(0.22)	(0.25)	(0.26)
Exchange Rates	0.8	0.81	0.81	0.75	0.72	0.74	0.82**	0.85**	0.81**
	(0.77)	(0.66)	(0.65)	(0.82)	(0.85)	(0.88)	(0.31)	(0.34)	(0.30)
Corruption indicators									]
CI	-0.79**			0.71			-0.18***		
	(0.30)			(0.61)			(0.02)		
Adj. CI		-3.30**			0.55			-0.20***	
		(1.28)			(0.69)			(0.02)	
WBCI			-1.57*			0.17			-0.23*
			(0.81)			(0.65)			(0.13)
Mixed-effects ML regression									
Islamic Dummy (ID)							2.92	2.99	2.19
							(3.23)	(3.43)	(2.08)
Bank EfficiencyXID							-2.69	-2.67	-2.65
							(2.13)	(2.15)	(2.17)
Capital Asset RatioXID							1.96	1.97	2.11

	(2.35)	(2.34)	(2.54)
Bank SizeXID	-0.29	-0.28	-0.27
	(1.11)	(1.11)	(1.09)
Board SizeXID	-0.02	-0.03	-0.01
	(0.07)	(0.07)	(0.06)
Female RatioXID	0.57	0.56	0.58
	(1.22)	(1.23)	(1.21)
Audit CommitteeXID	-0.24	-0.2	-0.19
	(0.37)	(0.34)	(0.31)
Risk ManagementXID	1.02	1.03	1.05
	(1.40)	(1.41)	(1.41)
Foreign OwnershipXID	-1.58	-1.57	-1.58
	(1.78)	(1.76)	(1.77)
State OwnershipXID	1.84	1.92	1.93
	(2.54)	(2.54)	(2.58)
CompetitionXID	1.98	1.97	1.92
	(1.56)	(1.53)	(1.51)
Supervisory PowerXID	0.24	0.22	0.24

							(0.19)	(0.24)	(0.21)
Creditor RightsXID							0.4	0.42	0.42
							(0.37)	(0.39)	(0.38)
Deposit InsuranceXID							0.19	0.18	0.19
							(0.17)	(0.19)	(0.21)
GDP GrowthXID							0.47	0.4	0.44
							(1.29)	(1.35)	(1.29)
InflationXID							0.32	0.34	0.37
							(2.91)	(1.98)	(2.29)
Exchange RatesXID							0.37	0.35	0.31
							(1.57)	(1.23)	(1.28)
CIXID							0.56		
							(0.27)		
Adj. CIXID								2.66	
								(1.03)	
WBCIXID									0.83
									(0.74)
Intercept	7.93***	8.00***	5.19	9.59**	4.43	8.35***	9.24***	8.41***	5.84***

	(1.98)	(1.99)	(4.26)	(4.57)	(6.74)	(2.03)	(0.88)	(0.71)	(1.71)
LR test statistic	356.85	458.24	241.65	365.81	425.23	522.89	248.85	971.15	1852.65
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Model diagnostics									]
Var (e_{jkl})	2.485	3.508	2.481	1.586	1.501	1.00	3.981	4.081	3.481
Var (μ_{pkl})	0.249	0.582	0.895	0.056	0.031	0.028	0.924	0.964	0.895
Var (ϵ_{pql})	1.879	1.104	1.904	0.985	0.982	0.976	1.951	2.104	1.904
Observations	1320	1320	1320	781	781	781	2101	2101	2101
Number of Banks	120	120	120	71	71	71	191	191	191

Note: This table exhibits the estimation of the insolvency risk models. This study used Z-Score as the dependent variable. Parenthesis shows standard errors whereas p-values are in [.].

*$P < 1\%$***, $p < 5\%$**, $p < 10\%$*, respectively. Moreover, see equation (3.13) for estimation of difference in risk taking for Islamic vis-a-vis conventional banks".*

TABLE 4.11: Testing the effect of crisis on bank credit risk.

Mixed-effects ML regression						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Level 1 predictor (Bank-level)						
Crisis Dummy	0.667	0.664	0.671	0.612	0.663	0.645
	(0.99)	(0.89)	(0.93)	(0.87)	(0.98)	(0.79)
Bank Efficiency	-6.161***	-6.159***	-5.742***	-5.741***	-5.794***	-5.791***
	(1.34)	(1.31)	(1.33)	(1.32)	(1.34)	(1.31)
Bank EfficiencyXCrisis Dummy		0.068		0.071		0.069
		(1.05)		(1.04)		(1.05)
Capital Asset Ratio	-4.028*	-4.029*	-3.978*	-3.912*	-3.89	-3.87
	(2.38)	(2.38)	(2.38)	(2.32)	(2.38)	(2.32)
Capital Asset RatioXCrisis Dummy		2.789		2.584		-3.014
		(4.13)		(3.21)		(3.26)
Bank Size	0.043**	0.042**	0.041**	0.040**	0.042***	0.041***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
Bank SizeXCrisis Dummy		0.048		0.048		0.045
		(0.51)		(1.20)		(0.65)
Board Size	-0.032	-0.03	-0.026	-0.028	-0.03	-0.02
	(0.06)	(0.06)	(0.06)	(0.06)	(0.05)	(0.04)
Board SizeXCrisis Dummy		0.036		-0.025		-0.03
		(0.46)		(1.26)		(0.08)
Female Ratio	-1.13***	-1.11***	-1.23***	-1.22***	-1.28***	-1.26***
	(0.27)	(0.28)	(0.34)	(0.35)	(0.27)	(0.28)
Female RatioXCrisis Dummy		-1.091		-1.19		-1.21
		(1.85)		(1.24)		(1.42)
Audit Committee	0.057	0.056	0.067	0.068	0.45	0.47
	(0.31)	(0.31)	(0.31)	(0.31)	(0.30)	(0.36)
Audit CommitteeXCrisis Dummy		0.045		0.066		0.42
		(0.17)		(1.03)		(0.44)
Risk Management	-0.533*	-0.531*	-.513*	-0.511*	-0.16	-0.14
	(0.30)	(0.29)	(0.30)	(0.28)	(0.31)	(0.32)
Risk ManagementXCrisis Dummy		-0.542		-0.214		-0.12
		(1.26)		(0.78)		(0.31)
Foreign Ownership	0.278	0.276	0.282	0.281	0.26	0.25
	(0.49)	(0.49)	(0.48)	(0.49)	(0.48)	(0.49)
Foreign OwnershipXCrisis Dummy		0.245		0.254		0.22

		(0.83)		(1.03)		(0.39)
State Ownership	1.11*	1.11*	1.11***	1.14***	1.10**	1.09**
	(0.45)	(0.44)	(0.45)	(0.47)	(0.45)	(0.43)
State OwnershipXCrisis Dummy		1.01		1.12		1.02
		(2.05)		(1.23)		(0.89)
Level 2 predictor (Industry-level)						
Competition	-0.639**	-0.637**	-0.588**	-0.586**	-0.614**	-0.611**
	(0.28)	(0.28)	(0.29)	(0.27)	(0.29)	(0.29)
CompetitionXCrisis Dummy		0.253		0.252		0.254
		(1.33)		(1.34)		(1.33)
Level 3 predictors (Country-level)						
Official Supervisory Power	-0.433**	-0.431**	-0.473**	-0.432**	-0.481**	-0.430**
	(0.19)	(0.19)	(0.17)	(0.18)	(0.17)	(0.18)
Supervisory PowerXCrisis Dummy		0.968		0.957		0.969
		(0.98)		(0.97)		(0.97)
Creditor Rights	-1.316***	-1.314***	-1.372***	-1.310***	-1.325***	-1.311***
	(0.35)	(0.35)	(0.33)	(0.34)	(0.35)	(0.35)
Creditor RightsXCrisis Dummy		0.958		0.952		0.952
		(1.09)		(1.10)		(1.09)
Deposit Insurance	1.093	1.091	1.048	1.093	1.014	1.087
	(0.75)	(0.73)	(0.83)	(0.81)	(0.74)	(0.86)
Deposit InsuranceXCrisis Dummy		0.966		0.963		0.96
		(0.98)		(1.03)		(0.98)
Mixed-effects ML regression						
GDP Growth	-0.02	-0.03	-0.03	-0.03	-0.02	-0.04
	(0.02)	(0.02)	(0.04)	(0.04)	(0.03)	(0.05)
GDP GrowthXCrisis Dummy		0.092***		0.078**		0.057*
		(0.01)		(0.03)		(0.03)
Inflation	0.091***	0.65***	0.073**	0.66***	0.054*	0.67***
	(0.03)	(0.15)	(0.03)	(0.18)	(0.03)	(0.17)
InflationXCrisis Dummy		0.073		0.077		0.074
		(0.10)		(0.09)		(0.10)
Exchange Rates	0.66***	0.056	0.63***	0.053	0.64***	0.057
	(0.18)	(0.09)	(0.17)	(0.09)	(0.19)	(0.09)
Exchange RatesXCrisis Dummy		0.60		0.62		0.61
		(0.74)		(0.73)		(0.76)
CI	0.600***	0.581***				

	(0.20)	(0.19)				
CIXCrisis Dummy		0.119				
		(0.08)				
Adj. CI			1.617*	1.616*		
			(0.37)	(0.87)		
Adj. CIXCrisis Dummy				0.103		
				(0.08)		
WBCI					1.015*	1.011*
					(0.43)	(0.43)
WBCIXCrisis Dummy						0.101
						(1.07)
Intercept	6.324***	5.243***	6.467***	6.247***	5.277***	4.247***
	(1.02)	(0.18)	(1.01)	(0.18)	(1.07)	(0.16)
LR test statistic,	406.19	410.11	478.52	468.59	473.29	478.23
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Model diagnostics						
Bank-level effect	5.592	4.857	5.288	3.243	4.936	2.291
Industry-level effect	1.34	1.04	1.14	0.776	1.121	0.314
Country-level effect	1.896	1.496	1.679	1.133	1.581	1.071
Observations	2101	2101	2101	2101	2101	2101

*Note: This table exhibits the estimation of the credit risk models. This study used Non-performing Loans as the dependent variable. Parenthesis shows standard errors whereas p-values are in [.]. P < 1%***, p < 5%**, p < 10%*, respectively. Moreover, see equation (3.14) for estimation of crisis impact on risk taking".*

TABLE 4.12: Testing the effect of crisis on bank insolvency risk.

Mixed-effects ML regression						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Level 1 predictor (Bank-level)						
Crisis Dummy	1.537	1.412	0.148	0.045	0.105	0.114
	(2.41)	(2.01)	(0.97)	(0.85)	(0.92)	(0.82)
Bank Efficiency	2.185***	2.086***	3.220***	3.195***	3.541***	3.014***
	(0.42)	(0.43)	(0.42)	(0.41)	(0.56)	(0.50)
Bank EfficiencyXCrisis Dummy		2.892		2.541		2.612
		(2.74)		(2.98)		(2.79)
Capital Asset Ratio	1.94	1.92	1.97	1.93	2.08	2.04
	(2.33)	(2.28)	(2.34)	(2.29)	(2.31)	(2.32)

Capital Asset RatioXCrisis Dummy		1.88		1.9		2.14
		(1.94)		(1.95)		(1.89)
Bank Size	-0.28**	-0.27**	-0.25**	-0.24**	-0.27**	-0.26**
	(0.10)	(0.11)	(0.10)	(0.09)	(0.10)	(0.10)
Bank SizeXCrisis Dummy		-0.26		-0.22		-0.22
		(0.81)		(0.81)		(0.14)
Board Size	-0.01	-0.02	-0.01	-0.02	-0.01	-0.02
	(0.06)	(0.06)	(0.07)	(0.05)	(0.06)	(0.06)
Board SizeXCrisis Dummy		-0.03		-0.05		-0.04
		(0.08)		(0.09)		(0.08)
Female Ratio	0.55**	0.54**	0.54**	0.52**	0.56**	0.57***
	(0.21)	(0.22)	(0.22)	(0.21)	(0.20)	(0.18)
Female RatioXCrisis Dummy		0.58		0.5		0.53
		(0.45)		(0.62)		(0.84)
Audit Committee	-0.21	-0.2	-0.2	-0.23	-0.18	-0.19
	(0.34)	(0.34)	(0.34)	(0.34)	(0.34)	(0.32)
Audit CommitteeXCrisis Dummy		-0.25		-0.19		-0.2
		(0.42)		(0.25)		(0.36)
Risk Management	1.02**	1.04**	1.01**	1.02**	1.05**	1.04**
	(0.40)	(0.42)	(0.40)	(0.39)	(0.41)	(0.38)
Risk ManagementXCrisis Dummy		1.05		1.12		1.01
		(0.89)		(1.56)		(0.84)
Foreign Ownership	-1.58**	-1.54**	-1.58**	-1.56**	-1.57**	-1.53**
	(0.78)	(0.76)	(0.76)	(0.75)	(0.78)	(0.72)
Foreign OwnershipXCrisis Dummy		-1.42		-1.52		-1.5
		(1.29)		(1.02)		(1.02)
State Ownership	-1.98***	-1.95***	-1.98***	-1.93***	-1.95***	-1.92***
	(0.56)	(0.55)	(0.56)	(0.53)	(0.57)	(0.53)
State OwnershipXCrisis Dummy		-1.22		-1.81		-1.82
		(0.98)		(1.30)		(1.58)
Level 2 predictor (Industry-level)						
Competition	0.910**	0.915**	0.581***	0.681***	0.689***	0.725***
	(0.43)	(0.42)	(0.19)	(0.19)	(0.24)	(0.23)
CompetitionXCrisis Dummy		1.851		1.745		1.722
		(2.04)		(2.01)		(2.15)
Level 3 predictors (Country-level)						
Official Supervisory Power	0.36***	0.34***	0.37***	0.32***	0.36***	0.35***

	(0.10)	(0.08)	(0.09)	(0.05)	(0.08)	(0.07)
Supervisory PowerXCrisis Dummy		-0.003		-0.005		-0.002
		(0.13)		(0.12)		(0.13)
Creditor Rights	1.05***	1.02***	1.07***	1.04***	1.06***	1.01***
	(0.27)	(0.21)	(0.24)	(0.22)	(0.25)	(0.20)
Creditor RightsXCrisis Dummy		0.016		0.014		0.016
		(0.13)		(0.13)		(0.13)
Deposit Insurance	1.32	1.33	1.3	1.29	1.29	1.27
	(2.07)	(2.34)	(2.08)	(2.28)	(2.12)	(2.39)
Deposit InsuranceXCrisis Dummy		0.015		0.013		0.014
		(0.13)		(0.13)		(0.13)
Mixed-effects ML regression						
GDP Growth	-0.01	-0.02	-0.02	-0.03	-0.04	-0.02
	(0.06)	(0.05)	(0.04)	(0.05)	(0.04)	(0.05)
GDP GrowthXCrisis Dummy		0.81***		0.82***		0.80***
		(0.19)		(0.21)		(0.16)
Inflation	0.81***	0.80**	0.84***	0.79**	0.82***	0.77**
	(0.22)	(0.27)	(0.25)	(0.29)	(0.26)	(0.28)
InflationXCrisis Dummy		0.44		0.42		0.45
		(1.23)		(1.25)		(1.21)
Exchange Rates	0.82**	0.35	0.85**	0.31	0.81**	0.34
	(0.31)	(2.14)	(0.34)	(1.12)	(0.30)	(2.18)
Exchange RatesXCrisis Dummy		0.31		0.38		0.29
		(1.84)		(1.22)		(1.15)
CI	-0.180***	-0.170***				
	(0.03)	(0.03)				
CIXCrisis Dummy		-1.081				
		(2.59)				
Adj. CI			-0.201***	-0.198***		
			(0.03)	(0.03)		
Adj. CIXCrisis Dummy				0.015		
				(0.13)		
WBCI					-0.230*	-0.210*
					(0.13)	(0.10)
WBCIXCrisis Dummy						0.138
						(0.18)
Intercept	9.248***	5.238***	8.412***	7.964***	5.841***	8.564

	(0.88)	(1.27)	(0.71)	(0.85)	(1.71)	(11.25)
LR test statistic	248.85	1856.33	971.15	540.73	852.65	651.2
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Model diagnostics						
Bank-level effect	3.981	3.245	4.081	3.712	3.481	3.656
Industry-level effect	0.924	0.879	0.964	0.846	0.895	0.82
Country-level effect	1.951	1.782	2.104	2.045	1.904	1.856
Observations	2101	2101	2101	2101	2101	2101

*Note: This table exhibits the estimation of the credit risk models. This study used Z-score as the dependent variable. Parenthesis shows standard errors whereas p-values are in [.]. P < 1%***, p < 5%**, p < 10%*, respectively. Moreover, see equation (3.14) for estimation of crisis impact on risk taking.*

For instance, at bank level results indicate that efficient banks face less credit risk than inefficient banks. The findings of this study are consistent with the bad management hypothesis, according to which inefficient banks face higher costs mainly because of inefficient control and inadequate credit monitoring of operating expenses. Therefore, reduction in revenue or cost efficiency thereby increases risk taking of banks due to credit, operational and reputational problems. However, this issue is low in efficient banks.

Moreover, the results show that larger banks face a higher risk taking. There are multiple reasons to explain why larger banks take more risk. First, according to the Too-Big-To-Fail hypothesis, regulators and governments are unwilling fail large and complex banks, which, in turn, lead to moral hazard behavior and increase bank risk-taking (Farhi and Tirole, 2012). Second, agency cost perspective suggests that complex and large banks usually engaged in multiple activities, for example, combining trading and lending, thus, face more agency issues and poor governance, translate into higher risk taking (Laeven and Levine, 2007). Third, based on unstable banking hypothesis, large banks usually financed more with short-term debt and incline to engage more in risky activities which, in turn, makes them more vulnerable and cause market failures (Gennaioli et al., 2013; Shleifer and Vishny, 2010).

At industry level, the results suggest that in competitive banking systems banks face less risk taking in terms of non-performing loans, which confirms the competition-stability hypothesis. More precisely, banks with more market power in a less competitive banking market are more likely to charge higher loan rates, which can cause the borrower to bear a greater risk and increases credit defaults. In other words, in competitive banking market banks face less risk and higher stability than in concentrated banking market. Finally, the result further shows that country level predictors have also significant impact on bank risk taking. For instance, both official supervisory power and creditor rights reduce bank risk taking. In case of official supervisory power, the findings are in-line with the public interest view hypothesis presented by Beck et al. (2006). The public interest view argues that powerful supervisors have skills and incentives to protect the banks from market failure resulting from information asymmetry, transaction costs and enforcement impediment. From this viewpoint, powerful supervision is decreases bank risk-taking and positively related to financial stability. Likewise, in a strong creditor rights environment, banks are able to grab collateral, force repayment, or even gain control of the debtor in financial distress that leads to lower defaults (Dell'Ariccia and Marquez, 2006; Berger et al., 2011). Moreover, corruption is another country level driver of bank risk taking used in this study and results suggest that increase in the level of corruption in a country leads to increase in bank risk taking. These findings would seem to support the sand the wheel hypothesis of corruption and are in-line with Detragiache et al. (2008) and Weill (2011) among others, who note that in case of severe corruption the growth of lending declines.

Chapter 5

Conclusion, Policy Implications and Future Research Direction

In this chapter, first includes concluding remarks and based on the findings of the study, policy implications are discussed subsequently.

5.1 Conclusion

Existing literature on risk taking of banks identifies risk taking determinants at three different levels; country, industry, and bank-level in an isolated way. Particularly, these studies predominantly focused on the direct effect of country-level, industry-level and bank-level predictors on risk taking. However, indirect influence of national regulatory framework variables, macroeconomic characteristics and corruption in a country through interaction with industry level and bank-level variables to shape bank risk taking is missing.

The aim of current study is to decompose the variance in risk taking at three levels and then go on to examine whether national regulation and supervision, macroeconomic characteristics and corruption channeled through industry and bank level factors to shape bank risk taking. Specifically, this study explores the three-level hierarchical structure of bank risk taking through nested data that contained 191 banks (level 1) nested within 2 industries-Islamic vs. conventional (level 2) nested

within 11 countries (level 3). More precisely, the study fitted three level multilevel models to examine the relative importance of countries, industries and banks as influence on bank risk taking and paid particular attention to assessing the possible causal effects of the multilevel determinants on risk taking. The focus of this study is specifically on the two types of bank risks, namely, credit risk and insolvency risk. Credit risk is linked to the loan quality while insolvency risk is linked with the bank's stability.

In order to achieve these objectives, this study begins by developing ANOVA model with random effects and all explanatory variables are initially excluded from the model. Particularly, a null model, unconditional means model is employed and then based on null model, intra-class correlation coefficients are calculated. Null model also serves as a baseline to evaluate subsequent models. A significant variation is found in both credit risk and insolvency risk at three different levels, therefore, it is concluded that other than bank specific attributes, industry and country levels determinants are also important sources of bank risk taking. Furthermore, a significant result of LR tests recommended that the three-level model therefore offer a significantly better fit to the data than the single-level model. Thus, it is concluded that the 191 banks do not act as 191 independent observations; rather, banks are nested in industries and countries to shape the bank risk taking.

In next step, to investigate whether national regulatory framework, macroeconomic characteristics and corruption channeled through industry and bank level factors to shape bank risk taking, predictors from each level are introduced into the model progressively. The results highlight that adding the predictor variables from bank, industry and country levels reduced the three-variance parameters. The large decline in the bank, industry and the country level variance due to the addition of predictors is witnessed that there are large baseline differences in bank risk taking across banks, industries and countries.

In case of credit risk, at bank level, for example, bank efficiency is found to be negative and significant indicates that efficient banks face less credit risk than inefficient banks and it seem to confirm the bad management hypothesis. Similarly,

a negative effect of capital assets ratio on risk taking supports the implementation of Basel accord and mandatory requirements of capital regulation as a defensive tool for risk taking. However, as for as bank size is concerned, larger banks are found to have a higher risk taking. Interestingly, governance indicators such as female board representation and risk management committee and state ownership are found to reduce the credit risk of banks.

At industry level, the coefficient of competition is significant and negative suggesting that in competitive banking systems banks face less credit risk. Finally, at country level, the coefficients of both supervisory power and creditor rights are significant and negative, implying that strengthening creditor rights and transparency in sharing of information reduce the bank credit risk. Moreover, the coefficients of three corruption indicators were statistically significant and positive suggesting that increase in the level of corruption in a country leads to increase in bank risk taking and these findings would seem to support the sand the wheel hypothesis of corruption.

In case of Insolvency risk, the findings are qualitatively similar to the results of credit risk. For example, at bank level, the coefficient of bank efficiency is positive and significant revealed that bank efficiency is associated with higher bank stability and lower insolvency risk. Likewise, coefficient of industry level predictor, competition, is also significant and positive implying that the stability of banks is lower in markets that are more concentrated or alternatively speaking, competitive banking systems lead to stability of banks and lower the probability of default. Furthermore, at country level, coefficients of both supervisory power and creditor rights are significant and positive that suggest that information sharing and creditor rights are linked with higher stability of banks. As for as corruption is concerned, the results exhibit that banks' stability decreases as the severity of corruption increases. More importantly, the cross level interactions for both credit and insolvency risks are found to be significant that confirms the indirect effect of country level variable particularly corruption on bank risk taking channeled through industry and bank level variables.

This study also finds whether the impact is significantly different for Islamic banks vis-a-vis conventional banks. This study is aimed to fill this gap in the context of commercial Islamic banks and conventional banks operating in 11 OIC countries with dual banking systems where Islamic and their conventional counterparts operate alongside each other. The study uses a sample of 2,101 observations on 71 Islamic banks and 120 conventional banks operating in eleven OIC countries over the 2007-2017 period. The largest number of observations is observed from Malaysia and Lebanon, while the lowest from Yemen and Kuwait. Approximately, 37 percent of the total observations are for Islamic banks and the remaining 63 percent relate to conventional banks.

The results indicate no significant difference between Islamic and conventional banks in terms of insolvency risk whereas Islamic banks face lower credit risk than their conventional counter-parts. Interestingly, the coefficient of the corruption indicators and their interactions with Islamic Dummy is negative and statistically significant, suggesting that severity of corruption in a country do not adversely affect the loan quality in terms of credit risk of Islamic banks. This is in line with the expected adherence of Islamic banks to ethical behavior, which is theoretically the cornerstone of Islamic banks, and plays a crucial role in possibly mitigating the negative effects of corruption on the credit risk/ loan quality of Islamic banks.

Finally, as expected, this study finds no difference in the impact of country, industry and bank level factors on risk taking during global financial crisis. This is because the effect of 2008-09 global financial crisis was significant for developed economies rather than developing economies.

5.2 Policy Implications

Based on aforementioned findings, this study offers following policy implications, which might assist regulators and supervisors in order to manage and reduce the bank risk taking. This study also provides future research direction for researchers in dual banking systems.

1. The findings of this study support the effectiveness of bank regulations and supervision mechanisms to minimize the risk taking. Thus, policy-makers and regulatory bodies should strengthen the bank regulations and supervision, particularly, supervisory power and creditor rights to mitigate the risk taking and make a sound and stable banking system. Because, the institutional factors such as weaker bank regulation and supervision and high level of corruption in less developed economies lead to higher levels of non-performing loans and loan losses (increase credit risk), hence, macroeconomic shocks tend to be larger in these economies.

2. The findings of this study regarding corruption and risk taking also have important policy implications for developing economies that are evolving upward on the emerging development ladder. On the one hand, results of this study regarding the detrimental impact of corruption on bank riskiness justify the urgency of the anti-corruption campaigns in these countries, particularly for conventional banks. On the other hand, the findings provide support for the positive contribution of Shari'ah supervision boards to overcome the adverse effect of corruption on riskiness of Islamic banks, and thereby underscore the need for enforcement and regulatory mechanism for them to be more effective.

3. The results also exhibit that competitive banking systems improve the stability and banks face less risk taking. Importantly, the coexistence of Islamic and conventional banking and competition between two banking systems could increase the efficiency of the whole banking system. Thus, this finding has possible policy implications for countries where Islamic and their conventional counterparts operate alongside each other.

4. The findings also show that governance indicators such as female board representation and risk management committee reduces the risk taking and improves the bank stability. Interestingly, the promotion of females on leadership positions in religiously conscious corporations such as Islamic banks decreases the risk taking and does not adversely affect their performance.

Such insight can assist policymakers to craft programs and policies that effectively address gender equality for the whole society in general and women participation in corporate affairs in particular. Moreover, risk management committee should be formed.

5. Moreover, results suggest that regulatory capital requirement acts as a safeguard of risk because banks having more equity portion in their capital face low credit risk. The findings of this study will help the regulators in assessing the consequences of implementation of Basel capital regulations in terms of risk reduction and efficiency enhancement.

5.3 Future Research Direction

As the findings of this study show that in dual banking systems corruption does not adversely impact riskiness and stability of Islamic banks compared to conventional banks. This could be due to corporate culture of Islamic banks that is based religious doctrine. Thus, future research can be headed to investigate the moderating role of Shari'ah supervision and Islamic Label on corruption and bank risk taking relationship.

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Appendix A

TABLE A1: Country-wise selected Islamic and conventional banks.

Country	Country Code	Islamic_Banks		Conventional_Banks		Total	
		Banks	Obs.	Banks	Obs.	Banks	Obs.
Bahrain	BHR	7	77	6	66	13	143
Bangladesh	BGD	8	88	19	209	27	297
Kuwait	KWT	4	44	3	33	7	77
Lebanon	LBN	2	22	19	209	21	231
Malaysia	MYS	15	165	14	154	29	319
Pakistan	PAK	10	110	14	154	24	264
Qatar	QAT	3	33	6	66	9	99
Saudi Arabia	SAU	4	44	6	66	10	110
Turkey	TUR	6	66	17	187	23	253
UAE	ARE	9	99	12	132	21	231
Yemen	YEM	3	33	4	44	7	77
Total		**71**	**781**	**120**	**1320**	**191**	**2101**

Note: Number of selected Islamic and conventional banks across 11 OIC countries for the period of 2007-2017.

Appendix B: Definitions of the Variable

TABLE B1: Definition of Variables .

Variables	Definition	Units	Source
Section-A: Dependent variables			
Risk proxies			
Loan_Loss_Provision	LLPs is calculated by dividing loan loss provision to average gross loans.	Percentage	BankScope
Non_performing_Loans	NPLs is computed by dividing non-performing loans to gross loans.	Percentage	BankScope
Z_Score	$z - scores = (ROA + ETA)/\sigma(ROA)$		Authors' calculation
Section-B: Bank Characteristics, Governance & ownership indicators			
Bank_Efficiency	Non-interest expenses to total assets.	Ratio	BankScope
Bank_Size	Natural logarithm of the total assets.	Logarithm	BankScope
Capital_Adequacy	Measured as equity capital to total assets.	Percentage	BankScope
Board_Size	Number of directors on board.	Logarithm	BankScope and annual reports

Female_Ratio	Number of female directors divided by total number of directors.	Ratio	BankScope and annual reports
Audit_Committee_Independence	A dummy variable that takes value 1 if audit committee comprised solely of independent outsiders and 0 otherwise.	Dummy	Anuual Reports
Risk_Management_Committee	A dummy variable that takes value 1 if risk management committee exists and 0 otherwise.	Dummy	Anuual Reports
State_Bank_Dummy	State-owned bank dummy that takes the value of one if the bank is state-owned, and zero otherwise.	Dummy	Anuual Reports
Domestic_Bank_Dummy	A dummy that takes the value of one if the bank is domestic, and zero otherwise.	Dummy	Reports

Foreign_Bank_Dummy	Dummy which is 1 if bank is foreign owned and zero , if domestically owned.	Dummy	Anuual Reports
Section-C: Industry Characteristics			
Competition	HHI index, is a proxy for banking industry competition as: $HHI_{ct} = \sum_{i=1}^{n}(Total\_Assets_{itc}/\sum_{i=1}^{n} Total\_Assets_{itc})^2$ It has a value between zero and one. Higher values show that the market is more concentrated.		Authors' calculation
Section-D: Country Characteristics			
Official_Supervisory_Power	The first principal component indicator of official supervisory power questions is used, with higher values indicating broader and greater authority for bank supervisors (Barth et al., 2013). The question takes the value of 1, if answer is found as yes, and zero otherwise. Taken from Bank Regulation Supervision Database, World Bank Surveys by (Barth et al., 2001, 2006, 2008, 2013).		
Deposit_insurance	A dummy variable is used that takes value 1 if deposit insurance, scheme exists in a country and 0 otherwise. Taken from Bank Regulation Supervision Database, World Bank Surveys by (Barth et al., 2001, 2006, 2008, 2013).	Dummy	
Creditor_Rights	An index constructed by four binary variables, see section 3.2.2.1		

	for details. Taken from Bank Regulation Supervision Database, World Bank Surveys by (Barth et al., 2001, 2006, 2008, 2013).		
GDP_Growth	The annual GDP growth per capita.	Percentage	WDI
Inflation	Captured through consumer price inflation rate.		WDI
Exchange_Rates	Captured as currency of sample countries per dollar term.		OANDA
Corruption	Corruption is misuse of public power for private gain. Taken from Transparent International and World Bank's WGI (Worldwide Governance Indicators).		